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Evaluation of the Developing Operational Research Capacity in the Health Sector Project

A Technopolis Group evaluation carried out for the UK Department for International Development (DFID)

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1. Executive summary

Introduction and project background

Operational Research (OR), defined as research into strategies and interventions that improve health service delivery, provides evidence to influence actions and policies to promote better public health in developing countries. Unfortunately there are few developing country professionals who are trained and supported in the field. In response, DFID provided £1,160 000 million over three years (October 2011 to August 2014; by the end of 2014, the figure has reached £1,250,000) to the International Union Against Tuberculosis and Lung Disease (The Union) to support the expansion of an innovative capacity building programme in OR. The project provided targeted training and mentoring support to improve the capacity of front line health practitioners in low income countries to carry out OR. This was done through training courses in OR and support of in-country OR fellowships.

The objective of the present evaluation is to assess the project's performance and impacts during the period October 2011 to August 2014, and provide feedback to the wider research and development community on the OR capacity building model. While the direct users of the evaluation are DFID's Research and Evidence Division (RED) and The Union, the evaluation will serve for accountability and learning purposes for the OR community, research capacity building programmes, research funders and others, feeding into the design of the next phase of the project and investigating the application of the model in other areas of practice.

The evaluation assessed the effectiveness, efficiency, relevance and sustainability of the project with respect to eighteen evaluation questions, using a mix of quantitative and qualitative techniques:

- Deskwork on documentation and monitoring
- Collection of available project data
- Interviews with internal stakeholders
- Questionnaires with participants and non-participants
- Case studies on course-level and two benchmark cases on OR capacity building models
- A bibliometric analysis of the publication output and patterns of the OR-course participants

Findings

The Union/MSF[1] deliver OR courses that are inter-connected with each other and focus on practical aspects and learning-by-doing. This approach aims to enable participants to benefit substantially. 79% of the participants report that the course they took was 'very useful'; another 15% report that it was 'quite useful'. Trained participants increased not only their knowledge of OR concepts, but also their skills and engagement in supervising research team members, collecting safe and ethical data, implementing study design and disseminating results.

Course participants publish the results of their research in a number of scientific journals. Over the last five years, participants published 272 articles in 84 scientific journals, mainly in medicine (86%), immunology and microbiology (20%). The top journals in which publications appeared are Plos One (45) and the International Journal of Tuberculosis and Lung Disease (44). Sixty-six of the articles were published

[1] Médecins Sans Frontières.

in the Journal of Public Health Action, The Union's open access online journal. The proportion of contributions from low-income and low-middle-income countries' institutions and researchers (especially from Malawi and India) are substantial and encouraging for North-South and South-South collaborations.

Course participants publish substantially more than non-participants. For example, the average annual number of paper submissions are 3.1 for participants compared to 1.7 for non-participants, and 1.6 compared to 0.6 regarding number of papers accepted in peer-reviewed journals.

Another positive outcome of the OR courses is the spill-over effect. OR course participants engage in stimulating the development of their colleagues through sharing OR knowledge, mentoring and teaching, participating in OR research projects external to their own department, and using OR findings in their daily work. When compared with their situation five years ago, when only a few percent used OR at least on a weekly basis, now about one third report that they use OR that frequently.

OR skills appear to be appreciated and increasingly required by institutions and non-profit organisations. One third of participants indicate that their individual efforts have made a large difference to their organisation in terms of institutionalising OR. Around half of the participants indicate that their organisations give high or very high priority to OR and two thirds indicate that OR features to some extent in the strategy documents of their organisation. Hence the training tends to boost trainees careers, as it opens doors to job opportunities within their own organisations or when applying for new jobs. Notably, there is no evidence of any brain drain from Southern countries to Northern countries.

There is evidence of institutionalisation of OR capacities in the organisations where the former course participants work. In total 71% of the participants indicate that this has improved over the past five years. There are also reported changes in policy and practice following publication of OR; from "closer collaboration between tuberculosis (TB) and HIV/AIDS programmes at central level" to "increasing trends in the proportion of HIV-TB patients receiving ART (Antiretroviral Therapy)". The most common impact on health systems has been the improvement of monitoring and screening of patients, reported by 56% of the participants. Around one third of participants indicate that their research led to improved policies and around one third indicate that their research led to improved guidelines. In total 19% of participants indicate that their research led to the improvement of existing treatments, 3% mentions the development of a new treatment. A majority of the participants estimate that significant numbers of patients were reached by their activities following their OR training; figures of both hundreds and thousands are mentioned. A large majority of the respondents claim that they intend to continue to carry out research, take OR training, and that their organisations are sustainably committed to OR.

Twelve OR-Fellows were supported through the project, all being very appreciative of the quality of the training and support provided, as well as the opportunities it created for them in terms of publications and careers. The OR-Fellows undertake a number of research projects, publish at quite a high rate and invest significantly in facilitating Modules on the courses, reviewing papers and presenting papers at conferences. Fellows report that the OR course increased their skills in structuring their research; in data collection and analysis, and in writing and publishing research. They feel more confident in the use of OR, work more autonomously and with greater freedom and responsibility, train other people in OR either at The Union/MSF courses, or in other ways in their home countries. The interaction between Fellows is less well developed, hence The Union is engaged in developing a more formal alumni network.

The OR-Fellows' participation in the project has led to cultural changes in their own organisations and new strategic orientation in integrating OR, changes in training provided within institutions, in the visibility of their organisation, as well as increasing national networking. In funding organisations, OR data has become of interest. The

involvement of MSF and the growing capacities of MSF in OR have resulted in a more global presence with the opportunity to expand to other areas.

OR-Fellows report that their OR research led to better screening protocols and guidelines, changes in the way HIV patients are educated, an increasing availability of training in OR, use of the OR work to improve the OR training courses and studies, improving the use of local and national evidence to improve programme design and delivery, and an increasing visibility of OR through disseminating research results.

The Developing OR Capacity in the Health Sector project is assessed to be highly effective. With reference to interview and survey results, the relevance and the quality of the training is high, and The Union's model of holistic training including research protocol development, data analysis, and public dissemination of results is an innovative undertaking that may set the standard for other OR capacity building models. Not least the mentoring of the course participants seems successful, given the prominent scientific output in terms of publications in reputed journals. The support provided to participants, both during and after the course, is considered to be very good. The overall quality of the teaching is consequently assessed to be high. The current course content and its delivery achieve high impact in a cost efficient manner. The support given to the OR-Fellows varies in intensity but is also considered to be at the right level. Additionally, the project has reached its intended goals in terms of gender balance. The Union/MSF applies a selection procedure taking into account the geographical location of participants to enable more local capacity building. This is an important change, which will influence the longer-term sustainability of project impact.

Value for money is in part difficult to ascertain from the data provided and collected, especially as there are elements of *pro bono* work by people employed by The Union and also the good will of the local institutions/faculties in supporting the participants during the course. Nevertheless, value for money is increased by the goodwill that is prevalent throughout the implementation as well as the recent integration of Modules 1 and 2 (out of altogether three Modules for each course; see detailed description of course structure in section 4.1). While course costs vary by location, with, as expected, the Paris and Luxembourg course being more costly than those held regionally, both types of location have pros and cons. The Union is considering locating more of the courses regionally in order to give OR training a stronger country focus. In any case, the substantial scientific output of the participants and the strong impact of the OR Fellows means that value for money is deemed most sufficient, even high.

The availability of expert mentors and facilitators for the courses, functioning as key individuals, sharing their personal networks, is a critical element with respect to both quality and sustainability. Therefore scalability could be a potential issue if this project was to expand to more courses or other health domains.

Recommendations

Recommendations in relation to the courses

1. A strong country-focused approach to the sourcing of participants is needed to create critical mass and a supportive local network of OR researchers and sustain the course's achievements with maximum impact. The strategy to date has been to source course participants widely, which worked well to raise visibility in the early years of running the OR courses, but has left some newly trained OR researchers isolated.
2. Team-based projects rather than individual projects should be considered as these proved effective in the benchmark cases of OR courses. This delivery method creates shared learning and management practices, and potentially nucleates sustainable networks. This delivery method could be particularly useful when course participants come from the same organisation. It is however important to ensure that teams are small enough that members can learn all aspects of OR to a high standard.

3. The selection of participants and the process of assessment should be made more transparent. An objective scoring system should be established so that potential participants are aware of the requirements at the time of application.
4. There is scope for involving ministries of health and national TB programmes in the course participants' home countries, for instance in selecting the research topics for projects. This should increase the likelihood of projects being aligned to national and regional priorities as well as increasing the influence and potential uptake of results by policy makers. This appeared to be a practice adopted by benchmark OR training courses.
5. Research output and its implementation should be better linked through improved dissemination practices (beyond open access publications). An implementation plan should be drawn up and shared with policy makers as an integral part of the project. Access to established networks through, for example, the WHO and MSF is crucial in this regard.
6. Introduce short courses for OR consumers to facilitate the uptake (and future funding) of OR in national settings. This type of course proved effective at benchmark programmes.

Recommendations in relation to the fellowship programme

7. Develop a clearer structure for the fellowship programme and define roles and responsibilities. Strengthen support to Fellows in their career development by providing access to mentorship, knowledge sharing and skill-development workshops.
8. Encourage Fellows to develop course material relevant to their own region and organise and facilitate OR courses in addition to The Union's courses. This 'spill-over effect' would be a practical way to further spread knowledge regarding OR.

Recommendations in relation to sustainability and value for money

9. Build a wider pool of experts and facilitators with knowledge relevant to the diversity of topics apparent in research projects. This could mitigate against some of the risks associated with reliance on a very small number of people at The Union. Thought needs to be given to succession planning in relation to the pioneers of the project in order to ensure its sustainability.
10. Establish 'training the trainers' and other courses in partnership with universities and research organisations that would continue activities without The Union's assistance after set up. These courses could ensure motivated participants and organisations and have been seen at benchmark organisations to work well. If such partnerships are established, there may be opportunities to introduce new, cost-shared models.
11. Consider reducing the ratio of facilitators to participants, particularly if team-based projects are introduced. This could increase the value for money but needs to be done with due consideration to maintain the current high quality of course delivery.
12. Consider supporting course participants to access further independent funding for future OR projects. Explore whether existing support to proposal writing and budgeting skills in the form of short courses can be further developed.
13. Improve community building among past and new OR practitioners with a Community of Practice IT platform so that virtual networking can take place. This could also store questions, answers, issues encountered and solutions.

Generalisable lessons

14. In the view of the study experts, there is a strong potential for applying The Union's modular training model linked to research projects in other areas of health research and beyond. Therefore it is recommended that DFID considers this training model to support OR development in other projects in their portfolio.

15. Sourcing course participants from selected organisations in a given country may enhance cooperation and cost-sharing of training courses. The Union should consider working increasingly at organisational level, as this was a positive lesson learnt from the benchmark programmes.

16. MSF also has multiple disease areas of interest where OR could be usefully applied. However, additional facilitators would need to be trained as the current Union/MSF pool is relatively specialised on TB and HIV.

17. There is potential for further use of this training model in cooperation with the WHO and their wider programme environment, giving access to networks, policy makers and practitioners, which would widen the model's ability to influence.

2. Introduction and programme background

2.1 A brief history

The Developing Operational Research Capacity in the Health Sector project is a three-year, £1.1 million project implemented by the International Union Against Tuberculosis and Lung Disease (The Union) and funded by the UK Department for International Development, DFID, and also, in part by the Bloomberg Foundation. The project, which began in October 2011 and is due to end in October 2014, deployed courses in OR in low-income countries as well as support for in-country OR-Fellows, in order to ultimately improve the health status of poor people in the low-income countries where the project is implemented, across Africa and Asia.[2]

The Union has a long history of engagement in OR and runs the Centre for Operational Research (COR) "established to enhance the operational research (OR) capacity of these countries in the field of HIV/AIDS and tuberculosis, as well as key non-communicable diseases, such as asthma, chronic obstructive pulmonary disease (COPD), diabetes mellitus and hypertension".

Prior to the project, in 2009, MSF Brussels and The Union collaborated together and designed a new OR course for the training of qualified people from resource-poor countries to learn about and undertake OR. At the start, in early 2009, the collaboration was set up so The Union could provide financial support to MSF in return for implementation of joint OR projects in low-income countries and assistance with OR capacity building. Even earlier, in 2006, OR capacity building was supported by a Bloomberg grant.

Up to June 2011, all OR courses were financed and organised through The Union and run in Paris or in India, and MSF provided faculty and mentoring. In July 2011, MSF started an OR course with three Modules in which The Union in turn provided faculty and mentoring. MSF also followed The Union's example and started supporting OR-Fellows. In the current project, which started in October 2011, the two organisations work together as equal partners, hence the project benefits from the experience and expertise of both organisations.

Furthermore no other potential partner than The Union, in collaboration with MSF, offered such a model where the whole OR cycle is covered. The Union/ MSF capacity building approach is quite new as they developed not only inter-connected modular courses with strict criteria for selecting individuals for training, but also performance-based support and OR-Fellows.

In January 2013 The Union and MSF joined with the Special Programme for Research and Training in Tropical Diseases (TDR) at the World Health Organization (WHO) to form an initiative called "The Structured Operational Research and Training Initiative (SORT-IT)". Generally, the new OR-courses follow the same model as previously and were renamed SORT-IT courses.[3]

2.1.1 Mission and objectives of the project

The focus on OR is one element of DFID's work to make health programmes more effective. Building OR capacity is believed to lead to a sustainable increase in the amount of independently conducted and locally owned policy relevant OR, more likely to be used in policy and practice, where the findings can be implemented in the appropriate programmes and beyond. Building OR capacity is also believed to improve

[2] Terms of Reference, DFID Project Evaluation – Developing Operational Research Capacity in the Health Sector.

[3] Ibid

the routine monitoring and evaluation (M&E) in health systems and improve health information systems.[4]

Low and middle-income countries, particularly in sub-Saharan Africa, still experience severe problems with infectious diseases like HIV, Tuberculosis, Malaria, and diarrhoeal diseases with high levels of maternal and child mortality. Simultaneously they are experiencing an increase in chronic, non-communicable diseases such as diabetes. To influence actions and policies in order to promote better health in developing countries, OR uses either national data or data generated through programmes. A constraint however to developing OR, is the lack of capacity in these low-income countries producing data in the field since there are few professionals, and few are trained and supported in OR.

By funding the Developing Operational Research Capacity in the Health Sector project, DFID looks for an increased generation and use of policy relevant OR that will lead to improved health programme performance and health service delivery. The project is expected to result in an increase in the use of research in health policy and practice through incorporation of OR into programmes and a sustained capacity to mentor and retain skilled personnel who can engage in OR in these programmes. The expected impact is improved health outcomes of poor people in low-income countries where the project is implemented.

The project is also in line with DFID's overall work in contributing to the health related Millennium Development Goals (MDGs), and according to the Business Case[5] for the project, the project is consistent with and will contribute to:

- Country Outreach Team Strategy and Objectives through strengthening southern research capacity and increasing the evidence directly needed by DFID country offices
- Research and Evidence Division's Operational Plan and Objectives
- DFID capacity building which emphasises the need to build a community of practice in low-income countries

Due to the above explained constraints of developing OR capacity, the project, if successful, is also seen by DFID as a model that could be used when developing OR capacity in other sectors, acting as a demonstration of best practice.

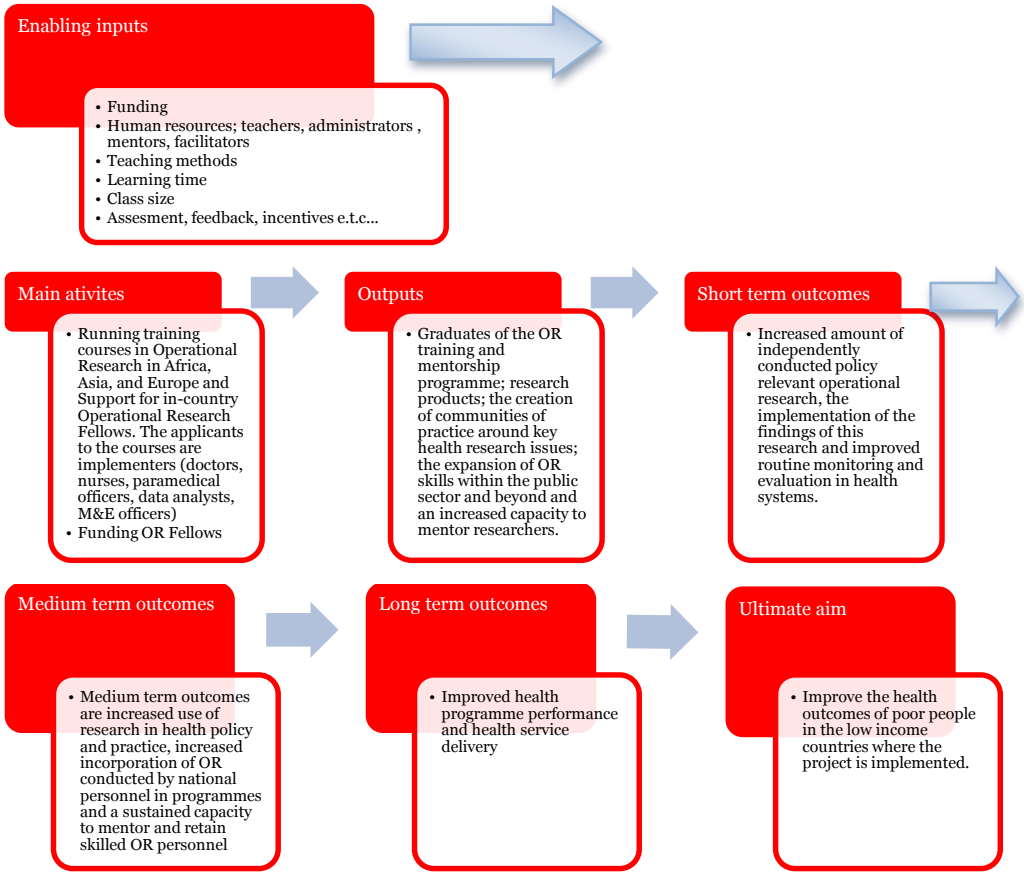
A programme logic of the project is presented in Figure 1.[6] It shows the basic components of the project: enabling inputs, main activities, outputs, outcomes and ultimate aim.

[4] Intervention Summary – Developing operational research capacity.

[5] Ibid.

[6] The programme logic builds on information from the Intervention Summary – Business Case for the project, from the project website and from the Log Frame of the project dated 20.02.13.

Figure 1 Programme logic of the OR Capacity in the Health Sector project



Source: Technopolis Group (2014).

The project provides targeted training and mentoring support to improve the capacity of front line health practitioners in low-income countries across Africa and Asia to carry out OR. This is done through two pillars, the first being the training courses in OR in Africa, Asia, and also in Europe, and the second being in-country OR fellowships.

The ultimate aim of the project is to improve the health outcomes of poor people in low-income countries where the project is implemented. This is to be achieved through the long-term and short-term outcomes and outputs described in the model above.

2.2 Objectives of the study

Developing the capacity to effectively carry out essential health research is an integral part of health systems at both the national and global level. For the knowledge from health research to have maximum impact, countries need the capacity to not only do research, but also commission and use the results of that research.

OR has an important part to play. A key DFID priority for long-term research in health is to focus on OR to make health programmes more effective. However, one of the major constraints to developing OR is the lack of capacity in the health research and development community.

The DFID project Annual Review of 2013 highlighted the possible learning aspects from this project. Even though the project was commended for its approach to

capacity building, a key recommendation of the annual review was that an external evaluation of the programme should be carried out especially as a tool to improve DFID's ability to learn about the project and to share lessons with others, thus magnifying positive impacts.

The objective of the present evaluation is thus to assess the project's performance and impacts during the period of October 2011–August 2014 not only for accountability and learning purposes but also for setting the future direction of the project. While the direct users of the evaluation are DFID's Research and Evidence Division (RED) and The Union, this report is a tool to provide feedback to the wider research and development community.

This evaluation study is structured along the effectiveness of the project, impact, and value for money. Taking a formative angle, the last three evaluation questions focus on lessons learnt for the future (see Table 1).

3. Methodology

The evaluation methodology follows the four groups of evaluation questions (effectiveness, impact, costs and value for money, and lessons learnt) using a mix of quantitative and qualitative techniques. The methodology combines a number of data collection and analysis methods linking to the different evaluation questions:

- Deskwork (documentation and monitoring data of the programme, individual courses, alumni data files, comparable programmes), mainly to collect data on the effectiveness of the project, the costs and value for money and to feed into the analysis and future recommendations
- Interviews with the internal stakeholders (The Union, OR-Fellows, MSF, Bloomberg Foundation) to discuss the objectives and general delivery of the project, the costs and value for money of the project and the views and perception on quality and impact of the research fellows.
- Questionnaires with two groups (participants, non-participants). 132 participant responses were gathered (a response rate of 73%) and 244 non-participant responses were gathered (a response rate of 38%). Both response rates can be considered more than adequate for the purpose of a reliable estimation of effects and for valid comparison for the counterfactual analysis
- Case studies on past courses (i) to document the evolution of the courses between 2011 and 2014 and analyse curriculum design, efficiency and delivery; and (ii) to gather information that showcases the impact The Union's OR training programme had on the participants and policies.
- Two additional benchmark cases of other models of capacity building to deliver operationally relevant research. The case studies include deskwork and targeted interviews with course participants and stakeholders of other models, and provide valuable in-depth information on the outcomes and impacts and likelihood of sustainability. They also provide a better insight into the quality of the curricula and the training and teaching. The benchmark cases finally seek to provide information for the value for money analysis (VfM) and lessons for the future
- A bibliometric analysis of the publication outputs and patterns of the OR course participants. This analysis is based on data available on the individual participants by means of a dedicated online platform and article downloads from the journal Public Health Action (PHA), The Union's new free open access online journal

The data analysis strategy includes organising, cleaning, summarising, triangulation, interpretation of the data collected, and finally reporting.

We considered taking a local approach with on-site interviews and surveys; however, this was revised due to costs and the fact that we could make use of the knowledge and expertise of the OR-Fellows in ten countries. Our internal OR health expert has assessed the quality of both the training Modules as well as the output. We have also undertaken a bibliometrics scan in Scopus as part of the deskwork, which is a much more efficient and cost effective use of resources than for example using a peer review process for assessing research output quality.

3.1 Counterfactual analysis

In complex social interventions such as the Operational Research in the Health Sector project, measuring the effectiveness can be challenging due to the concept of *deadweight*. Deadweight is the part of the effect size that would have taken place in the absence of the intervention. This deadweight effect should be subtracted from the overall observed effect in order to establish the actual net effectiveness.

In any empirical evaluation, a true counterfactual is not possible to establish. This is due to the lack of a possible alternative reality in which the participants did not take

part. The second-best solution, an experimental approach in which participants are randomly selected into the course, is clearly neither feasible nor desirable.

However, there are various accepted techniques for establishing proxies of measuring the net effect size, of which several are employed in this evaluation:

- Qualitative assessment through interviews
- Self-assessment of net effect by participants via the electronic questionnaire
- Difference-in-difference analysis through comparison with a control group

The first two strategies are self-explanatory and are valuable tools in gaining a good insight into the perceived *additionality* of the project (i.e. the extent to which the intervention has had a perceived additional, net effect). However, self-assessment has inherent difficulties as participants themselves do not have a frame of reference for their own development after the programme, and are likely to overestimate the effect of the training course. There are other issues with self-reporting, such as the likelihood of socially desirable reporting (desirability bias), despite the anonymity offered in an electronic survey.

A good complementary strategy is therefore to carry out a counterfactual analysis using a control group, in which the performance of a similar group is compared with the intervention group. Finding such a control group is generally challenging, since the two groups need to be similar (in terms of important background characteristics) as well as accessible for data collection. An obvious candidate would be to use the rejected candidates as a control group, since this group is relatively easily accessible. However, there is a difficult dilemma when deciding whether this makes for a valid comparator sample. This is due to selection bias: the idea that a training programme selects only the best candidates, which leads to participants being inherently non-similar to the control group, leading to an overestimation of effects when using rejected candidates.

In this study, we decided to take the approach described above and compare applicants who were selected (participants) with those who were not selected (non-participants), based on a number of arguments. First of all, there is a large group of candidates for the OR-courses and many are rejected simply due to lack of capacity, not due to their inherent quality. Secondly, we can control for performance differences between the two groups using a technique called difference-in-difference analysis, in which we compare the situation before and after to take out the effect of starting possibly at another performance level, thereby only measuring the net effect.[7] As a risk-mitigating strategy, we have carried out a comparison of the two groups in terms of background characteristics (see section 4.5.1). Given the nature of this counterfactual analysis, we regard the control group to be a 'comparison group', to highlight the fact that this is not a traditional 'perfect' control group.

Throughout this report the reader will see counterfactual tables in which the performance of participants[8] and rejected candidates (the comparison group is henceforth referred to as non-participants) is presented. We have used appropriate

[7] Since we are working with a group who did not participate, we operationalised and generalised 'before the course' as the year 2008, and after the course as 2013. Of course, there is a difference between participants who just finished the course and those who did three years ago. To check for the effect of this difference, we carried out an analysis on the effect of the 'graduation year' on effect sizes (see section 4.5.2). Note that for some questions we have chosen to only ask 'after' questions, as they would impose too great a burden on respondents or would lead to unreliable answers (e.g. very detailed questions such as the number of co-published peer reviewed articles in 2008), but these were generally questions where we could triangulate with other evidence.

[8] Note that a small number of participants are also OR-Fellows (6). These participants are likely to score much higher on performance categories due to the additional support received. However, given the large sample size and the sole use of categorical questions, the effect on these means and medians of the total sample is statistically negligible.

statistical testing to establish whether the effect sizes are statistically significant. The report text includes only part of the counterfactual analysis, the full set of tables can be found in Appendix B.

Appendix C contains additional information on the methodology followed for the electronic questionnaire as well as further details on sample compositions and background characteristics.

For each section of this report, where empirical findings are presented, the top findings are summarised in a framed textbox at the beginning of the section, with reference to the specific evaluation questions (evaluation question 1-18; Table 1).

Table 1 Relationship between research questions and proposed methods

Evaluation criterion	Question	Deskwork	Interviews	Questionnaires	Case studies
Effectiveness of design and delivery	1. What is the relevance and quality of training and pedagogy in the Modules?	√	√	√	√
	2. How well does support provided to participants and Fellows meet their needs?	√	√	√	
	3. How well does the project mainstream gender?	√		√	
	4. What is the quality of the teaching conducted by graduates of the course?	√		√	√
Impacts	5. Do the courses and other activities change knowledge and skill levels and/or behaviours?			√	√
	6. Do participants undertake and publish more and/or better operational research?	√		√	√
	7. Do they influence other practitioners to build their skills and conduct OR?			√	√
	8. Do they help institutionalise OR?			√	√
	9. What are the nature and extent of impacts produced by Research Fellows?		√	√	
	10. Are any changes beginning to cause enhanced use of OR findings and improved health services?			√	√
	11. To what extent are (early) impacts likely to sustain?			√	√
Costs and value for money	12. What is the full cost of running OR courses?	√	√		
	13. How does this vary by location?	√	√		
	14. Does this model of capacity building offer value for money compared to other models of capacity building and other models of generating operationally relevant research?	√	√		
	15. What is the cost-effectiveness of this capacity building model?	√	√		
Lessons, implications and sustainability	16. How can The Union strengthen the relevance, quality, effectiveness and efficiency of the project, sustain and enhance impacts and, if necessary, boost value for money?	√	√	√	√
	17. What are the wider implications for this and other models of capacity building?	√	√		√
	18. To what extent will the benefits of the project continue after the funding has ceased?		√	√	√

3.2 Independence

The independence of the evaluators' work is crucial both vis-à-vis the client, DFID; and the operative stakeholders of the object of study, The Union (its staff) and people affiliated to the project. The evaluators have consulted with DFID regarding technical and management issues, but never when it comes to analysis, conclusions or recommendations. Technopolis Group is a private company under individual ownership and without any affiliation with The Union or any of the informants of the evaluation.

4. Findings

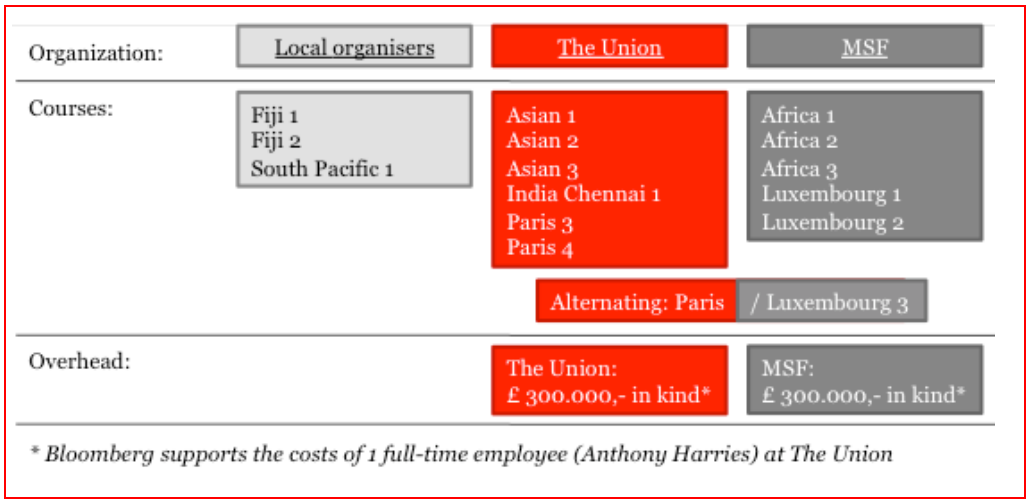
4.1 The OR courses

4.1.1 OR courses overview

The OR courses are organised by The Union and MSF in partnership. The Union and MSF work closely together and each takes a lead responsibility in organising different courses.

Figure 2 shows an overview of the courses organised by both parties.[9]

Figure 2 Organisation of OR courses at the beginning 2014[10] (2011–2014)



Source: Technopolis Group (2014).

Some courses take place in Paris and Luxembourg as this is where the headquarters of MSF and The Union are located. Others are organised by local organisers, and for these courses The Union and MSF take care of the faculty.

4.1.2 Course management

The course management, from application to post course follow-up is undertaken by The Union. The phases are detailed in Appendix D. The process of course management has changed little over time. The main change has been in relation to the choice of applicants. In the beginning, the courses tended to have a very wide geographical spread of participants and in order to help build greater capacity, there is now more consideration given to training two or more people in closer proximity. The evaluation criteria are reviewed very carefully and the application form states clearly that the decision of the selection committee is final and there are no appeal processes.

4.1.3 Course participants

At the time of this evaluation, there had been 807 applicants for the OR courses. Of these 807 a total of 190 people have followed a course, making the application acceptance rate 24%.[11]

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[9] The courses in Luxembourg and Paris are no longer organised in parallel in 2013/2014, these will be organised alternating from one place to the other.

[10] Figure 3 will include additional courses that were not known at the time of creation of figure 2.

Most applicants come from the continents of Africa (300) and Asia (390), combined they make up 83% of the applicants. They do not have the highest application acceptance rates. African applicants have 20% and Asian applicants have 17% acceptance rates. There are fewer applicants from Europe (25) and Oceania (90) but they tend to be more successful: Rates are 84% and 44% respectively.[12] There is a general trend for higher acceptance rates in locations where the courses are being held for the first time, with the exception of Paris.

Gender is more evenly distributed among participants (58% M, 42% F) than among non-participants (66% M, 34% F).[13] Therefore more men (356) apply for OR courses than women (201). Women are however more successful with an application acceptance rate of 34% compared to 26% for men.

For contextual and analytical purposes, a number of additional background indicators of the participants were collected through the online questionnaire. The background indicators are: age, education level, profession, organisation type and some information about how they were invited to apply to the course. These indicators are discussed below, and Figure 39 to Figure 43 in Appendix F gives a full overview of the questions in the survey.

In terms of age, the survey shows that around half of the participants are between 25 and 34 years old and the other half is between 35 and 54 years old. Almost no participants were either under 25 or over 54. Education-wise the survey shows that 23% of the participants did not have a Master's degree or PhD and 2% have only a college or high school diploma. The professions vary greatly and include specialised medical doctors, nurses and monitoring / evaluation specialists, to name a few.[14] The organisations participants work for are most commonly non-governmental (44%), followed by public hospitals (21%) and universities (17%), government administration (14%) and finally, the unemployed (2%) as the smallest category. The majority of participants were invited to apply by colleagues which might explain why the number of applicants grows when courses are put on in the same location as a previous course.

4.1.4 Course structure

The Union's OR courses are designed to run over, approximately, a nine-month period in three closely linked teaching Modules. In these Modules the participants are taught and guided through the principles and practice of conducting effective OR. The standard course material is not adapted to specific needs of particular courses but has continuously evolved over the past four years as a result of faculty experience and student feedback in order to achieve higher relevance and efficiency.[15] The course is structured around the following core material in these three Modules:

- Module 1. Research questions and protocol development
- Module 2. Data management and analysis
- Module 3. Scientific paper writing and communication

In the first Module (six days) the participants are taught to develop a thorough understanding of what operational research is and to ensure that a draft research

[11] See Table 28 in Appendix F for an overview of the courses, their number of applicants and their application acceptance rate.

[12] See Table 29 in Appendix F for an overview of the continents and their number of applicants, participants and the application acceptance rate.

[13] The data presented is based on participation data and gender data is not consistently presented in the application form, nor recorded systematically. There are particular gaps in the non-participant data.

[14] The figures in Appendix F give a full overview.

[15] More detail on course evolution is provided in section 4.1.5; for a detailed description of the aims, content and milestones of the various modules see Appendix E.

protocol and an ethics submission form is produced for their individual OR projects. Participants elaborate their research questions and study protocols under the principle of 'learning by doing' during the week with the support of the facilitators.

The second Module (six days) ensures that participants understand the importance of good data quality, have the skills to produce an electronic data entry form, to capture quality-assured data, and to use the free and open source software, 'EpiData' for statistical data analysis. Module 2 now directly follows Module 1 (with a Sunday break between the Modules) to foster closer links between the course content and to avoid unnecessary travelling for both participants and facilitators. At the end of Module 2 the participants return to their countries to conduct their 8-month operational research project.

In the third and final Module (seven days) participants perform a final analysis and interpretation of the results of their studies and turn these into a scientific manuscript for submission to a peer-reviewed (usually open access) journal, relevant to public health. Participants are also taught how to deal with online submission, editors' and reviewers' comments, and how to communicate their findings to lay audiences and use social media. This last Module is of high importance, in order to increase dissemination of research output via published papers.[16]

4.1.5 Course evolution 2011–2014

A new model of OR course was introduced by the partnership of The Union and MSF in Paris in 2009 at The Union's headquarters. By 2011 the standard OR course consisted of three Modules of five days each, with clearly defined outputs for each Module. Twelve participants were selected from a larger pool of applicants according to set criteria[17] and those who were not able to achieve progress milestones were eliminated from the course, and recorded as course failures. Typically, one or two participants were accepted from individual countries from all over the world for the courses held in Paris and Luxembourg (MSF headquarters) including India, China, Vietnam, Bangladesh, Fiji, Myanmar, Peru, South Africa, Kenya, Malawi, Ethiopia, and Uganda. Most course participants that were accepted in the course completed the training programme, however, there were occasional cases of personal or visa issues. Initially courses were relatively simple and organised around separate Modules consisting of 1) Protocol development; 2) Data management and analysis; and 3) Scientific paper writing.

The year 2012 was a transformational one for The Union's OR course, as it saw a major policy change of combining Module 1 and 2 and expanding the course delivery to regional centres in Asia and Africa (Figure 3).

The Africa 2012 course was re-branded half way through as SORT-IT[18] in July 2012, and the Luxembourg 2013 course was the first that was held entirely under the SORT-IT brand. New course material was also added in 2013 and, simultaneously, Modules were extended from the original five days to accommodate such changes.

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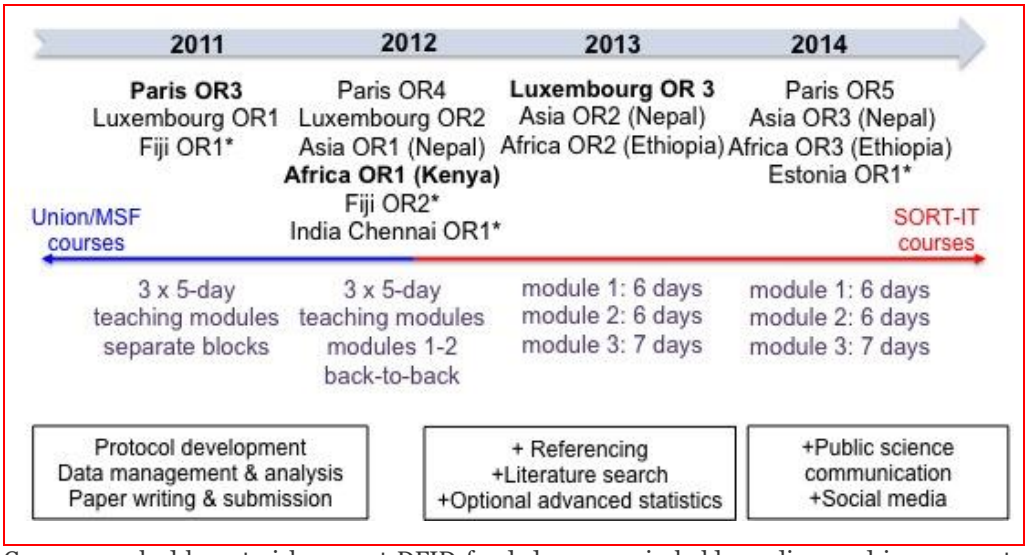
[16] Harries, A.D. (2013), *Building operational research capacity in low- and middle-income countries* [PowerPoint slides]. Retrieved from: http://www.europarl.europa.eu/stoa/webdav/site/cms/shared/2_events/workshops/2014/20140211/2.ADH_OR%20Capacity%20Building_Final.ppt

[17] Bissell, K., Harries, A. D., Reid, A. J., Edginton, M., Hinderaker, S. G., Satyanarayana, S. Enarson, D. A. and Zachariah, R. (2012) "Operational research training: the course and beyond" *Public Health Action* 2, pp. 92-97.

[18] SORT IT stands for Structured Operational Research and Training IniTiative, and is a collaboration between TDR, The Union, and Médecins sans Frontières (MSF).

Figure 3 Timeline of key developments of The Union's OR courses



Courses marked by asterisk are not DFID-funded; courses in bold are discussed in a separate case study; courses are shown according to their start date; Source: Technopolis Group 2014.

4.1.5.1 Combining Module 1 and 2

Module 1 included an introduction to OR, a discussion around research questions and the corresponding methodology of statistical data analysis. Participants then returned to their country and obtained approval of their project from their research organisation and local mentor. Participants also had to seek ethical approval from a local ethics committee and The Union's Ethics Advisory Group. Module 2, originally approximately two months after Module 1, provided the information for quality-assured data collection; taught the basics of summary statistics using the software EpiData for both data capture and analysis. This Module concluded with a plenary session where participants presented and discussed their draft research protocols. Participants then returned again to their country and carried out their research project over a 6-month period. The final Module was essentially about scientific writing and preparations to submit a manuscript to a peer-reviewed journal.

As a result of standard Module evaluations, the organisers learned that some participants used the intervening period between Module 1 and 2 to start collecting data even before they learned about the quality-assured data capture techniques. Faculty discussions led to a policy change in that Module 2 would immediately follow Module 1 in future courses with only a weekend break. Advantages include diminished cost due to the reduction of travel and establishing closer links of the Modules' content allowing a better retention of information. In addition, EpiData software and resource files can be installed on participants' computers before Module 2 begins to further improve the quality of training time during Module 2. There were however concerns about the fatigue for participants and faculty during the intensive training, and potential socio-cultural issues of women being away from their families for a longer period of time. The pedagogic advantages and cost efficiencies were deemed to outweigh the potential threats the policy change represented and so it was adopted for future courses.

4.1.5.2 Course delivery in regional centres

Courses delivered in Paris and Luxembourg were well received by the participants according to evaluations carried out by The Union and interviews conducted by the study team. After the completion of each Module, participants were invited to provide anonymous feedback via a survey by scoring on a scale of 1 (very poor) to 5 (excellent) various dimensions of the Module (11 quantitative questions about course

organisation, teaching material, accommodation, etc.). For example, Module 2 of the Paris OR3 course received an average overall score of 4.5. The question about whether the participants would recommend the course to a colleague was ranked highest with an average of 4.8, and the quality of accommodation, the overall format of the course, and the balance between Module components all equally ranked at an average of 4.1. Similarly, the evaluation statistics of the most recent Luxembourg OR3 course showed that the course was considered good/excellent (4.6) with the highest scores obtained for 'organisation during the Module' and excellent quality 'course materials'. However, the accommodation was deemed noisy and rated less highly by the participants, with a score of only 3.5, despite the fact that the corresponding cost was rather high.

There was a growing general view of the faculty that OR training courses need to be closer to the regional centres where public health concerns are particularly high. This would enable more local participants and facilitators from a particular region to attend the courses and the new model may also contribute to creating a good regional network of operational researchers. In particular, new courses were introduced in Africa (Kenya and Ethiopia) and Asia (Nepal) starting in 2012. The course structure and content for these regional centres were very similar to those described for the European ones, however, there were characteristic challenges related to delivering courses in poor resource settings.

Course material and software were shared during the course initially via USB keys, but more recently via a local Network Attached Storage (NAS) device; an uninterruptible power supply (UPS) was also required, in particular, during the Africa courses for smooth running of the programme. There was a request by participants to share the electronic version of the course material before the course; the cloud-based services DropBox and WeTransfer are currently used for this purpose. Nevertheless, paper copies of all core course material are provided during the course so that participants can write on those, a particular request during the African course.

Collecting pre-course information about participants' prior knowledge on statistical software skills and the hardware/software configuration of their laptops to be used during the course was also implemented so that facilitators could focus on the effective delivery of the teaching material and hands-on exercises.

4.1.5.3 Course development and Module extension

After each Module of the OR course, faculty assessed the feedback from participants and discussed the extent to which course content and delivery required modifications. Faculty were quick to implement changes and effectively respond to challenges. They revised the teaching material where necessary and e-mailed all participants an up-to-date version of the course.

Key changes to content in 2013 included the addition of material to formally teach reference management and literature search techniques, using the free programmes Mendeley and PubMed, respectively. It quickly became clear that additional course material could only be effectively delivered and learned properly if it is coupled with additional teaching hours. In the Luxembourg OR3, Module 1 was extended from the original five-day teaching week to six days, with additional teaching on Saturday. This change also allowed more time for early team building and to develop high quality study protocols using an example of what a completed research protocol should look like taken from a previous course. As already stated, Modules 1 and 2 are now delivered back to back over a two-week period with only a Sunday break.

Module 2 in the Asia OR 2 course was expanded from the original five days to six in February 2013. According to The Union's evaluation documents available for Module 2, it was concluded that during a five-day programme participants were under too much pressure, and the advanced data entry and analysis training could not be delivered on time so that participants are ready for the final plenary. However, feedback from participants indicated that plenary discussions were very useful and often contributed to an improved focus of research projects. An analysis of the list of research projects conducted by OR course participants showed that, with the

expansion to regional delivery of courses, the project topics went beyond the historical TB/HIV theme and involved other topics (in Africa 2012) such as hypertension, diabetes, Lassa fever, sexual violence, specialised surgical repair of obstetric fistulas, and paediatric care. An extra day (Saturday) was therefore added in Module 2 that allowed more time for teaching and preparation of data recording files for participants during the week, including an optional session on multivariate analysis.

During discussions in 2013, faculty also identified that Module 3 was the most challenging part for both participants and faculty to reach the aim that all participants complete their research papers by the end of the week. As Professor Harries, Director of The Union's Centre for Operational Research, explained, "this expectation meant that days, evenings and nights were spent by participants and faculty creating and working on the papers by way of critical review and high level analysis". Although milestone 3 requires that all data are collected by participants six weeks before the start of Module 3, lots of work remained for data analysis and writing up during the final week. It was thus decided that Module 3 would start on a Friday rather than a Monday, giving two extra days (Sunday off) for data analysis and preparation of tables and figures before tangible paper writing could begin on the Monday. The extra time was also needed for a refresher session on statistical data analysis using EpiData and extra lectures on science communication to lay people and decision makers. The first such seven-day Module 3 was introduced during the 2013 Asia OR 2 course.

Finally, a recent efficiency change to Module 3 was proposed as faculty saw that the first plenary session on data analysis and tables was sub-optimal and not a good use of time. Therefore in the Paris 2014 course this session was mentor group-based rather than bringing together all participants and faculty as is done in other full plenary sessions. For further detail on the course, please see Appendix E.

4.2 The in-country OR fellowships

There are 12 OR fellowships awarded under the Developing OR Research Capacity in the Health Sector project.[19] The funding for the OR-Fellows comes from DFID, MSF and Bloomberg (although the funding from Bloomberg has been terminated). Five OR-Fellows are working with the MSF Operational Research Centre, two are working with the South East Asia Union Office and the others (five) with TB programmes or HIV/AIDS programmes in their respective countries. The fellowship programme for OR in MSF was initiated in July 2011 after the completion of the first MSF-Luxembourg based OR course. A total of three candidates were nominated. These include one paramedical officer based in the OR unit in Brussels and Luxembourg, and two medical doctors – one working in Kibera slums, Nairobi, Kenya, and another in Ethiopia. Table 2 gives an overview of the location and type of OR-Fellows.

Table 2 Overview of the OR-Fellows

	Type of OR-Fellow	Location	Years active
1	DFID	Benin	2012–2014
2	DFID	India	2012–2014
3	MSF	Brussels	2011–2014
4	MSF	India	2012–2014
5	MSF	Sudan	2011–2014
6	MSF	Brussels and Luxembourg	2011–2014
7	MSF	Nairobi, Kenya	2011–2014
8	DFID Bloomberg	Malawi	2009–2014
9	DFID Bloomberg	Vietnam	2010–2014

[19] There is now an additional OR-Fellow, located at MSF, Luxembourg, 2013-2014.

	Type of OR-Fellow	Location	Years active
10	DFID Bloomberg	India	2010–2014
11	DFID Bloomberg	South Africa	2010–2014
12	DFID Bloomberg	Zimbabwe	2011–2014

Source: Union documents 2014.

Taking the OR-course is a general expectation for any individual before being considered as an OR-Fellow. Most of the OR-Fellows (ten) interviewed as part of this evaluation had taken the course (either in Paris during 2009 or 2010, or in Luxembourg 2011). Some took the course before considering becoming an OR-Fellow; others took the course in order to fulfil the requirements for becoming an OR-Fellow. Two of the OR-Fellows did not participate in any of the courses, since their previous experience in OR was deemed equivalent.

The majority of the OR-Fellows are employed full time in their respective countries. Where they are employed part-time, the OR-Fellows are often combining studies alongside their work (for example a PhD or Master's Studies in Public Health).

4.2.1 OR-Fellow objectives

The overall role of an OR-Fellow is to conduct and publish research into strategies, interventions, tools and new knowledge that will help to improve health care delivery either in programme settings or important health-related problems.

The specific roles are listed in the terms of reference as the following:[20]

- Mandatory attendance of the training for all three Modules conducted by the OR Centre
- Develop protocols for research projects under the mentorship of staff at the Centre or within The Union and in collaboration with country colleagues
- Submit such proposals to ethical review to ensure that the highest standards are being met
- Ensure that protocols, once approved, are implemented in the field within a reasonable time frame
- Be responsible for the collection, filing, management and storage of all data, with appropriate back-up strategies, and quality-assured data entry and validation with technically suitable and appropriate electronic application software
- Conduct data analysis under the mentorship of staff at the Centre or within The Union
- Ensure that within three months of completion of any research project that a paper is prepared and ready for submission to an international peer reviewed journal
- Be responsible for the submission, management and follow-up of all papers submitted electronically to journals
- Present the results of published work at relevant national and International conferences
- Submit each year at least two papers to peer-reviewed journals

[20] There is a terms of reference for the OR-Fellows (2009) which forms part of the Fellows contract – but has also evolved over time. The terms of reference sets out the responsibilities of the OR-Fellows

- Attend targeted training on protocol development, data entry, data analysis and paper writing skills and participate / facilitate in Union-sponsored training courses

OR-Fellows receive financial and other support (for example, laptop computers) to enable them to undertake research projects in the field. In addition, they periodically undertake targeted training on research protocol development, data analysis and paper writing skills, and every attempt is made to include them in Union-conducted training courses or symposia.

In addition to the terms of reference, the present OR-Fellows are actively involved in facilitation and mentorship in the OR courses run by The Union and MSF. They also undertake more than their two required research projects for the year and have done or are doing their PhD. They are also supporting their national/regional/local government to undertake OR and build capacity in OR at national/regional/local level.

4.2.2 OR-Fellow education levels

The education levels of the OR-Fellows vary from a Bachelor's degree to a PhD (see Table 3). The majority are Medical Doctors or those with a degree in Public Health. Other education subjects covered include a degree in Computer Science, Microbiology and Biostatistics. Those interviewed as part of this evaluation, have been employed as Operational Research Fellows from, earliest 2009, and, latest, 2012.

Table 3 Overview of the ages, education levels and professions of the OR-Fellows (n=9) – participant survey

Age range	Level of education	Profession
35-44	PhD	Specialised Medical Doctor
25-34	Master-level / MPH (tertiary education, second phase)	Specialised Medical Doctor
35-44	Master-level / MPH (tertiary education, second phase)	General Medical Practitioner (GP)
25-34	Master-level / MPH (tertiary education, second phase)	Nurse / Other Medical Professional
35-44	Bachelor-level (tertiary education, first phase)	Nurse / Other Medical Professional
25-34	Master-level / MPH (tertiary education, second phase)	Researcher
35-44	PhD (achieved while an OR Fellow)	Staff of National Tuberculosis Programme
35-44	Master-level / MPH (tertiary education, second phase)	Specialised Medical Doctor
25-34	Master-level / MPH (tertiary education, second phase)	Researcher

Source: Technopolis Group (2014).

The OR-Fellows are appointed as a result of recommendations from their senior colleagues, a good curriculum vitae and an interview process.[21] They have a contract for up to two years around a programme of work, with an annual assessment of performance. Failure to submit at least two papers to peer-reviewed international journals within each 12-month period will result in failure to renew the annual contract.

4.2.3 OR-Fellows' reasons for joining the fellowship programme

There were a number of key reasons given by the OR-Fellows for taking part in the fellowship programme:

- Natural development in their career – training, promotion and recognition
- Improving their research expertise – specifically in the health related sector

[21] Almost all of the OR-Fellow interviewees were recommended to apply to the programme by a senior person in their respective organisations, or by a mentor/facilitator.

- Adding practical experience to their research
- Opportunity to be mentored by people at the top of the OR-profession
- Using OR to bring innovation into practice on the ground
- Using OR to improve critical reflection on the practical implementation of health programmes
- Using OR to support and influence policy decisions

Joining the fellowship programme is, for many of the OR-Fellows, a natural development in their career and also an opportunity for promotion and gaining recognition. Many of the OR-Fellows were already involved in research activities and saw the programme as a way to take their research to another level. By taking part of the programme some of the OR-Fellows hoped that it would provide a structure to what they were already doing. One of them expressed the following:

> *"Since I was already involved in data collection and other things relating to OR I thought this would be a good thing; that it would provide some structure to what I was already doing."*

It is also common for the OR-Fellows to describe that they have been missing the practical part of research in their academic training, and this was something they saw they could get from the fellowship programme. One of the interviewees described it like this:

> *"When the opportunity came it was pretty much what I was looking for. In academia there was not much possibility to publish. I was teaching on publishing courses, but I did not really have the experience. I needed the experience in conducting research and publishing research; that was what I was looking forward to."*

Being able to conduct research that has an impact on the health-sector is also a reason given for joining the programme. The fellowship programme is a way of doing research with more social relevance and linked to application.

Some of the OR-Fellows also highlighted the importance of being mentored and working with highly experienced people, like Professor Harries, and coupled to this, the access to very experienced people helped OF-Fellows to develop in their career and also to gain a career boost.

Another key finding from the interviews is how being in the fellowship programme strongly supports innovation within routine operations and contributes to critical reflection on programme orientation and its impact over time. Applying research findings into policy and practice, and being able to influence their own countries and passing the knowledge on to their own organisations and colleagues was also seen as important for many OR-Fellows. A few of the OR-Fellows stated that the possibility of pursuing a PhD along with working as a Fellow was of great importance to them.

4.3 Scientific outputs

This section presents the results of the bibliometric analysis of a selection of participants of the OR courses. More information on the methodology used and some additional results are included in Appendix G. The results of this analysis are based on a search for all chosen participants in the Scopus database. The bibliometric results are based on the following 'relevant' or 'citable' document types: *articles, reviews, conference papers, editorials* and *letters*.

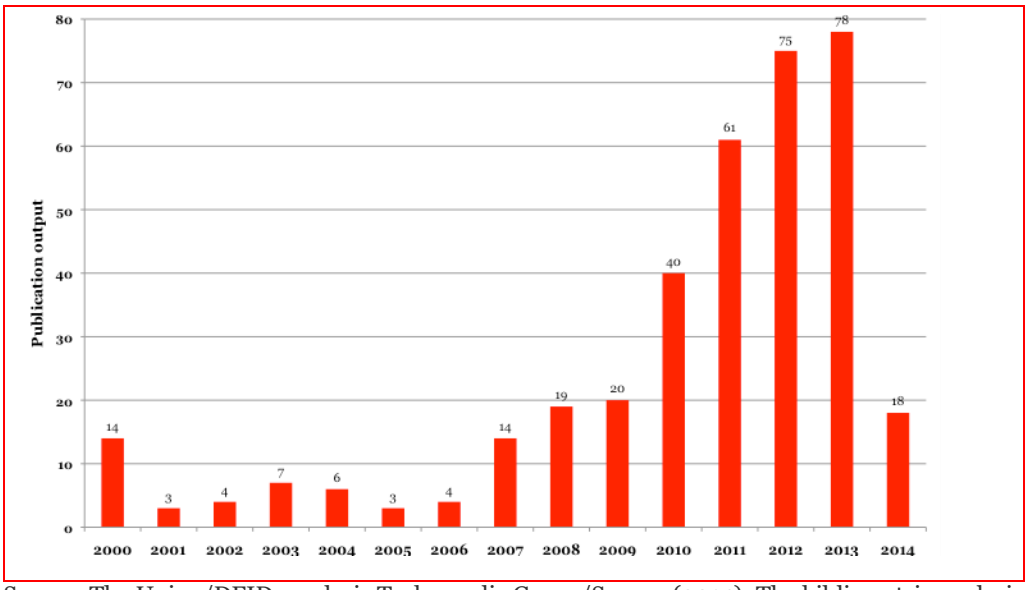
In total 86 participants of the courses have been identified and are covered by Scopus, which means that they have published at least one article in a peer reviewed scientific journal that is included in the Scopus journal set. This is almost half of the total number of participants. These researchers have been identified based on the information from a monitoring survey on publication data that The Union collected

amongst the course participants. This information contained the titles of articles that the participants have published as a result of the courses. It was more challenging to identify researchers who had not yet themselves reported on their publication record due to the fact that searching just on names and countries did not produce results which could be verified (it was not possible to guarantee the right person had been identified). For the same reason it was not feasible to include the non-participants in the bibliometric analysis.[22] Of those identified, we included all publications from the year 2000 onwards. In particular we looked at the differences in publication output and quality between three five-year periods: 2000 to 2004, 2005 to 2009 and 2010 to 2014 (the period in which the courses have been organised). This is done in order to identify any potential changes. The analyses on the scientific outputs focus on the following aspects:

- The overall publication output of the group of participants
- The relative publication output across subject fields (scientific disciplines)

In the period 2000–2014 the group of participants identified contributed to a total of 366 articles published in scientific journals that are covered by the Scopus database, which is on average more than 4 articles per person.[23] Of this set, 34 articles have been published in the period 2000–2004, 60 in the period 2005–2009 and 272 during the last five years. This represents a considerable increase, possibly attributed to the training courses. Figure 4 shows the annual publication output. The most recent annual review[24] of the activities implemented by The Union mentions that the course participants submitted 104 articles, of which 70 have been accepted for publication. As this number is higher than the number of course participants, it demonstrates that some participants are submitting more than one journal article during the course. The deviation of these figures with the higher number of Scopus publications is caused by the fact that course participants contribute to publications of other researchers as well.

Figure 4 Annual publication output period selected course participants (2000–2014)



Source: The Union/DFID, analysis Technopolis Group/Scopus (2014). The bibliometric analysis was performed on 5 May 2014; this implies that only publications that have been published before this date have been taken into account.

[22] This was agreed upon with DFID during the course of the evaluation.

[23] It is possible that the participants published in (open access) journals that are not covered by the Scopus database. This implies that the figures presented in this report might be an underestimation of the actual output and quality.

[24] Annual Review 'Developing operational research capacity in the health sector' (28 February 2014).

The research foci of the participants based on the number of publications per subject field or scientific discipline (as categorised by Scopus) are as expected Medicine (86% of the publications belong to this field), Immunology and Microbiology (20%), Biochemistry, Genetics and Molecular Biology (16%) and Agricultural and Biological Sciences (13%). Because of overlap between subject fields, many papers are included in multiple labels.

The Journal Public Health Action (PHA)[25] is The Union's free access online journal and was launched on 1 May 2011. The journal aims to promote the vision of The Union (health solutions for the poor) by disseminating new knowledge on health systems and health services for vulnerable groups, with a priority on tuberculosis, lung health, non-communicable diseases and related public health issues. Since its launch in 2011, the journal had 12 quarterly issues containing 169 publications of which 108 were research articles (i.e. excluding editorials, notes and short communications). In total the 169 publications have been downloaded 26,964 times (on average around 160 downloads per publication).[26] Half of these downloads concern article downloads (13,109 downloads of 108 articles).

A total of 47 course participants, from the different courses, published in one or more of the issues of PHA. Together this group is responsible for 66 publications, mainly articles. This represents around 40% of the total publication set. The publications of this group of researchers have been downloaded 8,258 times altogether. The average download rate of the articles of this group is 111 downloads per article, while for the other researchers this is slightly higher with 132 downloads per article.

4.4 Effectiveness of design and delivery

This section answers evaluation questions 1, 2, 3 and 4. (*1. What is the relevance and quality of training and pedagogy in the Modules? 2. How well does support provided to participants and Fellows meet their needs? 3. How well does the project mainstream gender? 4. What is the quality of the teaching conducted by graduates of the course?)*

The relevance and the overall quality of the training are high. The heavy over-subscription to the courses, the overwhelmingly positive response of the participants and the positive indication of the usefulness of the course all support this conclusion. The large number of peer-reviewed publications that course participants produce is also evidence of the high quality of the training. The 2014 Annual review of the programme also reports high relevance and quality of the training.

The pedagogy of the training is of high quality. An expert evaluation of the course material and delivery techniques, as well as participants' opinions expressed in interviews all support this conclusion.

The support provided to participants of the course, both during and after is considered to be good. The access and availability of the mentors and facilitators throughout the course is to be commended. The support is freely given during the 9-month period of the course, not just during the training Modules.

The support given to the OR-Fellows varies in intensity but is also considered to be at the right level. They receive support in many different ways, tailored to their own needs and also indicating the "open door" policy of The Union and other facilitators for advice and exchange of ideas. If more support could be given, it would be to increase their access to platforms for disseminating their research more widely.

[25] http://www.theunion.org/what-we-do/journals/pha/.

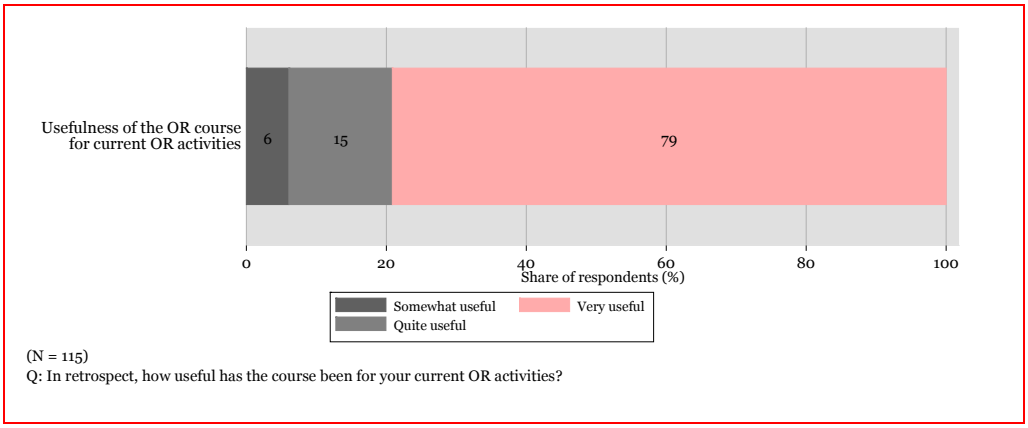
[26] Figures provided by the The Union/Public Health Action, status 25 April 2014.

The project has reached its intended goals in terms of gender balance. There is also evidence in the research projects that gender is considered in the subject matter of research as well as the analysis of the data.

4.4.1 Effectiveness of the OR course

Participants of the Developing Operational Research Capacity in the Health Sector project are positive about the usefulness of the OR training course. The participant survey asked respondents to provide an overall assessment of the usefulness of the course. Figure 5 shows that 79% found the course very useful, 15% quite useful and 6% somewhat useful. Nobody choose the option 'slightly useful' or 'not useful at all'.

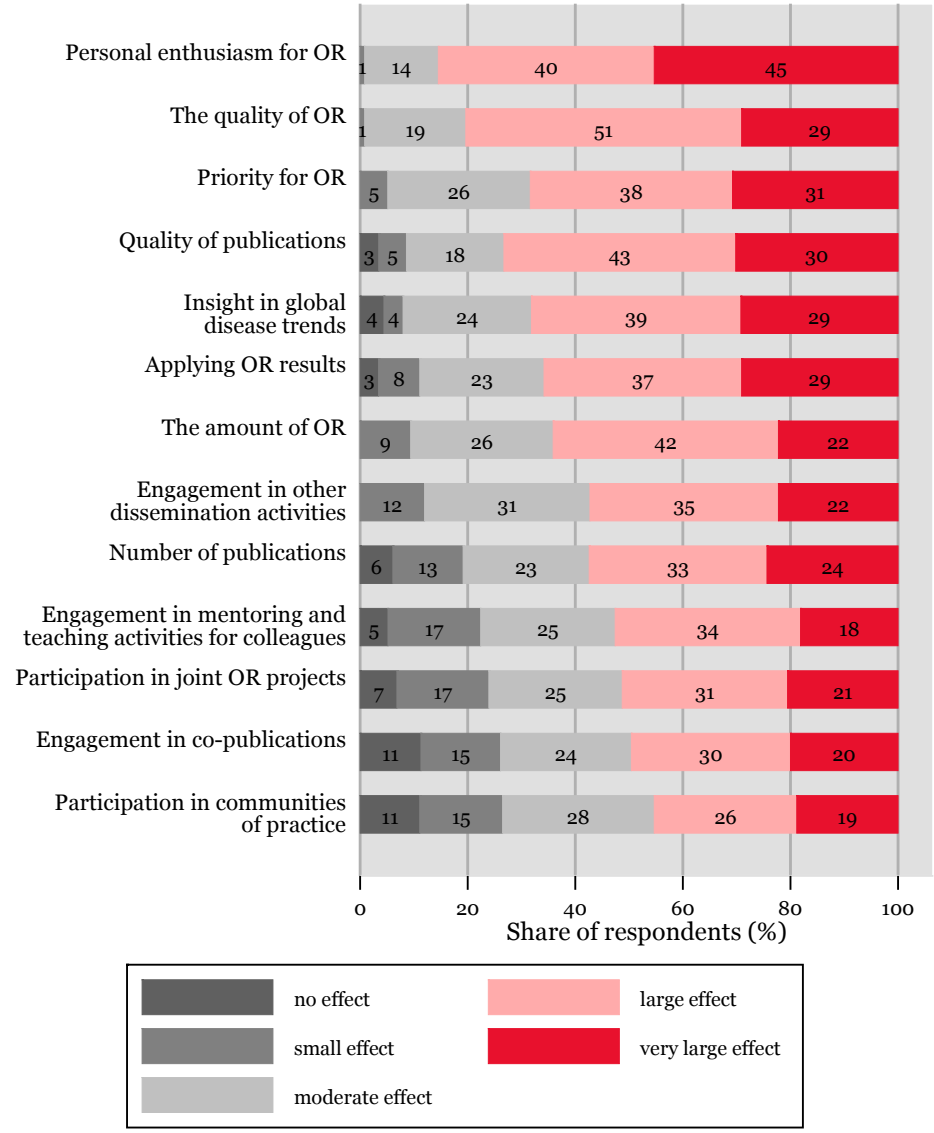
Figure 5 Usefulness of the OR course for current OR activities



Source: Technopolis Group (2014).

Participants were asked to indicate the extent to which the OR course had a positive effect in relation to a number of variables. Figure 6 shows the largest effects were seen in relation to: personal enthusiasm for OR; the quality of OR, priority for OR; and quality of publications. Smaller effects were seen in relation to engagement in co-publications and participation in communities of practice. The lower networking and community effect is a point which is seen throughout this evaluation, typically hindered by the difficulty in creating concentrated capacity building in a small global project.

Figure 6 Effects of the OR course on participants



(N = 117)

Q: Please indicate to what extent the OR training course had a positive effect on ...

Source: Technopolis Group (2014).

4.4.2 Effectiveness of the OR-Fellows in their roles supporting courses within the project

OR-Fellows are positive about their impact on the course participants. This in part is due to the amount of time given to supporting the research projects and publication process. The work is described as being intense, but very rewarding and during the process the OR-Fellows also learn a lot about the areas of research being undertaken by the participants which enhances their own knowledge.

The OR-Fellows indicate they devote a substantial amount of time to facilitating course activities. One of the OR-Fellows estimated that approximately 50% of his time involves facilitating courses, which includes teaching during the Modules and the 'after work'; helping the course participants with data analysis, editing manuscripts etc. Effectiveness can also be hampered by the competing priorities of the fellowship programme (including course support) and the OR-Fellows host organisation.

4.4.3 Effectiveness of the training and other support received by the Fellows

OR-Fellows are either full time or part time in terms of their financial support but there is a uniform budget for training for all of them. According to The Union, OR-Fellows generally choose their own training with regards to their requirements, which are then discussed and approved centrally.

The subsequent training approved and received as an OR-Fellow varies in intensity. Many of them state they have received no formal training after the OR-course. Some indicate having their own mentor, others not. Almost all of them say they feel that they are provided with the support they need, and there are people at either the MSF or The Union they can contact whenever they have a question. As one of the OR-Fellows puts it; "If I had needed, I could have taken courses other Fellows have, but I was already well trained".

For the OR-Fellows that work as facilitators, the preparatory work before the courses and the work around the course-weeks also functions as support and widens their knowledge of research topics. During this time, facilitators often work together in teams and meet and exchange ideas in a more or less formalised way.

For those who have received specific additional training, this includes direct analytical skills development as well as skills relating to presentation and language. Both types of courses have been helpful for the OR-Fellows in allowing them to fulfil the requirements set out by The Union and other funders. The 'Advanced Epidemiological Analysis' course at London School of Hygiene and Tropical Medicine was noted as providing additional skills for mentorship through the delivery of advance methods of analysis (Poisson regression, Logistic regression (conditional and unconditional), analysis of matched case control studies, Cox proportional hazards model, analysis of clustered data – and used STATA for demonstrating these analyses).

Financial support was not commented upon to any great degree in the interviews with the OR-Fellows. One mentioned the lack of financial incentive for working as an OR-Fellow, but indicated it was not important since the work is interesting and rewarding in many other ways. It was also mentioned that a better pay-structure is to be developed for the OR-Fellows.

If further support were to be given, OR-Fellows would benefit from a more formalised alumni-network (which is already being put in place). This is indicated as being particularly beneficial for those OR-Fellows who are not part of a 'facilitators group' or those who do not have OR-colleagues in their own organisation or home countries. One of the OR-Fellows said that she missed the contact with others and felt left on her own. "*It would be nice to have knowledge sharing workshops. Even virtual get-togethers would be appreciated".* Other notable suggestions include making funds available for research conferences (poster presentations), since those kinds of conferences are important platforms for learning what other researchers are doing and also gives opportunities to interact with others.

4.4.4 The relevance and quality of training and pedagogy in the Modules

The relevance of the OR programme can be assessed by judging whether the intervention logic of the programme is sound. In general, it seems that the overall programme objectives are well aligned with the identified needs (i.e. the HIV/AIDS, TB and Malaria burden), and given the credibility of the Millennium Development Goals (MDG) it is straightforward to conclude that these challenges are valid societal needs (the MDGs are to be replaced by an eventual successor in 2015 and the intervention logic should be updated in the future to reflect the new goals established). The idea that the strategy of strengthening OR could indeed contribute to addressing the disease burden seems in general convincing. We have uncovered some hard evidence of the impact of strengthening OR on reducing the disease burden (Appendix H), and in addition, the fact that organisations such as WHO and Bloomberg Foundation (and of course, also DFID itself) have signed up to support the OR courses is a testimony to the relevance of the programme.

The Union's training courses specifically target implementers of OR projects in the health sector with the aim to enhance the number of graduates equipped with skills to conduct independent research and mentor others in their organisations, thereby building sustainable capacity in countries with the highest disease burden. The course relies on participants with suitable educational and work experience in the local health sector but without the skills and knowledge of research tools and methodology relevant to producing evidence base for policy makers.

The Union has provided the review team with complete course material of the three Modules, all individual course satisfaction survey results, and actions taken by the organising team recorded in the various course reports. The expert reviewer conducted a careful analysis of the content of the course material, the delivery and assessment methods applied during the course, and compared those with other similar courses delivered at UK universities. In addition, two interviews (one face-to-face and one over the telephone) were carried out with the senior course organiser to probe in-depth the reasons for and impact of the changes implemented. Interviews conducted with course participants (2 male and 2 female) and a fellow/trainer further contributed to the following expert assessment.

In summary, the current course content and its delivery were deemed to be the result of continuous improvements in the past five years in order to achieve maximum effectiveness. The course structure is designed in a way that provides a practical introduction to participants about operational research protocol, data management and analysis in two teaching Modules over a two-week period; the third and final Module of the course is delivered after an eight month research project and produces a submission-ready research paper and teaches modern public science communication skills. Pre-reading material is now provided to participants four weeks prior to the Module that covers study design and the basic concepts of statistical analysis. The content of the Modules is well integrated, tasks follow a logical flow, and the course gradually builds up the knowledge and skills of participants so that they can efficiently conduct their research project. The course includes illustrative examples of successful as well as failed implementation of OR projects, and these represent a balanced cross-section of the different disease areas and socio-cultural contexts. It should be noted that currently the course content is not adapted to the needs of a particular course, unlike one of the benchmark programmes considered in this study (KNCV). While there may be arguments to be more flexible in this regard, the transferability of operational research principles across different areas and retaining a high quality standard content at a realistic cost are good reasons to maintain this model of delivery. An alternative may involve developing a broader selection of examples that facilitators may use appropriately during a particular course. It has however proved difficult for facilitators to fully cover the background of the expanding research topics.

There is an absolute clarity about expectations before and during the course: Participants must complete milestones before they can progress to the next level and graduate. The high facilitator-participant ratio during the entire course contributes to

the high success rate of the course and building knowledge and confidence for further independent work by participants.

The very positive learning experience of students recorded in surveys and interviews serve as testimony that a combination of formal lectures, small group-based practical exercises, and plenary presentation/discussion sessions are delivered in an accessible way. This however is by no means a straightforward task with participants coming from diverse backgrounds and with different levels of experience. The responsive teaching practices used in the course and the enthusiasm of facilitators were repeatedly heard in interviews as major factors that have empowered course participants to conduct independent research projects. There is a formal mentorship implemented in four mentor groups comprising three participants plus a junior and a senior facilitator each. In addition, an informal peer-support strategy has been in use since 2012: Participants are paired according to their level of knowledge and skills, so that fast learners support others during individual exercises. Participants appear to appreciate learning cooperatively and it provides an opportunity for fast learners to get engaged and trained as a future facilitator. During the 8-month research period when participants conduct data collection and analysis in their countries, local mentors are available on the ground as well as Union/MSF staff via the Internet (email and Skype).

The large number of international peer-reviewed publications produced by course participants also evidences the high quality of the training. Participants reported in interviews that their improved knowledge and skills are increasingly recognised by employers and their sustained operational research goes to show the achievements of The Union's course. The growing awareness about the course worldwide contributes to increasing application numbers: there were 159 applicants for 12 places at the Paris OR5 in 2014. This may well contribute to an ever-higher quality of course participants and research projects.

A comparison with other programmes delivering OR courses, including the two benchmark OR courses indicates that The Union's model of a holistic training including research protocol development, data analysis, and public dissemination of results of the research projects is an innovative undertaking that may set the standard for other OR courses. Indeed, the high quality and originality of The Union's training is recognised by the WHO and now forms the backbone of SORT-IT.

4.4.5 The effectiveness of the project in mainstreaming gender

There are a number of ways in which gender can be mainstreamed within the project. First there is the choice of the course participants and a balance of gender across the successful applicants. Secondly there is the prevalence of gender related issues within the research topics chosen by the course participants, and those studied and published by the OR-Fellows.

The Union has been reporting on the gender ratio of participants since the final quarter of 2013. As highlighted in the section on course participants, gender is quite evenly distributed (58% M, 42% F). More men apply for OR courses than women, however females are more successful with an application acceptance rate of 34% compared to 26% for males. The results from the participant survey show there are no significant differences between male and female participants in response to the question on the usefulness of the course. There are however a few significant differences between the genders on the responses to the question relating to the extent to which the OR training had a positive effect on participants. Male participants give a significantly higher score for the following factors: the quality of OR, the quality of publications, the frequency of participating in joint OR projects; the frequency of

engaging in co-publications and the frequency in participating in communities of practice.[27]

Within the courses, there are many examples of research topics taken forward which address gender related issues. There are a small number of research projects which relate specifically to gynaecology and obstetrics, for which major beneficiaries of the results of the research will be women. There are two projects noted which look in particular at health of sex workers. There are also some projects, which, in their general descriptions, highlight demographic data analysis which investigates the gender dimension.

Some of the examples include:

- Prevalence of conditions amenable to intervention amongst first booking pregnant women who attend antenatal clinic at Nausori Maternity Unit, Fiji
- Characteristics, management and outcomes of survivors of sexual gender-based violence in Eastern Nairobi, Kenya
- Incidence and progression of cervical intra-epithelial lesions among female commercial sex workers in Korogocho, Kenya (Fellow is a mentor)
- Facility based management of Severe Acute Malnutrition: do age, sex and source of referral determine sustained nutritional improvement and adherence to follow-up?
- Characteristics and pregnancy outcomes of women in a 'safe motherhood' health voucher system in rural Kenya 2007–2013

Gender does not appear to be clearly spelt out as a line of enquiry in the research projects relating to TB or HIV proposed by the course participants.

The OR-Fellows have published a high number of papers or are instigating research on issues, which are gender specific. These tend to be the MSF Fellows. Examples where the OR-Fellows have published or researched with due regard to gender include the following:

- Roll-out of Universal Antiretroviral Therapy (ART) for HIV Infected Pregnant and Breastfeeding Women ("Option B+") in Malawi: Factors Influencing Retention in Care
- To assess rates and potential predictors of ART retention after introduction of the PMTCT option B+ among women starting ART while pregnant or breastfeeding in Malawi: study implemented and completed
- Cost effectiveness of PMTCT Option B+ strategy for mothers and babies to decrease vertical HIV transmission in Malawi: Mathematical modelling study
- Gender-related differences in ART outcomes and associated factors among HIV-positive patients: a cohort study in the Zimbabwe National ART program
- Characteristics of tuberculosis patients in Vietnam: Age and sex differences in notification and treatment outcomes
- Use of insecticide treated bed nets among pregnant women and children under the age of 5 in Liberia
- Sexual violence in Post conflict Liberia; survivors and their characteristics
- Medical management and outcomes of survivors of sexual gender-based violence in Eastern Nairobi

[27] Statistically significant on a basis of 0.05.

- HPV-Infection, Cervical Abnormalities And Cancer, In A Cohort Of HIV-Infected Women In Mumbai, India
- Prevalence of anaemia, syphilis and hepatitis B in pregnant women in Nausori, Fiji
- Does provision of an incentive package to pregnant women and Traditional Birth Attendants increase ANC visits and health facility based deliveries in a pastoralist setting
- Obstetric Fistula in Burundi: a comprehensive approach to managing women with this neglected disease
- Peanut-based ready-to-use therapeutic food: how acceptable and tolerated is it among malnourished pregnant and lactating women in Bangladesh
- Constraints in the diagnosis and treatment of Lassa Fever and the effect on mortality in hospitalised children and women with obstetric conditions in a rural district

4.5 Improved knowledge, skills and capacities of OR course graduates

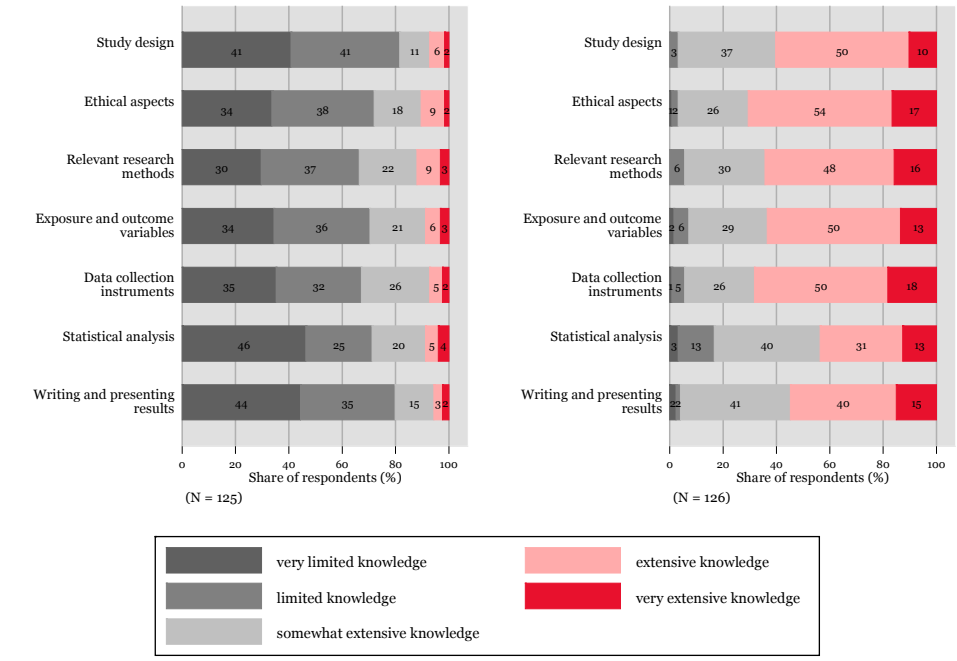
This section responds to evaluation question 5 (*Do the courses and other activities change knowledge and skill levels and/or behaviours?*).

There is a clear indication that the OR courses increase participants' knowledge and skill levels. A large share of participants are very enthusiastic about OR and claim to assign high priority to OR in their daily work. When asked whether they also implement different aspects of OR (e.g. research projects, dissemination of knowledge through publications), 40% agreed or strongly agreed with the statements that they are sufficiently engaged in these activities.

The focus of the analysis is on impacts on the participant level, on the organisational level and on health system level. The observations are based on the analysis of interviews with the project stakeholders and include results from the survey and the bibliometric analysis. The results from the counterfactual analysis are presented where relevant and possible.

One of the key goals of the OR courses is to improve knowledge about key concepts in OR. The knowledge from the courses ranges from concepts on study design and statistical analysis to data collection and presenting and results. From the results of the survey among participants and non-participants (Figure 7 and Appendix C), participants indicate their knowledge of OR concepts has increased across the board during the past five years.

Figure 7 Theoretical knowledge of participants (Left: 2008, Right: 2013)



Source: Technopolis Group (2014).

Where five years ago the typical choice was 'limited knowledge', this has now improved to 'extensive knowledge' for almost every category except statistical analysis. At least 60% of participants indicate this is to a large or very large extent the result of their participation in the OR course. This statement is backed up by the counterfactual analysis (Table 4) which shows that on all categories, participants and non-participants started at roughly the same level five years ago, but that participants improved their knowledge more than non-participants (although non-participants also improved their knowledge). The largest effect is on writing and presenting results – although the differences between the effect sizes are small.

Table 5 Knowledge indicator comparison (1 = very limited knowledge; 5 = very extensive knowledge, Mann-Whitney test)

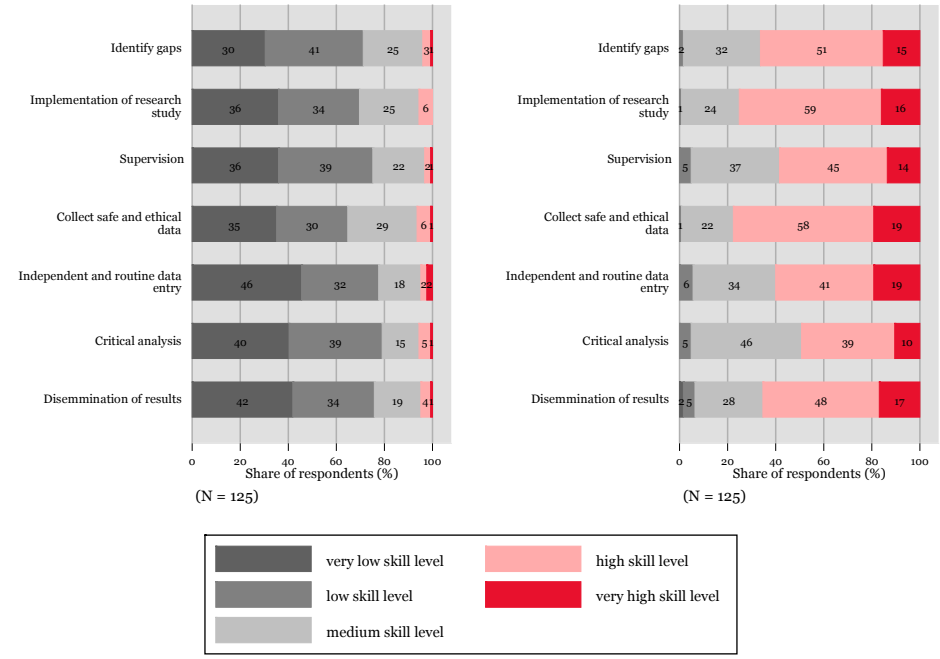
Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-parti-cipants	Parti-cipants	Between p-value	Non-partici-pants	Parti-cipants	Between p-value	Dif-in-dif	Between p-value
Study design	1.8 (2)	1.9(2)	0,63	3.1 (3)	3.67 (4)	0	0,51	0
Ethical aspects	2.1 (2)	2.1 (2)	0,58	3.5 (4)	3.83 (4)	0	0,39	0
Relevant research methods	2.2 (2)	2.2 (2)	0,7	3.3 (3)	3.75 (4)	0	0,41	0
Outcome variables	2.0 (2)	2.1 (2)	0,73	3.1 (3)	3.68 (4)	0	0,53	0
Data collection instruments	2.2 (2)	2.1 (2)	0,3	3.4 (3)	3.8 (4)	0	0,5	0
Statistical analysis	1.9 (2)	2.0 (2)	0,95	2.8 (3)	3.37 (3)	0	0,5	0
Writing and presenting results	2.0 (2)	1.8 (2)	0,3	3.0 (3)	3.63 (4)	0	0,74	0

Source: Counterfactual analysis based on participant & non-participant survey. Technopolis Group (2014).

The courses are not only focused on transferring knowledge to participants, but also aimed at learning OR skills in practice. These skills include supervision of research team members, implementation of study design and dissemination of results.

The results are quite similar to the effects on skills, in that both participants and non-participants improved their skill levels from a base of 'low skill level' five years ago to either 'medium' or 'high skill levels' now (see Figure 8).

Figure 8 Skill level of participants (Left: 2008, Right: 2013)



Q: Please indicate your skill level of the following OR aspects, five years ago and currently

Source: Technopolis Group (2014).

Again, participants increased their skill levels much more than non-participants (all effects from the difference-in-difference analysis are significant). Participants rate their starting level slightly lower than non-participants, although the differences are relatively small.

Given some of the selection procedures (see Chapter 3) it becomes clear that some applicants are able to participate without having a Master's degree and that some applicants are rejected due to over-qualification. The latter could have lowered the average starting level of participants in comparison to non-participants.

The observations from the counterfactual analysis (see Table 6) are similar to the perception of participations themselves, as a majority indicates that their improvements are largely caused by their participation in the OR training course.

Table 6 Skill indicator comparison (1 = very low skill level; 5 = very high skill level) Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-partici-pants	Partici-pants	Between p-value	Non-partici-pants	Partici-pants	Between p-value	Dif-in-dif	Between p-value
Identifying gaps	2.2(2)	2.0(2)	0,2	3.5 (3)	3.8 (4)	0	0,49	0
Implementation of research	2.2 (2)	2 (2)	0,13	3.4 (3)	3.9 (4)	0	0,63	0
Supervision of research team	2.2 (2)	1.9 (2)	0,03	3.4 (3)	3.7 (4)	0,01	0,57	0
Collection safe and ethical data	2.4 (2)	2.1 (2)	0,02	3.6 (4)	4.0 (4)	0	0,61	0
Independent and routine data entry	2.0 (2)	1.8 (2)	0,05	3.1 (3)	3.7 (4)	0	0,87	0
Critical analysis	2.1 (2)	1.9 (2)	0,1	3.1 (3)	3.6 (3)	0	0,63	0
Dissemination of results	2.2 (2)	1.9 (2)	0,02	3.3 (3)	3.7 (4)	0	0,74	0

Source: Counterfactual analysis based on participant & non-participant survey, Technopolis Group (2014).

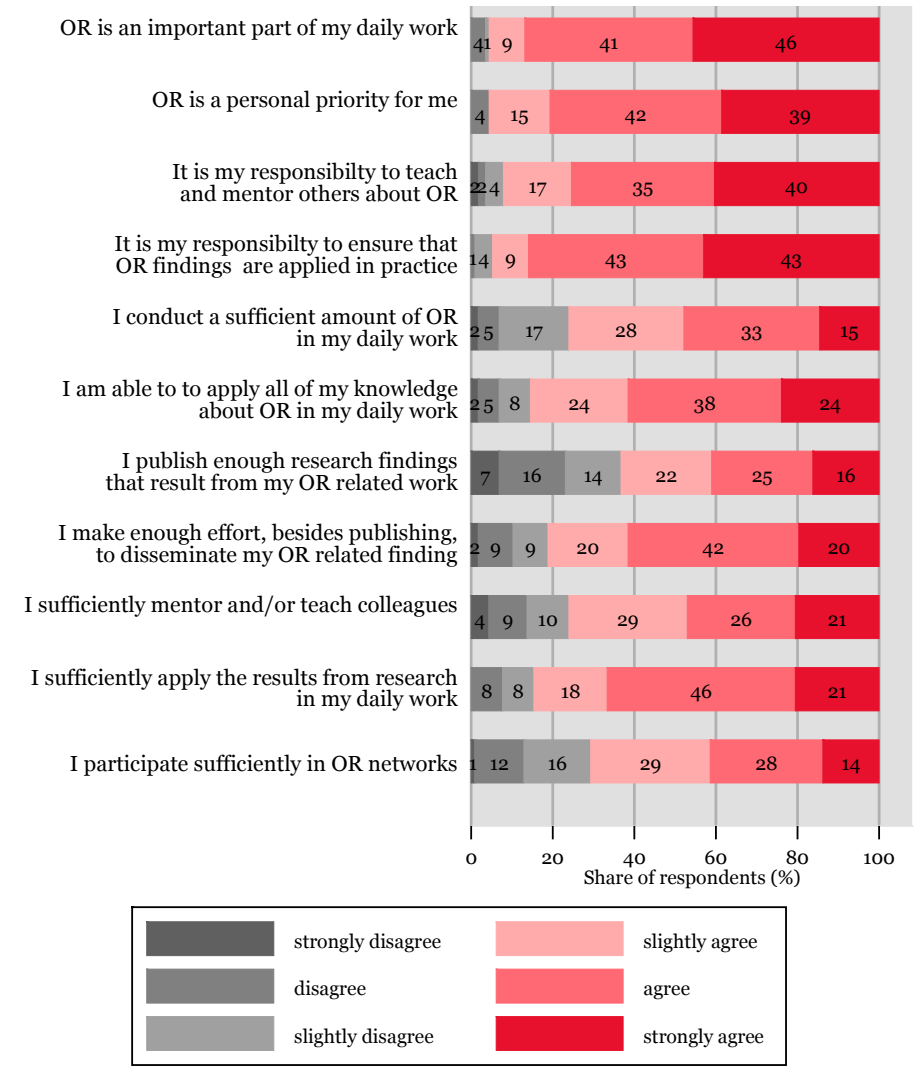
Attitude can be an important driver of future behaviour. The level of priority given, and enthusiasm for OR, are likely to be important predictors of future actions. Participants were therefore asked to self-evaluate their enthusiasm for OR, but also to indicate whether they felt satisfied with their current level of activity in OR. More than 60% of the participants indicate that they agree or strongly agree on these statements. The level of priority given to OR has increased over the past five years for virtually all participants.

Figure 9 shows that a large share of participants are very enthusiastic about OR and claim to assign high priority to OR in their daily work. When asked whether they also implement different aspects of OR (e.g. research projects, dissemination of knowledge through publications), 40% agreed or strongly agreed with the statements that they are sufficiently engaged in these activities.

These results show that while participants indicate they have a very positive attitude towards OR, they 'would like to do more'. This discrepancy is present for most behavioural analyses, but provides useful background information for further analysis about future actions.

The results show there is no difference between the level of enthusiasm and priority of OR between non-participants and participants. However, participants are more positive in the self-evaluation of their own behaviour when it comes to implementation of results from OR and their activities to disseminate results through publications and in other ways.

Figure 9 Reaction on statements on OR by participants



(N = 114)

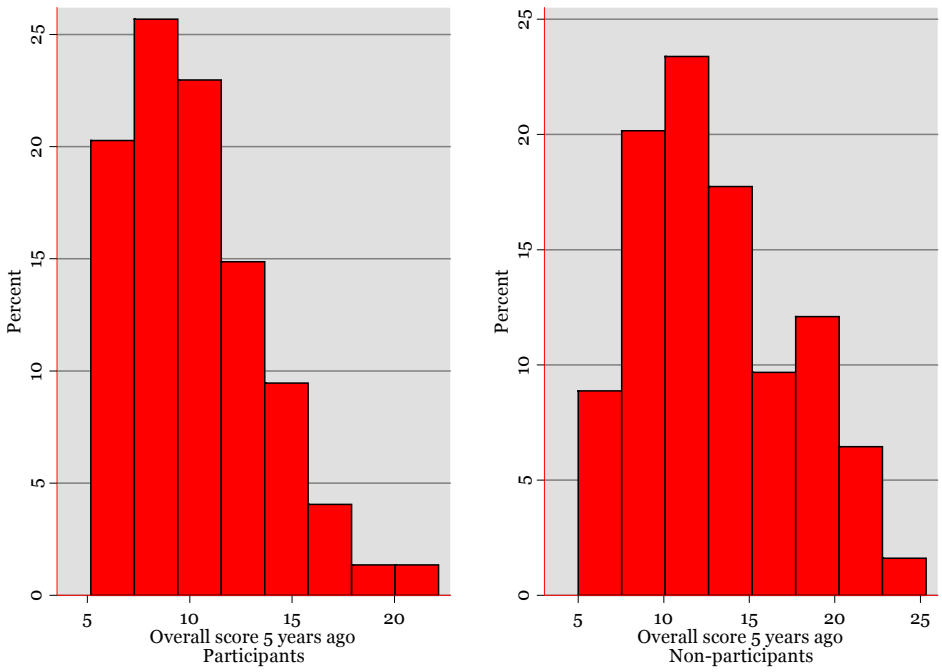
Q: Please respond to the following statements about conducting OR: I feel that …

Source: Technopolis Group (2014).

4.5.1 Analysis of non-participants versus participants

Throughout the survey results non-participants show better 'performance' in the 'before' analysis (five years ago) than participants. Since the statistical analysis of the sample showed us that there is no reason to believe there is a sample bias based on different background characteristics, this is an unexpected result. In order to further explore this issue, a composition analysis of a constructed 'aggregate performance score' (across different survey items) was carried out (see Figure 10). This shows that participants indeed have a larger group of 'low-performers', while non-participants are more evenly spread across the performance score categories.

Figure 10 Aggregate performance scores of participants and non-participants to the OR course



Source: Technopolis Group (2014)

In order to provide further insight in this phenomenon, we have carried out an analysis of significant differences in characteristics of participants / non-participants with low aggregate performance scores compared to those with high aggregate scores. We have found that those participants and non-participants with low scores are on average:

- relatively older (more in the category 45-54, relatively less in the category 25-34)
- relatively less educated (fewer Master degrees)
- working more at NGOs and fewer at universities

However, as the sample composition analysis has shown, there are no significant differences between participants and non-participants in any of these background characteristics. One explanation is that 'too good applicants' are not selected for the training, because there is the idea that they may not learn enough from the training course.

An alternative explanation is that non-participants overestimate their own performance because *'they do not know what they do not know'*. A training course could have actually made participants aware that their initial knowledge was rather limited, while non-participants do not have this insight.

4.5.2 Additional validation analyses on the OR course effectiveness

The categorical variables were split up into two groups[28]; this makes results very clearly understandable and adds power to the statistical tests. Table 7 shows the effects, in this a (+) means a positive effect, a (-) means a negative effect, a single * means the found effect was significant with a p-value between (0.05) and (0.10) whereas a double ** means the found effect was significant with a p-value below (0.05). Thus effects with a single * will indicate weak effects whereas double ** will indicate stronger effects. In grey cells no effects were found.
The categorical variables in the table are defined as followed:

- Age – grouped people below 35 and above 35 years old
  - A positive effect here means that older people score higher
- Education – grouped people with and Master's and/or PhD degree and without
  - A positive effect here means that people with a Master's and/or PhD score higher
- Continent – grouped people from Africa, Asia, Oceania and Europe
  - A positive effect here means that people from a certain continent score higher than the average of the other continents
- Time past after following the course – grouped participants who finished the course this year or 1 year ago and participants who finished the course more than 1 year ago (This was only tested for people who participated in an OR course)
  - A positive effect here means that participants who finished the course longer ago score higher

[28] Continents (four groups) were analysed as statistical dummies, i.e. one continent vs. the average of the others combined.

Table 7 Relations between categorical variables and OR properties

	Age	Education	Continent	Time passed after following course
Theoretical knowledge	(-)*	(+)**		(+)**
Skills level				(+)**
OR activities				
Publishing		(+)**		(+)**
Apply OR related findings			Africa (+)** Asia (-)** Oceania (+)** Europe (-)*	
Personal priority of OR			Africa (+)** Asia (-)** Europe (-)**	
Organisational priority of OR	(+)*	(-)*	Africa (+)** Europe (-)**	(+)*
Engagement in dissemination			Europe (-)**	
Implementation of OR research results	(+)**		Africa (+)*	(+)**
Patients benefitted from OR research results	(+)**		Africa (+)** Oceania (-)** Europe (-)**	(+)**

Source: Technopolis Group (2014).

Age

Although a weak relationship, age appears to have a negative impact on theoretical knowledge, meaning that older people have a lower score on theoretical knowledge. This seems counter intuitive. A possible reason for this could be that younger people value their skills more while older people are more aware of their shortcomings.

There is a strong link between age and the implementation of findings and number of patients benefitting from the results. This infers that older people do more effective research or are better at making sure their work is being used.

Education

Having a higher level of education results in higher theoretical knowledge, a result which is expected. Skills are not affected by the education level, which is also expected as the difference between the two educational groups is more theoretically based. A higher education level results in higher publishing scores, which is again logical as publishing is taught more in the later stages of education, meaning the Master and especially the PhD phase.

Having a higher level of education does not however result in a higher organisational focus on OR. Although the connection is weak this implies that higher educated people work in organisations with a lower priority on OR.

Continents

People from Africa score significantly higher on applying findings, implementation, the number of benefitting patients, and organisational priority for OR. Thus it can be inferred that people from Africa have a greater focus on and success in OR, even

though they do not score notably higher for dissemination efforts. Other continents score, across the board, significantly lower on most of these categories.

Time past after following the course

For those who took the course a while ago there are significantly higher scores on both theoretical knowledge and skills. This means that after course completion the knowledge and skills levels appear not to decline and may well have further increased. This implies that the development of skills after the course continues, providing positive evidence of the sustainability of the course outcomes.

This cohort also scores higher on publishing, implementation of results and the number of patients benefitting from their OR research results. Although this is logical as they have had more time to publish, implement and help patients, it also adds weight to the positive finding of sustainability as people do not stop working on OR.

4.6 Publication outcomes

This sub-chapter responds to evaluation question 6 for which concerns OR courses (*Do participants undertake and publish more and/or better operational research?).*

The number of unique journals in which the course participants published increased from 13 in the period 2000–2004 to 84 in the period 2010–2014. Currently, most participants publish around 1-4 articles a year, of which one is in an international peer-reviewed journal as lead author. On all categories around three quarters of participants indicate that their current publication activities are much higher than in 2008. Participants publish much more than non-participants.

This section presents the results from the bibliometric analysis with a particular focus on the scientific impacts in terms of:

- The impact factors of journals in which the participants published
- The citation scores of the publications
- The co-publication patterns of the participants
- The h-index of the participants that published the most

The methodology that was used is detailed in Appendix G.

Every scientific journal in which the course participants published has a journal impact factor. In Scopus there are two different indicators to show a journal's impact, which are:[29]

- The SCImago Journal Rank (SJR), which is weighted by the prestige of a journal. Subject field, quality and reputation of the journal have a direct effect on the value of a citation. SJR normalises for differences in citation behaviour between subject fields. A journal transfers its own 'prestige' to another journal through the act of citing it. A citation from a journal with a relatively high SJR is worth more than a citation from a journal with a lower SJR.
- The Source Normalised Impact per Paper (SNIP), which measures contextual citation impact by weighting citations based on the total number of citations in a subject field. SNIP takes into account characteristics of the source's subject field, which is the set of documents citing that source. SNIP especially considers:
  - the frequency at which authors cite other papers in their reference lists
  - the speed at which citation impact matures

[29] Information on the journal metrics used can be found on http://www.scopus.com/.

– the extent to which the database used covers the field's literature

The difference between the two is that a SJR value of 1.5 in a given year means that the publications of a journal in the three previous years received, on average, one and a half weighted citations in the given year. A SNIP value of 1.5 in a given year means that the publications of a journal in the three previous years have been cited, on average, one and a half time more frequently in the given year than publications in other journals within the same subfield.

The following results (Table 8) relate to the two impact factors of these journals in the period 2000–2014. In order to reduce the influence of the years in which there were not so many publications (see before), we created three clusters of years: 2000–2004, 2005–2009 and 2010–2014. The first cluster (2000–2004) show the highest SJR and SNIP, however this is greatly influenced by one outlier journal (entitled Chemical Reviews) that has a SJR of 10.048 and a SNIP of 8.786. When not taking this into consideration (the value in brackets), the values are comparable to those of the other two-year clusters. The reason for the SJR and SNIP values not increasing that much is the fact that the additional journals in which the research is published are not so prestigious on an international level. A considerable number of these journals are country related (e.g. the Indian journal of tuberculosis, the Turkish journal of paediatrics and the Malawi medical journal) which are less cited by people from other parts of the world, causing a lower impact factor.

Table 8 Overview of number of journals and their average impact factors

Year	# of publications	# of journals in which selected course participants published	Average SCImago Journal Rank (SJR)	Average Source Normalised Impact per Paper (SNIP)
2000 – 2004	34	13	2.082 (1.285)	2.125 (1.006)
2005 – 2009	60	43	0.982	1.375
2010 – 2014	272	84	1.136	1.300
Total	**366**	**116**	**1.174**	**1.393**

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

The publications of the last four years (2010-2014) have been published in journals that are just above world average (SJR of 1.136 and SNIP of 1.300) when it comes to the number of citations of their publications. This might be an implicit effect of the courses that the participants attended; however it is not so easy to make a clear attribution.

The number of unique journals in which the selected course participants (i.e. about half of the total number of participants that have been identified in Scopus) published increased from 13 in the period 2000–2004 to 84 in the period 2010–2014. Overall, 116 different journals contain publications of this group of researchers. There are two journals that received publications in each period: *The International Journal of Tuberculosis and Lung Disease* (44 publications) and the *East African Medical Journal* (4 publications). The top 5 journals that received the largest number of publications by the course participants are:[30]

- Plos One (45 publications)

[30] The journal Public Health Action (PHA) is not (yet) included in the Scopus database, because it is too new and does not have a formal impact factor.

- International Journal of Tuberculosis and Lung Disease (44)
- Tropical Medicine and International Health (30)
- Transactions of the Royal Society of Tropical Medicine and Hygiene (14)
- BMC Public Health (13)

Another way to give an impression of the research quality of the selected course participants (and therefore a proxy for the overall group of participants) is the analysis of the citations. We also looked at the citations within a three-year citation window.[31] The choice of a three-year citation window makes it easier to compare publications from the past with more recent ones; without this older publications have had a higher chance to get cited. In total, the 366 publications in this period produced 2,767 citations (excluding self-citations). When only looking at the citations within the three-year citation window, this number is reduced to 875. Based on this number of citations and the publication count, the average number of citations is calculated. Over the entire period the publications are cited 2.4 times in the year of publication and the two consecutive years.

As the number of publications during the first years (from 2000 to 2007) are relatively low, the average number of citations might be influenced by one or two publications that receive quite a high number of citations, while others do not get cited much. From 2008 the number of publications start to rise, which means that the increasing average number of citations provides a more reliable indicator of the citation patterns and therefore an indication of higher research quality. From this year the average number of citations also starts to increase. The reason for the slightly lower value in 2011 might be that not all citations are yet included for the year 2013.

It is relevant to look at the co-publications between the course participants and other organisations. There are no figures about the share of international co-publications as a percentage of the total number of publications. However the assumption is that the majority of the papers have researchers from multiple countries involved. The 366 publications contain researchers from 60 countries. For this study, we classified these countries, based on the World Bank Classification of Countries by Income:[32]

- Low-income economies (income of $1 005 or less)
- Lower-middle-income economies ($1 006 to $3 975)
- Upper-middle-income economies ($3 976 to $12 275)
- High-income economies ($12 276 or more)

When the World Bank Classification of Countries by Income is applied to the set of publications, the following results are obtained. There were 142 instances where a researcher from one of the 18 low-income (developing) countries was included in the list of authors. The main countries of this class are Malawi (contributing to 47 publications), Kenya (24) and Cambodia (15). In total 13 lower-middle-income countries contributed to 132 publications, of which India is by far the largest contributor (which is not surprising because of the number of Indian researchers). A total of 9 upper-middle-income countries contribute to 64 publications, of which the majority are by South African researchers. High-income countries (20 in total) are contributing to 492 publications, which implies that these countries must be contributing to the same publication as the number exceeds the total size of the publications set of 366. The largest contributor is France (105 publications), followed by the United States (91) and the United Kingdom (86). This means that a large share

[31] When using a three-year citation window (only the citations in the year of publication and the two consecutive years are taken into account), publications later than 2011 are not included.

[32] http://data.worldbank.org/about/country-classifications/.

(almost 70%) of publications of the course participants is in collaboration with organisations in high-income (developed) countries.

Table 9 presents the contribution by countries according to the classification introduced above. For each class, the top 3 of countries that contributed the most in the period covered by study are shown.

Table 9 Countries contributing to course participants' publications classified by income

Country classification	# of countries	# of publications	Top-3 of countries (# of publications)
Low-income economies	18	142	1. Malawi (47) 2. Kenya (24) 3. Cambodia (15)
Lower-middle-income economies	13	132	1. India (97) 2. Vietnam (13) 3. Ghana (4)
Upper-middle-income economies	9	64	1. South Africa (37) 2. Peru (8) 3. China (7)
High-income economies	20	492	1. France (105) 2. United States (91) 3. United Kingdom (86)

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

In addition to the country-level analysis of the publications, an investigation is made of the most important organisations that have contributed to the publications, with a distinction between European institutions and organisations outside Europe. The top 3 European institutions contributing to the publications are The Union itself (contributed to 85 publications), the London School of Hygiene & Tropical Medicine (64) and the Prince Leopold Institute of Tropical Medicine (21). Outside Europe, the World Health Organization contributed to 30 publications, followed by the Ministry of Health Malawi (28) and the Polytechnic University – Brooklyn (27).

The *h*-index of the course participants that published the most is listed below. This index is an indicator of an individual's scientific productivity and scientific impact. Half of them are OR-Fellows involved in the programme, who are more likely to have higher publication output and citation scores. A value of 4 means that the researcher has at least 4 papers published and each paper received 4 citations. Table 10 shows that these researchers, 6 from India, are quite active in publishing and receiving citations to these publications. A little over 60% of all publications of this group of most active participants is from the period 2010-2014 (i.e. the period in which the courses took place). This is an indication that the courses have been stimulating these people to increase their efforts in publishing.

Table 10 *h*-index of the ten most active course participants

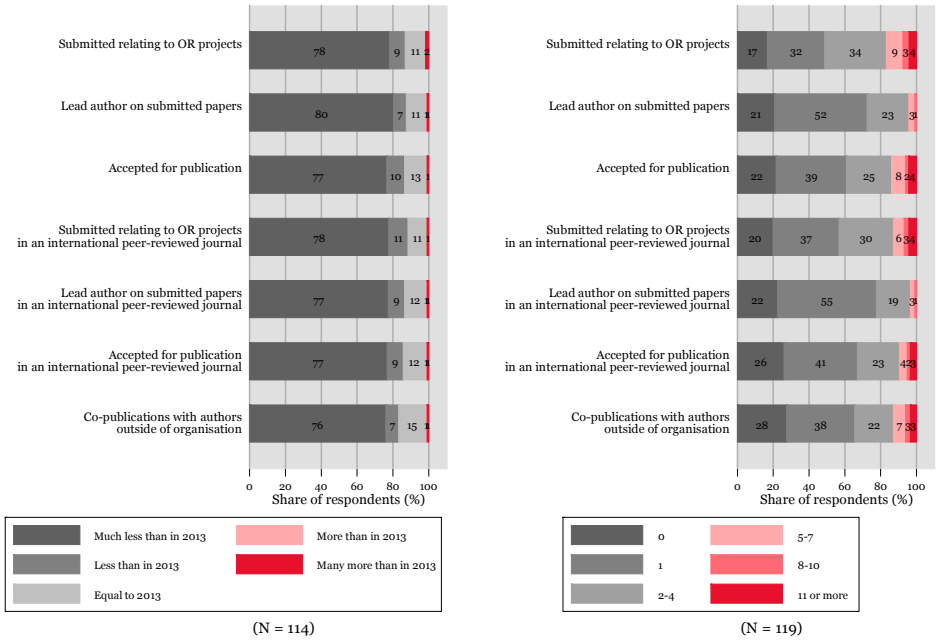
	Country	OR-Fellow?	Course attended	# of publications		# of citations	*h*-index
				Total	2010-2014		
1	India	√	Paris 2 (Jun 2011)	52	18	1 794	19
2	India	√	Paris 1 (Apr 2010)	52	25	216	7
3	Malawi	√	Paris 1 (Apr 2010)	32	24	250	10
4	Liberia	√	LUX 1 (July 2012)	23	22	98	6
5	India		LUX 2 (July 2013)	18	7	225	8
6	India		Paris 2 (Jun 2011)	15	10	48	4
7	India		PHFI 1 (Apr 2011)	15	11	12	2
8	Viet Nam	√	Paris 1 (Apr 2010)	13	12	103	5
9	India		PHFI 1 (Apr 2011)	13	13	27	3
10	Cambodia		LUX 1 (July 2012)	10	8	33	4

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

4.6.1 Publication behaviour

Publication behaviour deserves special attention. As well as being dealt with in the bibliometric analysis, this aspect was also featured in the electronic survey for participant and non-participants. Figure 11 shows different aspects of scientific publishing at the time of this analysis (spring 2014) and five years ago. Currently, most participants publish around 1-4 articles a year, of which one is in an international peer-reviewed journal as lead author. On all categories around three quarters of participants indicate that their current publication activities are much higher than in 2008. Participants publish much more than non-participants (Figure 12). For instance, participants publish on average 2.3 articles a year in peer-reviewed journals related to OR, while non-participants publish on 0.7 articles a year on average. Participants are on average lead author of 1.9 articles a year, while non-participants are lead author for only 0.9 articles a year. All differences are statistically significant.

Figure 11 Publishing of participants (Left: 2008 relative to 2013, Right: 2013)[33]



Q: Please select the option which applies best to your situation in terms of publishing, five years ago and currently

Source: Technopolis Group (2014).

Figure 12 Publication indicator comparison (Average annual number of publications, t-test)

Indicator	**Current mean (median)**		
	Non-partici-pants	Partici-pants	Between p-value
Total paper submissions	1.7 (0)	3.1 (3)	0
... as lead author	.9 (0)	1.9 (3)	0
Total accepted papers	1.2 (0)	2.9 (3)	0
Paper submission in peer-reviewed journals	1.0 (0)	2.8 (3)	0
Papers Accepted in peer-reviewed journals	.6 (0)	1.6 (0)	0
Papers Accepted in peer-reviewed journals related to OR	.7 (0)	2.3 (3) [34]	0
Submissions with co-authors outside organisation	.9 (0)	2.4 (3)	0

Source: Technopolis Group (2014).

[33] Information for 2008 was collected as relative to 2013, as generally respondents find it difficult to reliably produce detailed figures for a long time ago.

[34] Some respondent may have interpreted the first option as non-OR papers. The OR question is probably most reliable.

4.7 Influence on other practitioners

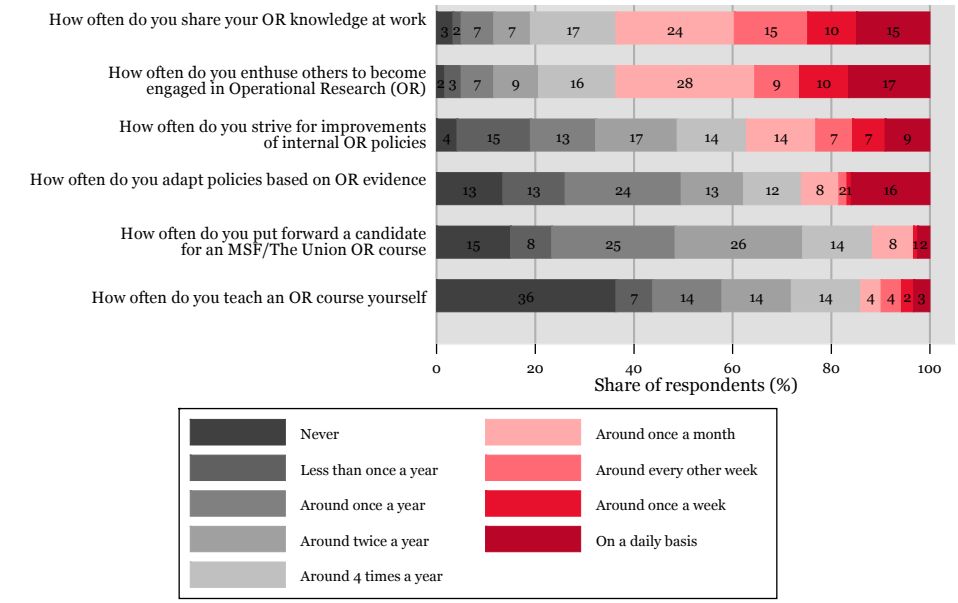
This section responds to evaluation question 7 (*Do they influence other practitioners to build their skills and conduct OR?*), evaluation question 9 (*What is the nature and extent of impacts produced by Research Fellows?*) and evaluation question 10 (*Are any changes beginning to cause enhanced use of OR findings and improved health services?*).

The most common activities that the participants engage in are sharing OR knowledge with colleagues at work, or enthusing their peers to become active in research themselves. A large majority of participants indicate that they are now much more engaged in stimulating the development of their colleagues through mentoring and teaching, as well as participating in both formal and informal collegial networks. Whereas in 2008 only 1% applied results from their own OR in their work on a daily basis and only 2% applied results from others on a daily basis, this has changed to 24% and 26% respectively. There is also substantial use of others' OR in the work of the OR-Fellows.

4.7.1 Engagement with colleagues

Ideally, participants do not only learn skills and knowledge for their own use; the programme should also stimulate them to develop themselves as local drivers of development of OR competences with colleagues. There is evidence from the survey that course participants are engaging with colleagues who have not taken part in the course. The most common activities that participants engage in are sharing OR knowledge with colleagues at work, or enthusing their peers to become active in research themselves. Fewer participants engage in teaching OR courses themselves. In general, nearly three-quarters of participants (73%) indicate that they are now much more engaged in stimulating the development of their colleagues through mentoring and teaching. In total 38% of participants are engaged in influencing improvements of OR policies at least once a month, while nearly a quarter (24%) indicate that this is also implemented at least once a month or more.

Figure 13 Activities of participants



(N = 121)

Q: Please indicate how often you engage in the following activities at present time

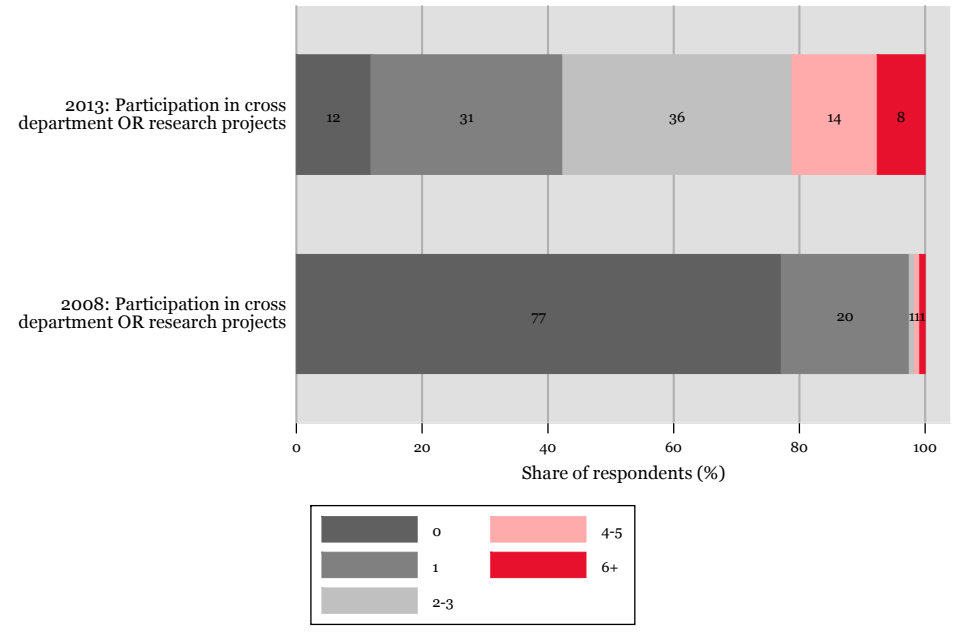
Source: Technopolis Group (2014).

There is additional evidence from the interviews with the OR-Fellows of good engagement with colleagues as a mechanism for increasing the influence of OR within their wider practitioner network. Where OR-Fellows are part of national programmes for TB for example, their role can encourage other colleagues to consider OR as an important source of evidence for change. In Benin, this has led to better monitoring of TB in children, so the data is more robust. In India through a change in culture, every time a new project is considered, wider staff also look at whether OR can be a part of the ex ante appraisal. There has been a large network created in India which has led to 50 persons taking the national OR course. In MSF in Brussels there is more awareness of how colleagues can be supported to consider OR. In Malawi, the OR-Fellow at the Lighthouse Trust is involved in OR capacity building within the organisation, ensuring colleagues understand its role. Where OR-Fellows are not involved in improving the skills of their colleagues, there is a recognition that without this input, it becomes difficult to reposition OR within the organisation as a key tool for making decisions in policy and practice. One solution to this is to train one other person within the organisation so that it becomes easier to devote time to raising awareness and increasing knowledge within other staff.

4.7.2 Networks in Operational Research

Engagement with colleagues and the dissemination of OR knowledge and skills takes place in formal and informal networks. Participants were asked to report on whether they participate in OR research projects with researchers or professionals outside their own department. Whereas 23% did so in 2008, in 2013 88% of participants were active in research projects like these (Figure 14).

Figure 14 Participation in OR research projects of participants outside own department (number of projects)



(N = 118)

Q: In how many joint research projects with OR professionals outside your department, did you participate?

Source: Technopolis Group (2014).

Besides participating in external research projects, dissemination and sharing of knowledge can take place through regular meetings that have OR as a core topic. Again, the differences between 2008 and 2013 are substantial: more than 70% of participants indicate that in 2008 they participated much less in this type of meeting than in 2013. The typical participant now takes part in a 'community of practice' meeting around once a month for internal meetings, and around four times a year in meetings outside their organisation. Participants take part in around three joint research projects a year on average.

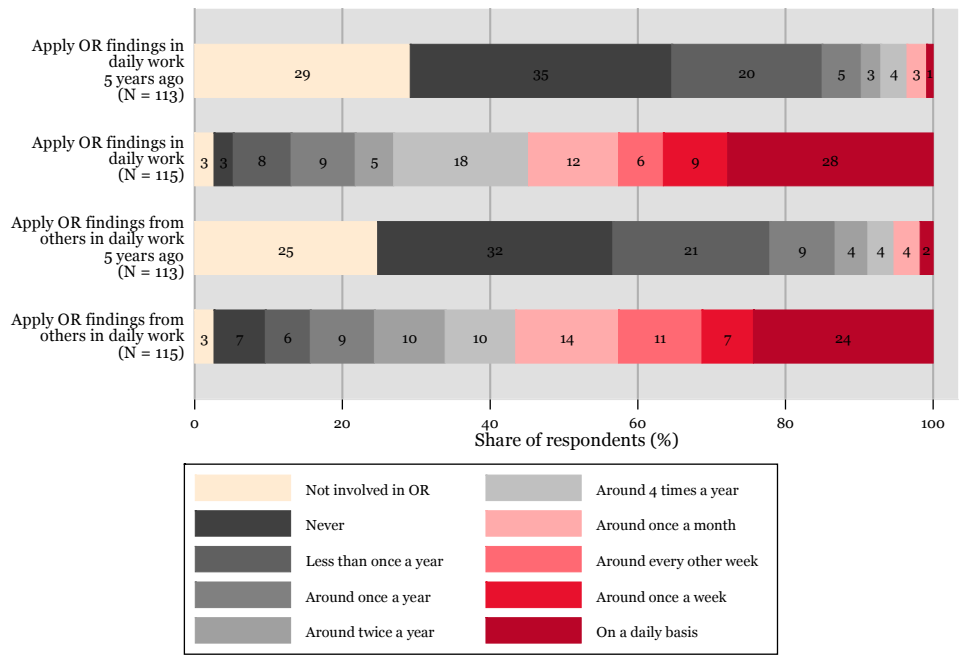
4.7.3 Use of OR findings in daily work

Impact on health systems will only occur when a pattern of implementation from results from OR is taken up by the health professionals themselves. In order to investigate the link between OR and the application of the results from this research, the participants were asked to report how often they use the findings from OR in their daily work. The contrast between five years ago (2008) and current application of OR results is large. Whereas in 2008 only 1% applied results from their own OR in their work on a daily basis and only 2% applied results from others on a daily basis, this has changed to 24% and 26% respectively. Participants improved their activity much more than non-participants, although this is mostly due to the fact that they started from a lower base.

Participants were also asked whether they used the results from the specific project that they researched during the OR training course. In total 28% of the participants apply these results on a daily basis, whereas only 3% never apply the results. It should be noted that interpretations on the scope of use is likely to vary substantially across outcomes, e.g. if a monitoring system was developed this will almost certainly impact daily usage while specific new treatments may be used less often. Figure 15 and Figure 16 show that the participants increasingly use OR and that the direct results from their training course are useful for many in their daily work.

Most of the OR-Fellows indicate a high frequency of use of the results of their research on a daily or weekly basis. Only two indicate using it on a monthly or yearly basis in the survey (in the case with the lowest level of use, the OR-Fellow appears to have taken on other responsibilities within his organisation). Overall the results from the interviews with the OR-Fellows highlight the importance of their research in their work and how it has influenced their own agendas as well as the agendas of their organisations. There is also substantial use of others OR in the work of the OR-Fellows. Recent examples include the use of a study on the treatment outcomes of childhood TB where the results have now led to a guide to help health workers to manage the diagnosis and the development of an action plan based on the findings of the national survey of TB prevalence in Vietnam.

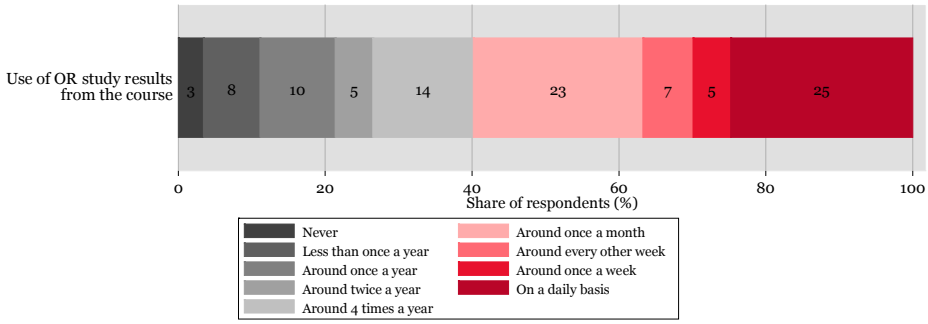
Figure 15 Use of OR findings of participants 2008 and 2013



Q: Please indicate how often you currently apply OR related research findings in your daily work, now and 5 years ago

Source: Technopolis Group (2014).

Figure 16 Use of OR study results of participants

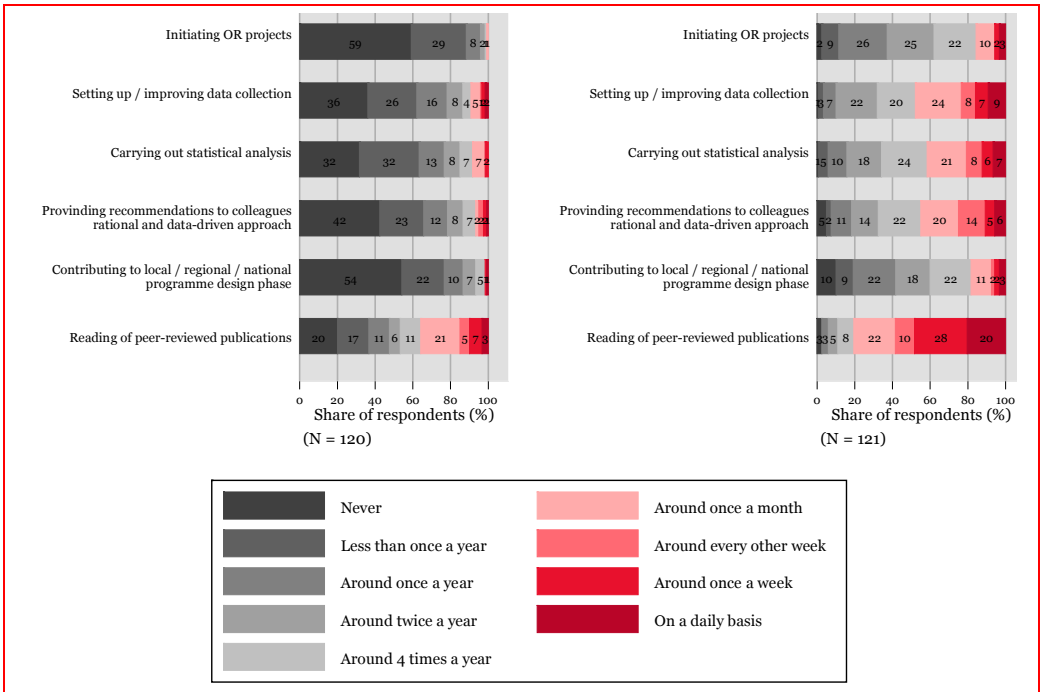


(N = 117)
Q: How often do you use the results from your OR study from the course?

Source: Technopolis Group (2014).

Lasting impact can only be achieved when skills and knowledge are translated into behaviour through the actual implementation of OR activities. One of the goals of the OR training course is that participants will engage in OR-related activities after graduation from the course. These activities include, among other things, starting OR projects, collecting data and becoming active in publishing (peer-reviewed) journal articles. As in the case of the skills and knowledge indicators, all constituting factors are very closely related. Reading publications is something participants do more often than other activities (around every other week), while contributing to larger research programmes happens less often (around twice a year). This is not surprising given the relative amount of effort needed for these activities. Figure 17 shows the frequencies in which participants engage in these activities.

Figure 17 Frequency of OR-related activities of participants (Left: 2008, Right: 2013)



Q: Could you estimate how often you engage on average in the following activities, five years ago and currently

Source: Technopolis Group (2014).

There is a clear sign that participants engage in these types of activities to a much larger extent in 2013 than they did in 2008. For instance, whereas in 2008 59% of participants never initiated OR projects and 54% never contributed to a research programme design phase, in 2013 these values have reduced to 2% and 10% respectively. The counterfactual analysis (Appendix B) shows that this is also the case for non-participants, but participants have increased the frequency faster than non-participants.

4.7.4 Personal developments and career impacts

OR is considered a key tool for helping to bridge the gap between knowledge of *what* public health programmes should do and knowledge of *how* they should do it for maximum public health benefit.[35] The Union/MSF courses are examples of an output-based model of OR training[36] where effective mentorship is a critical component to the success of the course.[37] The training effectively contributes to capacity building through personal development of participants, retention of OR personnel, and the sustained ability to mentor others. The training thus contributes to a growing desire for 'culture change' whereby policy innovation finds its basis in data.

35 ESSENCE (2014) "Seven principles for strengthening research capacity in low- and middle-income countries: Simple ideas in a complex world." ESSENCE Good Practice Document Series

36 Ramsay, A., Harries, A. D., Zachariah, R., Bissell, K., Hinderaker, S. G., Edginton, M. et al. (2014) "The Structured Operational Research IniTiative for public health programmes" *Public Health Action* 4(2) pp. 79-84

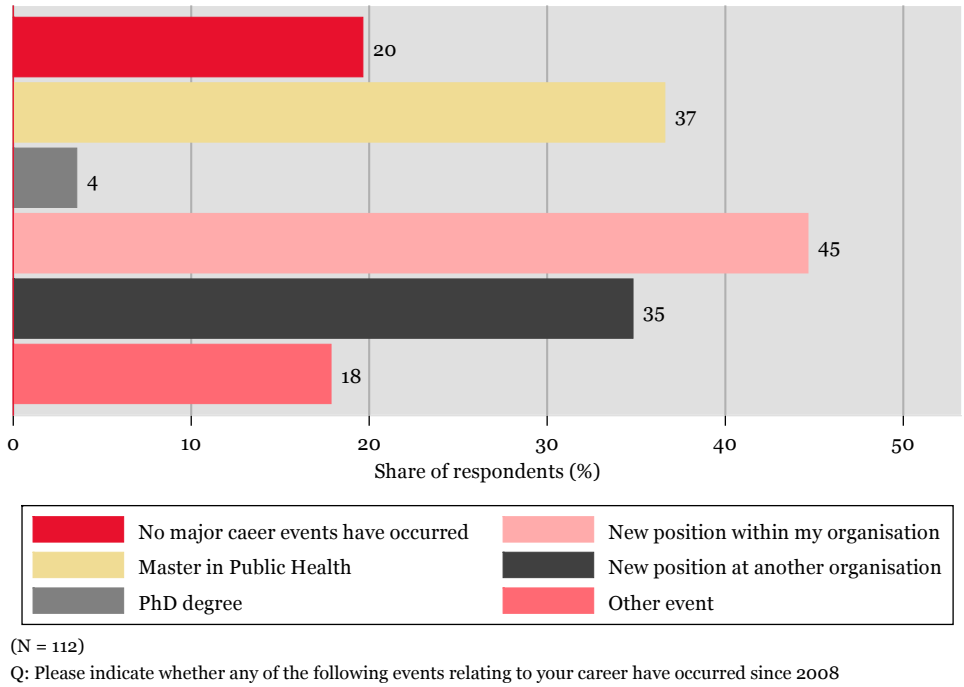
37 Harries, A. D., Marais, B., Kool, B., Ram. S., Kumar, A. M. V., Gounder, S., Viney, K., Brostrom, R., Roseveare, C., Bissell, K., Reid, A. J., Zachariah, R. and Hill, P. C. (2014) "Mentorship for operational research capacity building: hands-on or hands-off?" *Public Health Action* 4(1) pp. 56-58

It was remarked in both the survey responses and the in-depth interviews conducted with participants, trainers and course organisers of selected courses that The Union/MSF course implementation is done in a way which provides maximum benefit to course participants. The importance of the focus on practical aspects, well-linked Modules, learning-by-doing, and the facilitator-to-participant ratio were cited, all of which are considered to provide a pedagogic advantage. This well-regarded implementation helps to provide the conditions for participants' success on the course, which is likely to have a greater impact on individual achievement and benefit.

There has been a considerable amount of research activity from participants who have completed a Union/MSF OR course – a substantial number of course participants whom successfully complete an OR course continue to engage in the practice.[38] This is due to both the structure and implementation of the courses, as well as the aims and objectives, which facilitate marked and tangible career progression for participants.

Participants were asked whether certain key career events happened in the previous five years. The results are presented in Figure 18. In total 37% of the participants obtained a Master of Public Health or an equivalent degree, while 45% received a promotion or new position within their organisation. This is partly due to the fact that some participants have received their degree within the last five years, but also due to the fact that some participants can be accepted without such a degree if they have received a special recommendation. In total 4% received a PhD degree. Even though the participants indicate that OR in general and the course in particular did play a (large) role for these career events, there is no difference in the frequency of these career events compared to the non-participants.

Figure 18 Career events of participants



(N = 112)

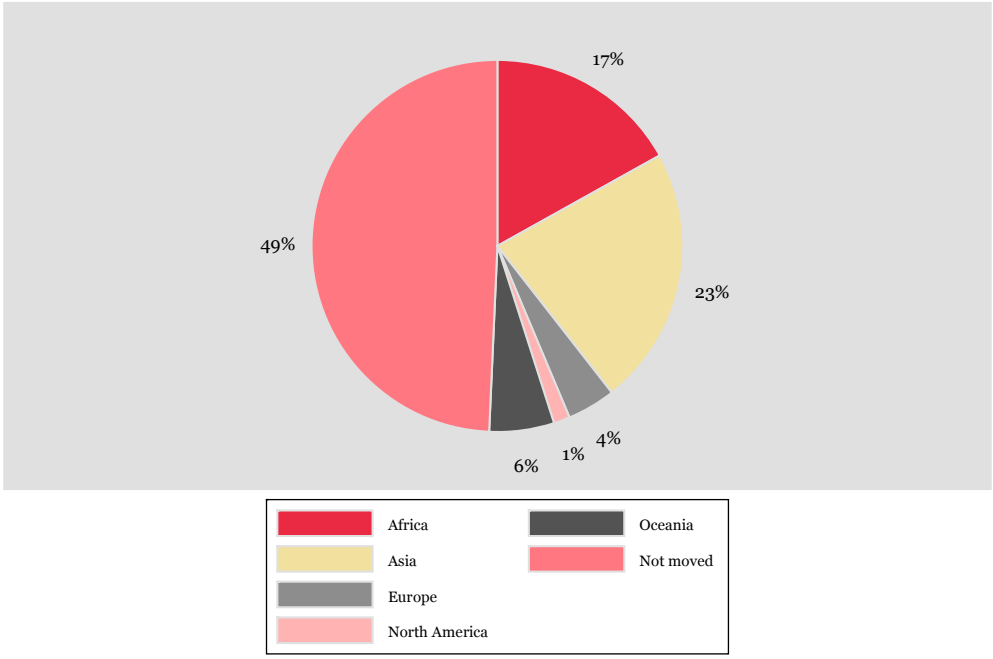
Q: Please indicate whether any of the following events relating to your career have occurred since 2008

Source: Technopolis Group (2014).

[38] Guillerm, N., Tayler-Smith, K., Berger, S. D., Bissell, K., Kumar, A. M. V., Ramsay, A., Reid, A. J., Zachariah, R. and Harries, A. D. (2014) "What happens after participants complete a Union-MSF structured operational research training course?" *Public Health Action* 4(2) pp. 89-95

An often-heard worry of training and education programmes is the risk of highly educated and skilled professionals from low-income countries migrating to high-income countries. However, the results show that only 4% of those from all countries who received a new position received it in Europe, and only 1% in North America (Figure 19). Therefore this does not appear to be a concern for the impact of the OR training courses. The data also shows that 15% of participants were living in another country at the time of answering the questionnaire compared to the moment of their application to the OR course.

Figure 19 Location of new position or promotion of participants

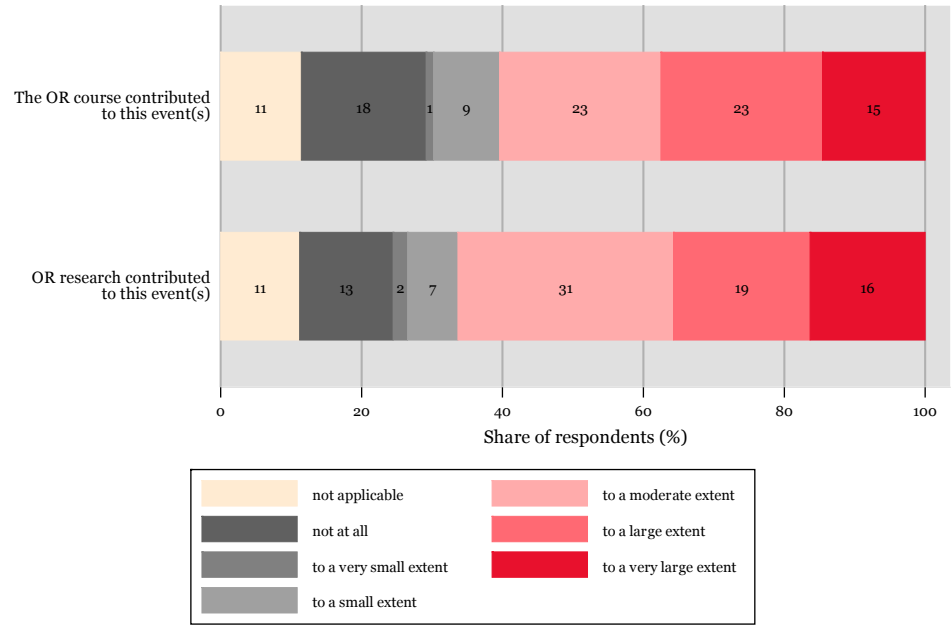


(N = 71)

Q: If your promotion or new position was in a new location, where was your new work location?

Source: Technopolis Group (2014).

Figure 20 Effect of OR course on career events of the participants



(N = 98)

Q: To which extent did ... contribute to the fact that this event or these events happened?

Source: Technopolis Group (2014).

Numerous survey respondents and most interviewees cited either a promotion within their organisation; a new, but related job; or a change of career path following their participation in Union-MSF OR courses. Figure 20 shows to which extent the OR course contributed to such career events. The findings indicate a positive individual benefit from undertaking a course, and also highlight a trend which suggests that individuals with skills and aptitude in OR are respected and sought after by employers in public health-related organisations. One participant on the 2013 Luxembourg course said: "*Having this skill makes me a firmer candidate for non-profit organisations*", while another had noticed OR gaining more traction and increasingly appearing in job descriptions. One participant from Kenya discussed the job promotion she received, which was directly linked to her increased aptitude in OR and growing number of publications.

A complete change of career path is markedly less common following completion of an OR course, though it does occur.[39] These tend to be individuals who progress to become OR-Fellows, helping to facilitate wider use of OR and assist those new to the discipline with the dissemination of techniques and skills learned: "*They* [medical associations] *perceive me as someone who is working as a researcher and want me to come and facilitate*", one individual commented. Two interviewees from sub-Saharan Africa referred to either their enrolment on a PhD programme, and their current process of creating a PhD proposal following undertaking the OR course: "*Doing the course was a key reason that I went to do my PhD. It was a huge plus on my CV*". Internal promotions remain the most common development following participation in an OR course.

[39] Bissell, K., Harries, A. D., Reid, A. J., Edginton, M., Hinderaker, S. G., Satyanarayana, S. Enarson, D. A. and Zachariah, R. (2012) "Operational research training: the course and beyond" *Public Health Action* 2(3) pp. 92-97

Recent studies carried out to track the development of participants on The Union/MSF OR capacity building courses indicate that 89% of participants are successful – where success is measured by whether or not a research project has been completed including scientific paper submission.[40, 41] Following course completion, OR skills are longitudinal; half of all participants engage in further OR after the course has finished.[42] This is particularly substantial in cases where participants had not undertaken research prior to course participation.

In one exceptional case, a course participant has cited his lead- and co-authoring of "close to 60 papers" following OR course participation (see BOX 1, Appendix H). A more commonly found example refers to the benefits realised by the employer organisation from the individual's newly-acquired OR skills: "*We have a programme that lends itself to operational research… so in that way it has really helped our organisation*". This was a common theme throughout the qualitative survey responses and interviews, showing how research skills of the individual, developed by the OR courses, can have wider organisational or national reach through further research and publication.

4.8 Institutional impact and sustainability

This section responds to evaluation question 8 (*Do they [courses and participants] help institutionalise OR?)*, evaluation question 10 (*Are any changes beginning to cause enhanced use of OR findings and improved health services?*) and evaluation question 11 (*To what extent are (early) impacts likely to sustain?*).

About one third of participants indicate that their individual efforts have made a large difference to their organisation in terms of institutionalising OR. Around half of the participants indicate that their organisations give high or very high priority to OR, and two thirds indicate that OR features to some extent in the strategy documents of their organisation. In total 71% of the participants indicate that this has improved over the past 5 years. In the interviews, numerous specific examples are given of enhanced use of OR findings in the health care practice. A large majority of the respondents claim that they intend to continue to carry out research, take OR training, and that their organisations are sustainably committed to OR.

An increasing knowledge and practice of OR – assisted by practical training through donor funding – in low- and middle-income countries should extend OR capabilities beyond the small group of researchers and fellows in which it has historically been focused.[43] OR should affect policy and practice, improve health-care delivery systems, and fulfil a key role in turning knowledge gained from research into action. The qualitative survey data, together with interviews indicate that The Union/MSF capacity building for OR courses is successful in these respects. The capacity building can be seen to have an impact on the organisations, regions and countries of the participants in the following ways:

[40] Zachariah, R., Ford, N., Maher, D., Bissell, K. Van den Bergh, R., Van den Boogaard, W., Reid, T., Castro, K. G., Brauguez, B., von Schreeb, J., Chakaya, J., Atun, R., Lienhardt, C., Enarson, D. A. and Harries, A. D. (2012) "Is operational research delivering the goods? The journey to success in low-income countries" *The Lancet* 12 pp. 415-421; Bissell et al (2012); Guillerm et al. (2014);

[41] Zachariah, R., Guillerm, N., Berger, S. Kumar, A. M. V., Satyanarayana, S., Bissell, K., Edginton, M., Hindraker, S. G., Tayler-Smith, K., Van den Bergh, R., Khogali, M., Manzi, M., Reid, A. J., Ramsay, A., Reeder, J. C. and Harries, A. D. (2014) "Research to policy and practice change: is capacity building in operational research delivering the goods?" *Tropical Medicine and International Health* 0(0) pp. 1-8

[42] Guillerm et al. (2014)

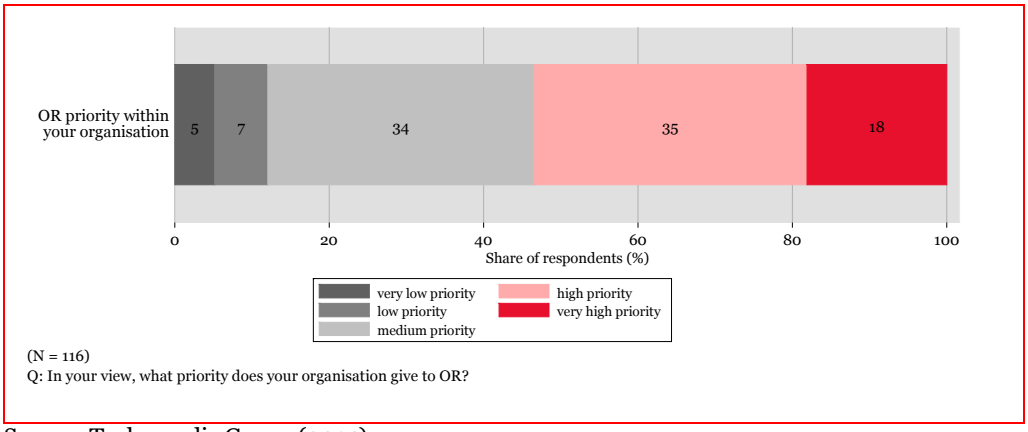
[43] Foreit, J. (2008) "Global Development and Coordination of Capacity Building" Frontiers in Reproductive Health, Population Council, USAID; Varkevisser et al. (1991)

- Through a policy change that is put into practice following the research undertaken as part of the course
- By creating unintended impact and/or spill-over effects
- By increasing capacity for further research which leads to policy and practical change
- By having long-term traction or practical use, enabling changes to be sustainable and longitudinal

Although the OR courses are primarily aimed at building capacity with individual health (and policy) professionals, a further aim is to improve health systems and outcomes in developing countries. This potential impact is often mediated through the institutionalisation of OR capacities in the organisations where the researchers work. The principle would be that these organisations internalise the skills and knowledge in a structural manner, such that the activities do not completely depend on the individual who was trained in the OR course.

In the survey, participants were asked to rate the priority their organisation gives to OR. Around half of the participants indicate that their organisations give high or very high priority to OR (Figure 21). In total 71% of the participants indicate that this has improved over the past 5 years.

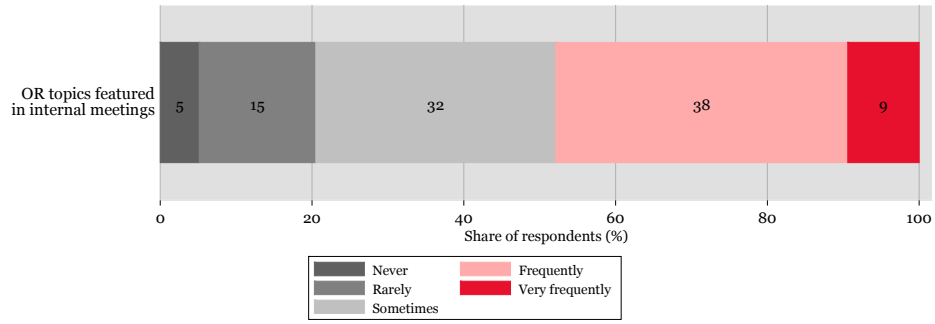
Figure 21 Priority of OR for organisations where participants work



Source: Technopolis Group (2014).

Almost half of the participants (47%) indicate that OR frequently or very frequently features at internal meetings in their organisations, and 64% indicate that OR features to some extent in the strategy documents of their organisation. Just over one third (35%) of the participants have a formal structure for regular meetings on OR in their organisation. This result stays the same if we control for researchers who moved between organisations (Figure 22).

Figure 22 OR topics in meetings of organisations where participants work



(N = 117)

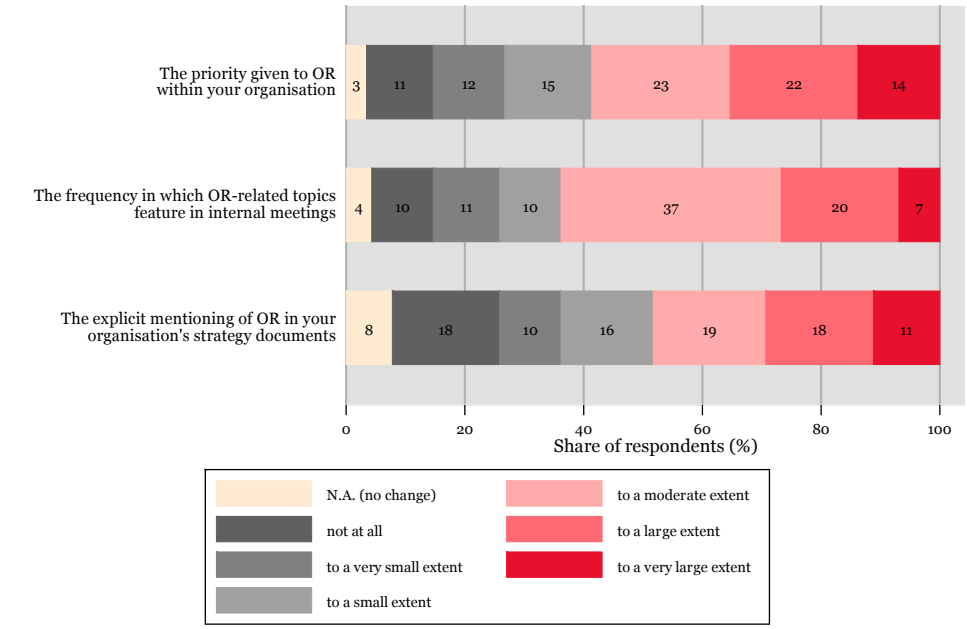
Q: In your experience, how often do OR related topics feature in internal meetings?

Source: Technopolis Group (2014).

The differences between participants and non-participants for most categories are not substantial. Again, a pattern emerges where participants started from a lower base five years earlier and now operate at a level similar to non-participants. One reason could be that the OR programme is explicitly aimed at starting professionals who by definition had lower activities five years earlier.

The theory of change behind improved institutionalisation of OR is that the trained individuals take action to promote OR in their organisations. Figure 23 shows that between 27% and 36% of participants indicate that their individual efforts have made a large difference to their organisation in terms of institutionalising OR.

Figure 23 Individual efforts to change the organisations where participants work



(N = 116)

Q: Please indicate to what extent any changes in the following aspects were related to your individual efforts?

Source: Technopolis Group (2014).

4.8.1 Impact on policies and practice in the health systems

Numerous participants from a range of countries including Brazil, Bangladesh, Malawi, Ethiopia and India reported policy and practice change following publication of their OR as part of The Union/MSF capacity building course, indicating that the goals of the course and OR itself are being adequately met. These policy changes were wholesale and piecemeal, occurring at various scales and levels. One participant referred to national "adaptation of upper and lower height cut-off points" for children in nutritional surveys, whilst another regarded The Union/MSF course as a catalyst for the creation of "a national TB/HIV working group, and the closer collaboration between TB and HIV/AIDS programmes at a central level". More locally, participants referred to simple changes in practice that had an important effect on public health, such as the "introduction of digital thermometers for measuring temperature", the implementation of "an IPT [isoniazid preventive therapy] register for children in Cape Town" and "improved links between community and tertiary TB care". It is difficult to attribute such changes in policy and practice wholly or partly to the courses, but it is likely they played some role.

As well as OR having impact directly related to the question set by participants prior to beginning a Union/MSF course, a number of participants referred to the ways in which the research process – data collection and analysis – led to the recognition of trends, policy problems and areas for development that were unintended or 'spill-over' from the initial research and question. In India, evidence from an OR project in 2010 contributed to a policy decision in 2011 that all HIV-infected TB patients should receive ART irrespective of their CD4 count (BOX 4, Appendix H). This policy change also led to change in practice for HIV-TB patients: there is an increased trend in proportion of HIV-TB patients receiving ART. Although several additional interventions were implemented during the same period, including intensified supervision, monitoring, and reimbursing travel costs to ART centres, the elimination of the hurdle of CD4 count for TB patients to start ART undoubtedly contributed to an increased performance.

Another interviewee explicitly mentioned "*a great benefit from work that was not intended*", referring to the realisation of the existence of a gender divide in accessing healthcare (see BOX 2, Appendix H). Another interviewee referred to the way in which there has, since the research, been an important consideration of the quality of healthcare provided in maternity facilities. Thus, whilst the initial scope of the study was to consider the access to healthcare, OR revealed that impacts of poor quality healthcare could be substantial. Such spill-over effects are highly important for further policy change, highlighting points for further research.

As already stated, a large number of course participants go on to undertake further research following completion of a Union/MSF OR course. This is particularly pertinent where course participants had not had publications or positions related to OR before course participation. One interviewee cited further research being undertaken qualitatively following unintended impacts of the OR which has led to increased consideration of public health outreach methods within the organisation, enabling increased use of clinics, visible in the organisation's annual reports.[44] An interviewee also discussed at length the way in which adoption of better record keeping in traditional societies as well as in medical facilities has been an important precursor to understanding and noting cause of death, and in the village setting, encouraging early intervention and clinical care (see BOX 3, Appendix H).

OR courses and their subsequent publications have led to a substantial number of effects at a wider level.[45] These wider impacts come from the scalability of proposed or

[44] http://www.thegaia.org/about/2013/2013_annual_report_GAIA.pdf; http://www.thegaia.org/about/2012/2012_annual_report_GAIA.pdf

[45] Zachariah et al. (2012)

implemented policy changes and the facilitation of wider OR knowledge through dissemination not just of research findings, but skills gained throughout the course. One participant outlined how courses are now run at a national level to increase OR capacity in the public health sector across the country. Another participant cited the benefits that an increase in OR capacity would have on their organisation's on-the-ground researchers.

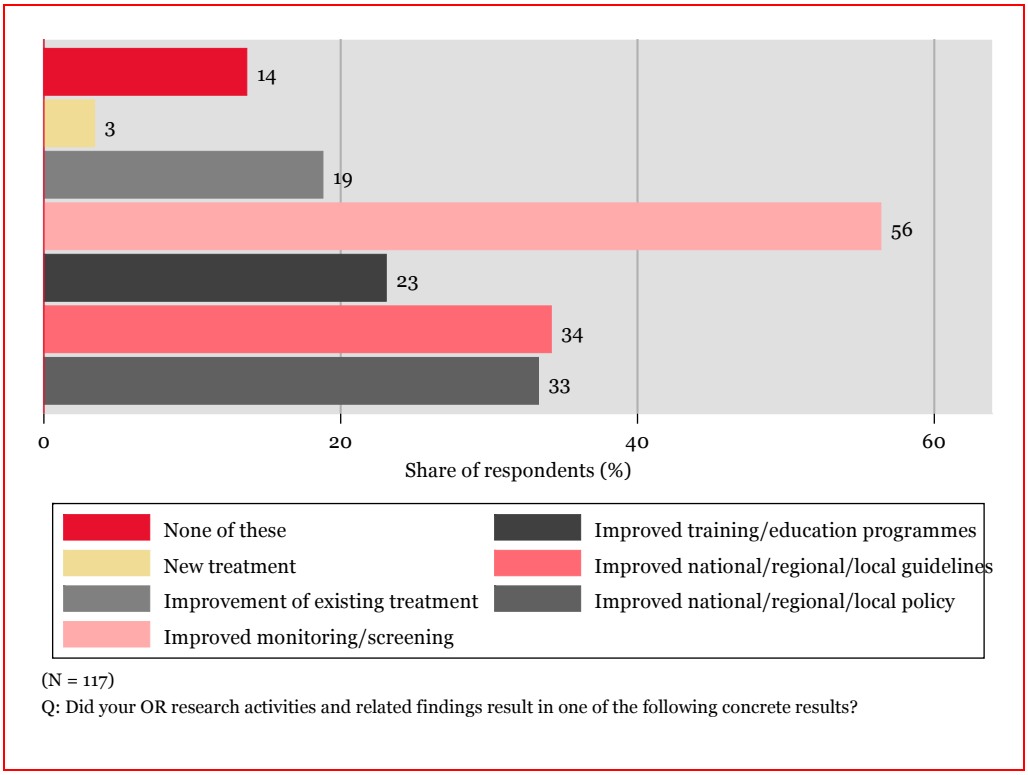
The aptitude of a policy to be scaled up is also paramount. A common thread running through the qualitative survey responses and interviews was the impact, or potential impact OR instigated policy changes could have on different scales: *"… if they [the Ministry of Health] were to switch to more of an outreach model as the research advocated, they would more effectively reach the population*". Another participant (see BOX 4, Appendix H) cited the policy recommendation scaled up from local-level research to HIV testing for TB suspects in "*all HIV settings in India*."[46] Later, OR was used to demonstrate how people could be trained to implement such practice countrywide: "*That research was very positive*". One interview participant cited how important a realisation of the use of OR was to the country's Ministry of Health. It was stated that the course contributed in part to the creation of a national TB and HIV working group.

> *"The realisation that we could use secondary data for health, regardless of its imperfection and holes – that was a key realisation and catalyst. Putting information out there and educating people, helping the Ministry decide what they will do next year based on data. Evidence based decision making has become integral to the Ministry."*

The final objective is to improve the health systems of the regions and countries through a recursive loop of system improvements through OR in local contexts. Health systems can be improved through the development of new guidelines, improvement of treatments, improved regional/national policies and so on as a result of evidence-based OR. Figure 24 shows that the most often mentioned impact is the improvement of monitoring and screening of patients (56%).

[46] Minutes of meeting NTWG on HIV/TB Collaborative Activities at national AIDS Control Organization, New Delhi, 21/04/2011

Figure 24 Impacts of participants' research activities



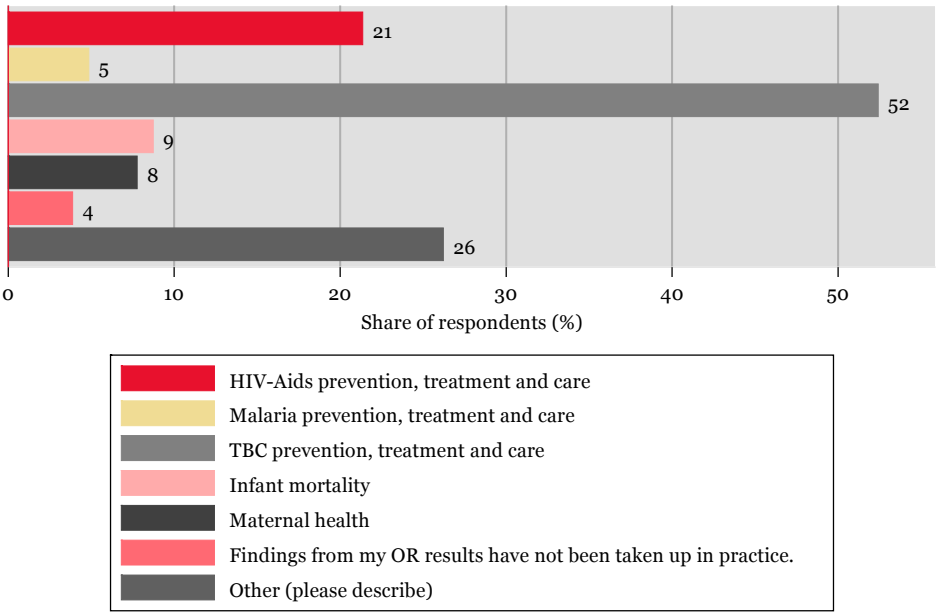
Source: Technopolis Group (2014).

Around one third of participants indicate that their research led to improved policies and around one third indicate that their research led to improved guidelines. In total 19% of participants indicate that their research led to the improvement of existing treatments, 3% mentions the development of a new treatment.

Naturally, these results only have actual impact on health systems if they are implemented in practice. Just over half (56%) of the participants have already implemented the results from their OR work, while around one third indicated that they will implement the results in the near future. Only 4% indicated that no implementation has taken place or will take place, although it is to be seen whether all those participants who did not implement yet will indeed implement results in the future.

Finally, the improved health systems should benefit patients through improved health outcomes, thereby contributing to the implementation of the Millennium Development Goals. Participants were asked to indicate the disease area covered where the findings of their research projects were implemented. The results are presented in Figure 25. Just over half of the participants have worked on TB prevention, treatment and care, while 21% has worked on HIV-AIDS. The other disease areas all have smaller shares. From the comparison with non-participants, it becomes clear that there are no major differences in terms of focus of research. This is no large surprise as non-participants self-selected into applying for this OR training course with a clear focus.

Figure 25 Improvements due to OR findings of participants

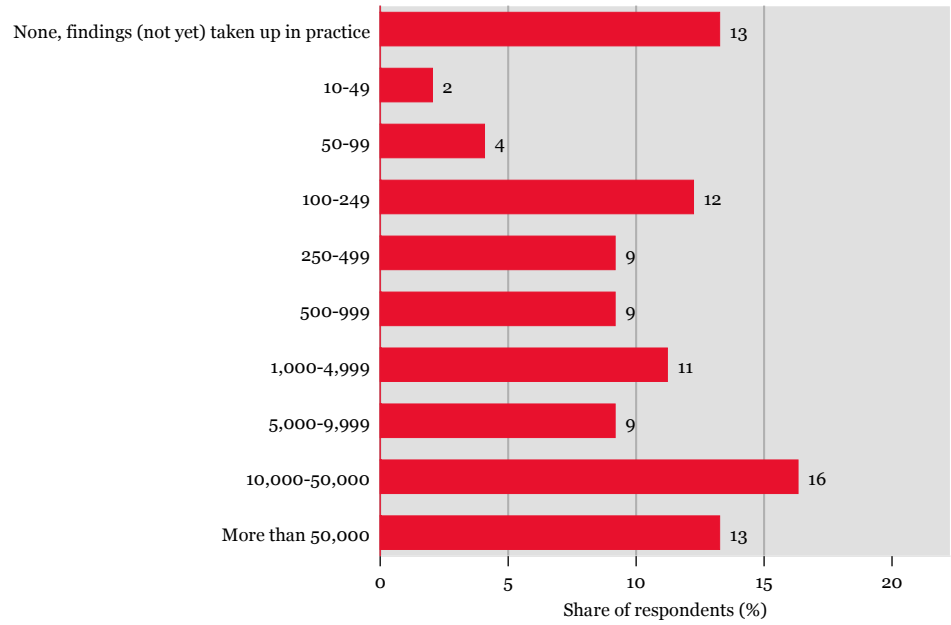


(N = 103)
Q: Please indicate for which health outcomes your OR findings have made a contribution to improvement

Source: Technopolis Group (2014).

In order to get a better view of the scope of implementation, respondents were asked to provide a rough estimate of the number of patients that are affected by implementing the research outcomes. As is clear from Figure 26, the scope of implementation varies extensively from between 100-249 patients to more than 50,000. In any case, respondents generally indicate through these estimates that the improved guidelines, policies and treatments in their view appear to have a substantial impact in terms of the number of patients affected. It is to be noted that these estimates are likely to be highly uncertain, as a large share of impacts is still to arise in the (possibly distant) future. A full detailed and quantitative impact assessment of the OR health training courses on the *health system level* would require a different approach to the one taken in the context of this study. While acknowledging the fact that the exact size and scope of these impacts cannot be established at this stage, the fact that a large number of participants indicate specific (expected) benefits for patients should be considered as an encouraging sign that the OR health courses have a positive effect on health systems in respective developing countries.

Figure 26 Number of patients benefitted due to OR findings of participants



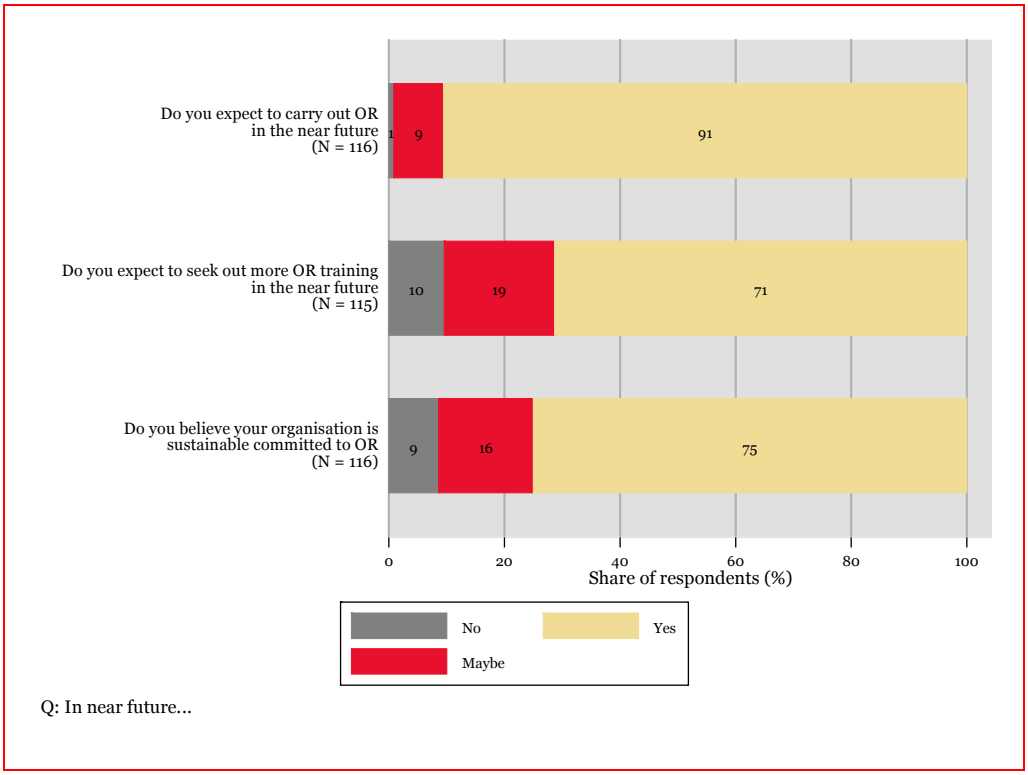
(N = 98)

Q: Estimate the number of patients benefiting yearly from treatment/care improved as result of your OR research?

Source: Technopolis Group (2014).

An important predictor of long-term sustainable impact is whether the participants themselves and their host organisations remain engaged and committed to Operational Research in the future. Figure 27 shows that a large majority are positive regarding their future engagement with OR. Naturally, people are generally inclined to be over-optimistic about their own future behaviour, but the level of enthusiasm for OR is clear. There are many other insights into sustainability throughout the report (critical mass, networking effects, long lasting relationship and community building) which are reflected in the conclusions.

Figure 27 Expectations about the future



Source: Technopolis Group (2014).

4.9 Impacts of the OR-Fellows

This section responds to evaluation question 9 (*What are the nature and extent of impacts produced by Research Fellows?*).

The OR-Fellows report a range of impacts resulting from the OR training and their position as a Fellow. There are personal impacts, cultural changes within their organisations, improved training of other staff members, increased visibility for their organisations and a generally strengthened practice of OR in their organisations. Health care services have improved in several ways, for instance better screening protocols and guidelines, and changed way HIV patients are educated. OR-Fellows have used their work to improve the OR training courses and studies improved the use of local and national evidence to improve programme design and delivery. OR-Fellows are better equipped to apply for additional funding sources and have a higher chance of success due to their publication record. From the external perspective, the inclusion of OR in the work of the organisation has helped to change the way that the organisation is perceived and gives more weight in terms of influence on policy through the use of the research evidence made available.

4.9.1 Specific outputs from the OR-Fellows

The intervention logic sets out a number of targets in relation to the OR fellowship. The first related output is an increase in skilled research personnel where an output indicator is the number of Fellows retained annually due to DFID funding. A target of ten is set out in the log frame and there are currently seven, which are funded by DFID.

OR-Fellows have output targets in terms of the numbers of papers published or in press (two per year) of which all have reached or exceeded their targets. Table 11 gives

an overview of the main outputs reported in the quarterly reports to DFID (for the DFID and MSF OR-Fellows) as a cumulative figure over the period September 2011 – March 2014. The DFID/Bloomberg OR-Fellows data was collected from The Union. Another target relates to Fellows becoming course mentors and facilitators. As indicated in Table 11, almost all of the Fellows have facilitated Research Modules on the courses.

Table 11 Cumulative outputs by type of OR-Fellow (September 2011 – March 2014)

Type of Fellow	No. of Fellows	Research projects undertaken	Papers published	Research Modules facilitated	Papers reviewed	Presentations at conference
DFID	2	110	50	40	12	46
MSF	6	265	117	48	30	58
DFID/Bloomberg	5	183	26	28	40	29

Source: Quarterly reports and individual reports on the DFID/Bloomberg Fellows.

Another identified output relates to the career pathways for skilled researchers, which indicates that seven OR-Fellows should be making adequate progress towards a PhD. This is not yet met as a target. According to the interviews, four OR-Fellows are either exploring the opportunity or undertaking a PhD. The interviews indicated that other OR-Fellows would like to have the opportunity to explore undertaking a PhD but have not yet done so. At least three others have a PhD (sometimes alongside their medical qualifications).

4.9.2 The outcomes and impact of the OR-Fellows

The outcomes and impact identified in the interviews with the OR-Fellows can be divided into:

- Personal impact (from the course and fellowship programme)
- Institutional impact (additional capacity building)
- Short and long term impact on the health sector (including policy and practice)

4.9.3 Personal impact on the OR-Fellows

The OR-Fellows describe that the OR-course increased their skills in data collection and analysis, writing and publishing research and getting a structure of the OR-methodology that could be summarised by the points below:

- Ability to identify research questions and develop them into research protocols
- Ability to supervise data collection and data entry
- Ability to write a manuscript for submission to peer-reviewed journals
- Ability to manage time and adhere to set timelines for completion of set tasks

By taking part in the fellowship programme they have increased their knowledge and experience, allowing them to feel more confident using OR.

> *"It has clear measurable outcomes that impact on improvement in personal academic/professional skills and improvement of health programmes."*

The OR-Fellows describe how they now work more autonomously and with greater freedom and responsibility than before joining as a Fellow and that they can take the lead, and monitor and evaluate research activities. Several of the OR-Fellows also describe that they now have the competence to train other people in OR, which they do in many cases, either at The Union/MSF courses or in other ways in their home countries.

An area for improvement in terms of personal impact is the networking between the OR-Fellows. Networking mainly takes place when the Fellows are fulfilling their duties through the OR courses. There is also some low level contact through social media reported. In one country where there are four OR-Fellows, they meet regularly through various committees and intend in the future to identify funding to conduct additional in-country or regional OR courses which are modelled around the Union/MSF OR courses. There is another example of collaboration between Malawi and Vietnam. However overall, the underdeveloped alumni group and the lack of critical mass in some countries mean this is hard to achieve. The Union is developing a more formal alumni network and have put individuals in touch with each other where they are working on similar issues. This would be welcomed by the OR-Fellows.

A majority of the OR-Fellows want to stay in their home country (or go back to their home country) continuing working with OR in the health sector after the fellowship programme (8 of the 12 OR-Fellows are currently based in their home countries).

4.9.4 Institutional impact

Apart from direct outputs such as an increased number of publications from the OR-Fellows' organisations, there are also other longer term impacts on the organisations as a result of participation in the fellowship programme.

Many of the OR-Fellows describe that their participation in the programme has led to cultural change within their organisations and new strategic orientations. They describe that within some of the organisations, a new way of thinking has been established. When for example a new project or programme is implemented it is seen as a natural step to ask about including OR in the programme and thinking about how it can add value.

It is also described that when other people in their organisations want to do OR, the management now supports it since they have evidence of how useful it can be. One of the interviewees expressed that "*I don't need to convince anyone any longer when it comes to OR*". The organisation is now open and receptive to the OR-Fellow to attend conferences for example and also to have their voice heard at the management level.

This cultural shift is also strongly emphasised by those OR-Fellows who have yet to see a direct influence on policy as it is believed to be the first step in a process of change and fundamental if there is to be a long term change in policy and practice.

Another interviewee described that the OR work he has done as a Fellow has changed the way they *"do business*" in his organisation. The organisation has benefitted from the OR-Fellow as a resource and uses the skills of the Fellow to improve the skills of other programme managers in the organisation with a particular emphasis on how to understand if a programme works well, and if not, how to make the necessary changes. Another OR-Fellow described the change of culture and ways of working:

> *"People now understand better why it is important to step back and reflect and try to see the big picture. You try to understand what your problem is and how you can solve it."*

Yet another example mentioned is that OR work within the programme has led to changes regarding training of the tuberculosis staff in an organisation, which is leading to changes regarding a reporting system for tuberculosis.

The OR-Fellows report how their role increases the visibility of their organisation. An example is given on how participation in the programme and the subsequent increased use of OR has led to a new "*public face"* of one of the organisations involved.

> *"We have established a visibility as technically experienced and not only as a humanistic organisation. Now people understand that we provide evidence-based care."*

For one of the OR-Fellows the increase in OR publications within his organisation has made it easier to apply for funding, since a programme application can be backed with relevant publications.

In one NGO hosting an OR-Fellow, their new projects in Pakistan and Haiti helped to change the way the organisation is perceived externally and gave them more weight in terms of their influence on policy.

National networking has increased as a consequence of the programme with a number of OR-Fellows indicating how they sit on national committees and contribute to spreading OR capacity and also taking information from national policy makers and using it in their institutions.

There is also institutional impact in the funding organisations. For example, for the Bloomberg Foundation, although OR is not a major focus or priority, they remain extremely interested in the data generated as well as the current strategy of WHO for tackling TB called Dots (directly observed treatment, short course). As the work of The Union and the Fellows is complementary to other areas of work they undertake in capacity building (rather than influence on policy and practice), they can see spill-over effects from the results of The Union/MSF programme into their capacity building programmes.

From the outset of the project The Union has worked together with MSF in delivering the OR courses and the fellowship programme. There are meaningful personal relations between the MSF and The Union and over the last years MSF has grown much stronger in its OR capacity. MSF has OR-Fellows who work at national level (there are seven altogether) as opposed to Union Fellows who tend to work in ministries. From their perspective, there have been substantial changes to the OR project in moving under the WHO SORT-IT banner. This has given OR a more global presence with the opportunity to expand into other areas. The work between the organisations has evolved and the fact that staff work across the organisations has meant everyone takes ownership. This also means it is possible, under WHO, to gain political support and faster expansion into new areas of the world.

4.9.5 Short and long term impact on the Health Sector

There are many examples given by the OR-Fellows of how OR studies and their involvement in the programme have led to policy change on a national level or other impact on the health sector (although some OR-Fellows report it is still too early to be influencing policy). Examples are reported by the OR-Fellows through the interviews and evidence is also provided through a recently published research article by Rony Zachariah (MSF) in cooperation with some of the OR-Fellows and The Union.[47] This article reports on the number of papers published as a consequence of the OR-courses and their reported effect on policy and practice. Of 96 papers submitted to scientific journals, 88 were assessed for effect on policy and practice with 65 studies reporting some change. Reviewers independently verified these effects. The following examples are given by the OR-Fellows in interview, some of which are also used as evidence in the research paper.

A piece of OR research on TB and diabetes led to diabetes screening in TB patients.

> *"A linkage between TB and diabetes was already known. After doing a multi-centre OR study on TB and Diabetes all TB patients in my country will now be screened for diabetes. And all this, from OR study to policy*

[47] Zachariah, R., Guillerm, N., Berger, S., Kumar, A. M. V., Satyanarayana, S., Bissell, K., Edginton, M., Hinderaker, S. G., Tayler-Smith, K., Van den Bergh, R., Khogali, M., Manzi, M., Reid, A. J., Ramsay, A., Reeder, J. C. and Harries, A. D. (2014), Research to policy and practice change: is capacity building in operational research delivering the goods?. Tropical Medicine & International Health. doi: 10.1111/tmi.12343

change happened very quickly, within 10-12 months. This is a very clear and recent example of how OR can lead to policy change."

Another example is where the OR project, undertaken by a Fellow, led to a national policy which stipulated that all TB suspects should also be tested for HIV.

In Liberia, a cross-sectional study assessing the characteristics of survivors of sexual violence and the package of care offered to them led to the guidelines being revised to improve the management of minors and male survivors.

In Malawi, an OR-Fellow consulted the technical advisor for the Ministry of Health to share research priorities. This approach greatly facilitated the transition of research findings into practice and policies. In 2012, a study on Health Surveillance Assistants (HSAs) in the provision of antiretroviral treatment (ART) in Malawi evaluated whether health surveillance assistants who attend a six month public health training could efficiently and safely provide ART for the more stable patients. The study findings showed that while task-shifting to HSAs appears promising, additional clinical training was needed before task-shifting stable ART patient care to lower-skilled healthcare assistants could be done. Therefore this approach was removed from the ART programme as a mechanism. Another study on pregnancy and ART led to a recommendation that ART clinics should integrate comprehensive family planning – which is now seen as a core service in relation to the treatment of women with HIV. The work in Malawi has also led to changes is record keeping on patient care in Angola.

In India, a national programme manager was inspired by the work of the OR-Fellow and put in place a national OR board in cooperation with The Union. This led to an expansion of the network and a national OR course.

Research on efficient, quality-assured data captured in OR through innovative use of open-access technology led to a new model of quality-assured data capture using multiple open-access technologies (EpiData, Dropbox, TeamViewer). This is being taught in subsequent courses and used in OR studies in Asia and Africa.

It is also highlighted by some of the OR-Fellows that they see a paradigm shift in how to plan and implement programmes in their countries.

"Now we find our own evidence through locally relevant designs. This is a big shift, and that will be the right way to move forward. Before we had global recommendations coming. Now we can find evidence ourselves of what suits our situation."

In India, OR has also led to a change in the way programmes are implemented and funded. Evidence is provided from the bottom up, based on their own country data and is considered the right way to move forward, rather than to rely on evidence from elsewhere in the world.

The MSF OR-Fellows report an increase in visibility of the MSF as a consequence of the dissemination of research results. For example, a study on maternal mortality in Burundi was used in a BBC documentary and this led to an invitation from the Commission of Development Affairs to discuss OR.

4.10 The project's budget and spending

This section provides insight in the financial aspects of DFID's support to The Union. It provides an overview of the distribution of the budget and the actual spending of the DFID grants. It also responds to evaluation question 12 (*What is the full cost of running OR courses)* and evaluation question 13 *(How does this vary by location?).*

While the contribution of DFID has been in total £1,160,000, both MSF and The Union report to have provided each £300,000 in-kind. Bloomberg Foundation has supported the initiative by paying for the salary costs of Prof Harries and support staff. The Union does not have detailed information regarding the in-kind contributions, hence we do not know to what extent these in-kind contributions have been actually realised. An estimate is that the full cost for running the OR courses 2011–2014 is approximately £1.9 million. It is clear that it is more expensive to organise a course in Paris, and it is a lot cheaper in Asia.

DFID has granted a total of £1,160,000 over three years (2011 to 2014) to The Union to support the expansion of an innovative capacity building programme in OR.

The main activities that their funding is allocated to are:

- OR health courses (54%)
- Support fellows (30%)
- Support for alumni (2%)
- Support for publications (4%)
- Indirect costs and audits (10%)

Just over half of the funding is for the delivery of the courses. The second largest element of the budget is for supporting the Fellows and is divided into two parts. The first part is funding for fellowship contracts, in this case funding new OR-Fellows, a coordinator and prolonging contracts previously funded by a different funder. The second part is funding logistics for the OR-Fellows to conduct OR, in this case laptops, logistic support and skills building. The alumni support and publication support are relatively small in terms of budget.

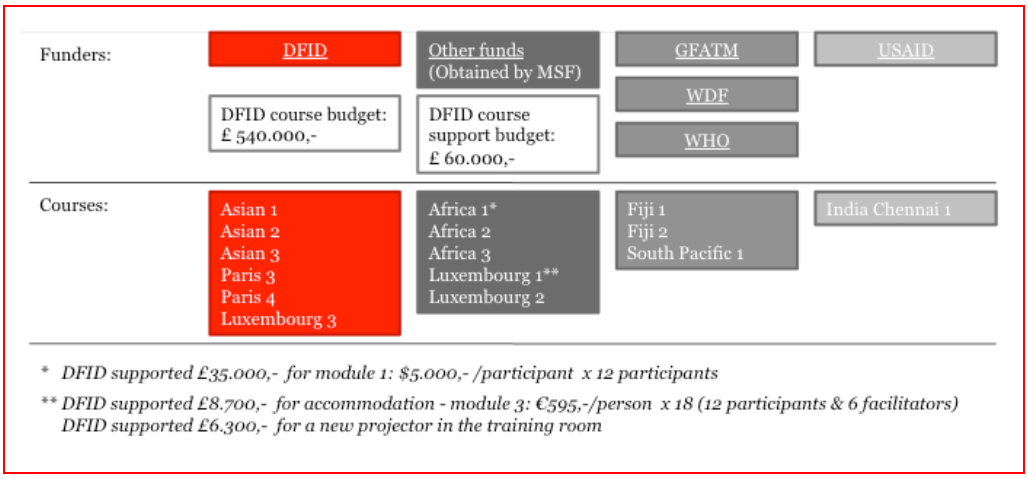
The OR courses that are organised by The Union and MSF have also been part-funded by the Bloomberg Foundation. Its support has for instance covered costs for the Project Director, a Project Administrator, an Administrative Assistant, the Deputy Project Director, and an Accountant.

DFID is the largest provider in terms of funding. DFID started with an initial budget of £1 million, quickly added another £50,000 in the first year and later in the last year adding £110,000 for OR-Fellow support as funds from Bloomberg were ending; this adds up to a total of £1,160,000.

As Figure 28 shows, DFID entirely funds the courses held in Asia and Paris, and partly supports the courses in Luxembourg and Africa. The additional contribution of £50,000 in the first year was allocated to the courses organised by MSF.

As well as the external funds, The Union and MSF also contribute to the courses themselves. Both parties report an estimated in kind overhead cost of around £300,000 respectively for organising the courses, for instance related to the OR-Fellows, as they were only partly funded by DFID. The Union does not have details on the exact distribution or usage of the funds, nor the exact amount of its in kind contribution. For the courses in Paris a coordination and logistics support team is arranged which is only partly covered by The Union's £300,000 in-kind. This coordination and logistic support team is also partly funded by DFID, and is budgeted for £20,000 per course, these costs are part of the £540,000 budgeted for courses.

Figure 28 Funding of OR courses (2011–2014)[48]



Source: Technopolis Group (2014).

The courses are one part of the funding from DFID; another part goes towards direct support to the OR-Fellows. The following paragraphs provide a more in depth presentation of the total distribution of the budget from DFID.

From the initial £1 million DFID budget £600,000 was allocated towards the funding of the courses and the support of the MSF courses. Around a quarter was allocated towards support of the OR-Fellows, which was increased by £110,000 making the total budget for Fellows close to £350,000. The remaining funding was allocated towards alumni support, journals and publications and a reservation for running costs for The Union. Table 12 shows an overview of the distribution of the budget; note that the (+£50,000) in year one is the budget that was granted to support MSF courses and it is kept separate as no 10% indirect costs are charged over this budget.

Table 12 DFID budget in main categories

	2011/2012	2012/2013	2013/2014	Total	Total (%)
Courses & support	£200,000 (+£50,000)	£200,000	£200,000	£600,000 (+£50,000)	56%
Fellows	£70,000	£173,750	£95,000	£338,750	29%
Alumni support officer	£0	£26,250	£0	£26,250	2%
Open access publication	£20,000	£10,000	£10,000	£40,000	3%
Indirect costs (10%)	£30,000	£42,000	£33,000	£105,000	10%
Total	£320,000 (+£50,000)	£452,000	£338,000	£1,110,000 (+£50,000)	100%

Source: Technopolis Group (2014).

The breakdown of the spending per course highlights the cost differences between the courses (Figure 44, Appendix I). It is quite expensive to organise a course in Paris (on

[48] Abbreviations: GFATM: The Global Fund to fight AIDS, Tuberculosis and Malaria, WDF: World Diabetes Foundation, WHO: World Health Organization, USAID: U.S. Agency for International Development.

average around £90k), and it is a lot cheaper in Asia (on average around £55k). Whether this means that courses should not be held in Europe is debatable as such decisions go beyond just costs, it is just an important factor to consider for future budgeting. A more detailed overview of the budgets and spending for the different budget categories is shown in Appendix I.

The full costs of implementing the courses are difficult to discern as funding streams related to the human resource cost of permanent staff members and OR-Fellows are separate from the organisation and delivery of the courses. This is also seen in the benchmark organisations (see below). If the project is to be scaled up in the future, a better accounting system is required to be able to better measure the true cost of individual courses.

4.11 Comparison with benchmark programmes

This section responds to evaluation question 14 (*Does this model of capacity building offer value for money compared to other models of capacity building and other models of generating operationally relevant research?*) and to evaluation question 15 (*What is the cost-effectiveness of this capacity building model?*).

A comparison between different OR programmes, provided by different organisations, is truly difficult. The two benchmark programmes are in part run more cost-efficiently, for instance with fewer mentors per student and with more student group work. At the same time The Union and MSF provide very good quality in their courses. Value for money and the cost-effectiveness of the Union/MSF courses are all in all assessed to be high. The scientific return of the investment is very high.

There are other programmes of capacity building that deliver training in OR in the health sector. We have investigated them as benchmark programmes, with the aim of gathering material to compare and contrast The Union's model with other practices, and provide information for potential improvement of The Union's current model and ultimately translating it into other domains. The benchmarking helps to understand how The Union can strengthen the relevance, quality, effectiveness and efficiency of their programme, sustain and enhance its impacts, and if necessary increase value for money.

The benchmarking cases were selected from a long list of programmes based on the following criteria:

- Target capacity building relevant to OR in health
- Delivery model through training courses
- Global geographical area of interest
- Data availability

The benchmarking study relies on desk research, semi-structured interviews with key informants in the relevant organisations, and a thorough analysis of evidential documents. Two programmes were identified in consultation with DFID that best meet the benchmark criteria:

- Frontiers in Reproductive Health Programme (FRONTIERS) of the Population Council that delivered OR training courses between 1998–2008 can provide valuable lessons learnt with the benefit of hindsight. The capacity building programme was active in 72 countries, including 20 countries in Europe, Central Asia, and Middle East, 28 in Africa, 13 in Asia, and 11 in Latin and North America
- Operational research capacity building programme of the KNCV Tuberculosis Foundation (KNCV), which provides training courses at country programme level across the world. Since 2006 KNCV has built research capacity in over 20 countries in Europe, Africa, Asia, and Latin America

In the following sections we summarise key findings from the benchmarking study, and the detailed case studies are available in Appendix J and Appendix K.

4.11.1 FRONTIERS

- FRONTIERS funded and/or provided technical assistance for a total of 63 courses with 1,171 participants over a 10-year Cooperative Agreement with USAID implemented by the Population Council between 1998 and 2008. This represents 7 courses per year with an average of 19 participants per course and ranging from 5 to 42.
- FRONTIERS' strategy was to increase both the demand for and supply of OR activities through the simultaneous expansion of the number of local organisations that fund and utilise the outputs of OR activities, primarily targeting managers, and the expansion of the number of individuals and organisations capable of conducting OR via specialised courses and hence providing increased number of field researchers. The goal was to lower the barrier to knowledge transfer between producers and users of OR.
- FRONTIERS targeted a small number of organisations in priority countries to build up infrastructure and incorporate teaching material in curricula. Working at the organisational level resulted in highly positive collaborations with local partners who enthusiastically engaged in and took ownership for OR training. Selection of course participants was carried out with local policy makers, mostly from the same country, to include 3-4 participants from a given organisation to build critical mass.
- FRONTIERS delivered diverse but relatively short OR courses without a research project component. It aimed at delivering the courses on a cost-shared basis and gradually decreasing technical and financial assistance to form independent OR training centres. Many cooperative agencies and institutions are willing to provide funds to train their staff in OR courses organised by FRONTIERS.
- Fully funded training courses often attracted the wrong people who were lacking motivation but were selected by their Ministries of Health.
- Taken as an example the South East Asia region, the average cost per participant of a 10-day capacity building course, active between 2001 and 2005, was $760 inclusive of transportation and per diem but excluding operational and FRONTIERS staff costs.
- Thirty-four OR proposals (out of 192 activities) developed at seven OR training workshops were funded by non-USAID/RTU sources. Twenty-four willingness to pay (WTP) studies have been conducted by organisations with non-FRONTIERS funding.
- Interns continued to carry out research, publish papers, work for healthcare NGOs and funding bodies. Fellows continued their work in OR in either new or their original organisations.
- FRONTIERS established international networks (INTACT, INDEPTH, and FHI360) that bring scientific evidence and analysis to bear on changes in practice.
- Course material posted on the Internet in different languages can provide easy access for students and hence multiply the effect of traditional training courses (for example WTF courses).
- Training and mentoring were two separate activities, however former directors believe that a model that combines the strength of on-going mentoring during a research project together with formal sessions on protocol development, data analysis and report writing would be optimal. Note that The Union's course offers such a holistic package.

4.11.2 KNCV

- KNCV delivers tailor-made OR courses in countries upon request of the National Tuberculosis Programme (NTP) to build a critical mass of researchers that are capable of conducting and understanding the relevance of OR projects in TB (including TB/HIV) and improving TB control. KNCV's research capacity building programme provides support to learners in conducting any or all steps of an OR project depending upon availability of funds and demand.
- Course participants are often selected by local partners based on criteria supplied by KNCV, however compliance is not always observed. More recently, KNCV has had a bigger role in selecting course participants. In all cases, approval is sought for participants' time commitment for the course from their line managers.
- Courses involve 12-30 participants with a total of 2 facilitators composed of KNCV and local facilitators. Individuals are developing research protocols in groups of four members and conduct research project over 9-15 months. Note that this team-based model represents an important difference with the Union courses.
- The OR course teams composed of members from NTP staff and academia contribute to building sustainable local links for future training and research. As a result, local partners now deliver the OR courses in Indonesia independently.
- Employing just 2 facilitators per course involving 4 to 7 local research teams (each with 3-4 members), is a cost-efficient way of conducting OR courses.
- KNCV promote the utilisation of existing data as much as possible since these are often underutilised. However, participants can propose to collect data beyond routine data in their research projects, requiring intervention studies. These research projects take longer to complete, because the intervention needs to be designed, implemented and only afterwards, data on its effect can be collected.
- Research experience is not always a pre-requisite for the course, and no formal milestones are set for the participants to achieve. In KNCV's experience, participants with no research background obtain enhanced learning during the OR course. While dissemination of results is encouraged as a report or article in a peer-reviewed journal, this is not a criterion of success. It was however acknowledged during the interview with the KNCV expert that the introduction of milestones similar to those in The Union's courses may be a useful way to drive effectiveness.
- Course material is based on a high-quality, comprehensive modular textbook entitled 'Designing and conducting health system research projects'[49] and KNCV's own Module on scientific writing.
- As an example: OR course in China (2007/8) comprised of a 2-week data-analysis workshop, 1-week monitoring visit, 2-week data-analysis/reporting workshop, and 1-week scientific writing workshop resulted in 4 publications in the following journals: BMC Public Health, 2010; BMC Public Health, 2011; BMC Health Services Research, 2011.

4.12 Value for money

An assessment of *value for money* is closely related to an assessment of cost-effectiveness (also called efficiency in evaluation terms). It refers to the question of whether or not a programme has delivered the results (effects) with the least amount

[49] Varkevisser CM, Pathmanathan I, Brownlee A. Designing and Conducting Health Systems Research Projects. Volume I: Proposal Development and Fieldwork, Volume II: Data analysis and report writing. WHO / International Development Research Centre, KIT Publishers, 2003. Available at http://archives.who.int/prduc2004/Resource_Mats/Resource_Materials.htm Accessed on 1/9/2014

of resources required. Given that it can be seen as the public alternative to commercial *return on investment*, it is a critical aspect of programme evaluation.

There are four main strategies to assess value for money:

- Monetising benefits and effects, thereby allowing for a direct comparison between costs and effects
- Comparing the relation between cost on the one hand and output, outcome and impact indicators on the other hand with benchmark figures of other comparable programmes
- A qualitative assessment using DFID's 3E approach (or equivalent)
- A qualitative comparison with other comparable programmes

The first strategy is clearly very challenging in terms of data collection and analytical framework (quantifying skill gains in monetary terms etc.), and is therefore beyond the scope of this evaluation. Our assessment of value for money is based on a combined approach of the three other strategies.

First, we will present the value for money using DFID's 3E framework (economy, efficiency and cost-effectiveness), where we have also integrated the output/outcome indicator benchmark where possible. Secondly, a qualitative comparison with two other similar programmes is presented. This section is concluded by a section on lessons and implications.

4.12.1 DFID's 3E framework

4.12.1.1 Economy

Economy refers to the acquisition of inputs in an economic or frugal way. In the case of the Developing OR Capacity in the Health Sector Health project, this revolves mostly around the organisation of the training courses. While we have little data on exact spending patterns for individual courses, it is clear that courses in Asia are significantly cheaper than those organised in Europe.

4.12.1.2 Efficiency

In the 3E framework, efficiency is considered the efficient translation of inputs (financial resources) to outputs. A good measure is the cost per participant required by the OR training course in comparison to alternative options and other training courses. An overview of the costs per participant compared to other options is presented in Table 13.

Table 13 Benchmark comparison of efficiency[50]

	OR Health	**FRONTIERS**	**Typical MSc in UK**
Cost per participant (GBP)	GBP 10,000	GBP 6,500[51]	GBP 27,000[52]

[50] Based on assessment of total costs. While the contribution of DFID has been in total 1,160,000 pounds, both MSF and The Union have provided each 300,000 pounds in-kind. Bloomberg Foundation has supported the initiative by paying for the salary costs of Prof Harries and support staff. As neither MSF nor The Union use internal accounting on an activity level, we do not know to what extent these in-kind contributions have been realised, nor do we know the exact monetary value of Bloomberg's contribution. However, if we use a realistic total of 1,900,000 pounds, we arrive at the following value for money indicator results (see table). Note that we have included all programme costs (also cost for fellows), as their work is highly focused on supporting participants. They also contribute heavily to the delivery of the courses.

[51] Excludes staff and operational costs, was only a 10-day course, corrected for inflation.

[52] Cost for a Commonwealth student, from DFID Annual review 2014.

Unfortunately, exact comparable information was not available for the two benchmark cases (FRONTIERS and KNCV), as it was not possible to collect full and reliable information on costs. Certain information could be obtained for FRONTIERS. The costs per participant of the OR Health training courses seem to be relatively modest given the amount and quality of training received, and the fact that the budget is also used to develop and sustain a network of OR-Fellows.

Comparing to a typical MSc programme also provides insights on cost-effectiveness. Of course this is not a perfect comparison; "a year-long MSc will offer considerably more 'teaching time' than the course. However, in terms of achieving the output of getting someone to the stage of writing and submitting an academic paper, the course is significantly more successful with 89% reaching the target of submitting an academic paper compared to approximately 10% of MSc students studying epidemiology at the London School of Hygiene and Tropical Medicine."[53]

4.12.1.3 Cost-Effectiveness

Cost-effectiveness pertains to the efficiency of translating inputs and outputs to outcomes and impact. While the OR courses have various outcomes, many of them are difficult to compare in a structured way (e.g. changes in knowledge, attitudes and skills). The number of publications, however, is an indicator which is more suited to comparison.

Table 14 Benchmark comparison of cost-effectiveness

	OR Health	**EU FP Health Research (Galsworthy)[54]**	**UK MRC**
# Publications per million GBP	192 Scopus publications[55]	8-11 publications	64 publications

Still, the number of publications per million pound seems excellent value for money, given that for instance the UK Medical Research Council records around 64 publications per million pound in 2012 (Table 14).[56] It has to be noted that such a comparison only serves an illustrative purpose since many other costs have been incurred to arrive at a publication (salaries, facilities, overheads at local organisations).

Looking at projects funded by the European Union during this time, over 50% produced no identifiable articles. In contrast, about 90% of projects started in the capacity building courses end up with an identifiable article. Second, of papers published through EU-funded research, the cost per paper published was £115,000 for those papers identified through Google Scholar, and £185,000 for those papers identified through PubMed.[57]

A comparison between different OR programmes, provided by different organisations, is truly difficult. The two benchmark programmes (FRONTIERS, Appendix J; KNCV, Appendix K) are in part run more efficiently, for instance with fewer mentors per student and with more student group work. At the same time The Union and MSF provide very good quality in their courses, as is also shown by participant satisfaction scores. Given the fact that the FRONTIERS programme costs do not include

53 DFID's Annual Review 2014.

54 Academic output of 9 years of European Union investment in health research in the late 1990s and early 2000s [Galsworthy et al, Lancet 2012; 380: 971-2].

55 Publications in *Public Health Action* are not included. Number based on the bibliometrics analysis

56 MRC UK (2012) Output report; http://www.mrc.ac.uk/about/spending-accountability/facts/

57 DFID's Annual Review 2014.

operational costs and have shorter courses, the relatively cost-effectiveness of the OR Health courses would seem to be high.

The Union also appears very efficient in producing relevant research outputs as high-quality publications in comparison to other OR training courses. The benchmark programmes did not show a similar level of achievement in their research projects for a number of reasons. First, KNCV's OR course does not set publication of research findings as a formal requirement for participants. Second, the low facilitator to participant ratio requires working in teams that may have positive effects on shared learning and forming sustainable networks, but the number of research projects conducted is significantly lower than the OR courses delivered by The Union.

The effectiveness of a programme also needs to be judged in terms of gender equity. The Union's OR course research topics include those relevant to women and also recruit women as participants.

We conclude that The Union's OR course represents good value for money in terms of publication outputs. Although The Union's model is innovative in many aspects of course delivery compared to benchmark programmes, the outputs from the courses have exceeded expected measures, both in terms of number of OR-Fellows supported and the research they have produced.

4.13 Lessons, implications and sustainability

This section responds to evaluation question 16 (*How can The Union strengthen the relevance, quality, effectiveness and efficiency of the project, sustain and enhance impacts and, if necessary, boost value for money?*), evaluation question 17 (*What are the wider implications for this and other models of capacity building?*) and evaluation question 18 (*To what extent will the benefits of the project continue after the funding has ceased?*).

Three opportunities are presented for how The Union could strengthen the relevance, quality, effectiveness and efficiency of the project. They relate to reduced number of research projects in a course, running the OR courses on a cost-share basis, where participants pay a fee for their participation, and design and select research projects in collaboration with local managers and researchers.

The wider implications relate to this; the importance to engage with the surrounding infrastructure and dig deeper into local OR-needs. This means a shift from the "bottom up" development of research questions from the single applicant to ensure that research questions are more related and relevant to the wider plans of policy makers.

To what extent the programme's benefits will remain after funding has ceased is dependent on the ability to build critical mass in OR, build sustaining OR capacity in-country through training nationals and increase the number of facilitators.

The approach to assess whether there are opportunities for improvement is based on insights from the benchmark programmes. We identified three alternative models that may contribute to strengthened relevance, effectiveness and efficiency. Whether it would also contribute to increased quality is uncertain; for instance, being more cost-efficient by reducing the number of research projects according to point 1 below may at the same time mean lower quality. It is still worth exploring these three opportunities for an increase in the value for money The Union can deliver:

1. Reduce the number of research projects in a course with twelve participants from twelve individual projects to about three team-based projects. If four participants work as a team on a single research project, not only does it reduce the number of research projects but also the number of facilitators required as seen in KNCV's OR training courses. Note that KNCV uses two facilitators per course while The

Union uses four facilitators for Module 2 and eight facilitators for Modules 1 and 3. If The Union focussed on building critical mass within selected organisations, team-based projects may also help nucleate a sustainable OR network within that organisation. Potential risks are that the success rate of course completion by participants may go down and the model provides less opportunity for training future facilitators.

2. Run the OR courses on a cost-share basis, where participants are not funded to take part in a course but they actually pay a fee for their participation. Many cooperative agencies and institutions are willing to provide funds to train their staff in OR. This way not only would The Union cut their cost of running courses but it could gradually decrease technical and financial assistance of regions. This was the recommendation of a former director of the Population Council's FRONTIERS programme, noting that fully-funded training courses often attract the wrong people who lack motivation. In addition, OR project proposals could be submitted for third-party funding as a measure of quality and strengthening financial sustainability. A potential risk is that relevant people or organisations may not be able to afford participation in the course.
3. Design, develop and select research projects through collaboration with local managers and researchers. An early "buy-in" by local partners ensures support throughout the projects, dissemination and successful take-up of research results, and their implementation in practice. Both benchmark programmes (KNCV and FRONTIERS) followed such a principle in order to increase the potential value and impact of the OR course. A potential risk is that local partners may hijack the course for their own personal agenda instead of adhering to a merit-based system which would lead to ineffective OR courses.

The interviews with other funding organisations give insight into how the project could be expanded, and also framed in a wider programme related context in order to maximise its impact and capitalise on other networks. The courses are now SORT-IT courses (Structured Operational Research and Training IniTiative). SORT-IT is a collaboration between TDR, The Union, and MSF and provides a number of opportunities for this project. SORT-IT is also a programme (not just a course) and through the SORT-IT programme there is a wider aim to engage with the surrounding infrastructure and have dialogue with countries to dig deeper into their OR-needs. The bigger picture approach means there is a shift from the "bottom up" development of research questions from the single applicant to the OR course into a wider more collaborative environment which should ensure that research questions are more related and relevant to the wider plans of policy makers for example. Another key aspect of the wider programme approach is the plans to build leadership capacity in OR and extend the offer. WHO/TDR are in a unique position to support its wider implementation through their own networks. If networks and countries get involved then this filters up to the global level and global networks. Both WHO and MSF note a number of challenges for the future related to cost effectiveness and some solutions, many of which are interlinked:

- Building critical mass in OR: Although there is a need to diversify and expand OR there is also a challenge to ensure that there is critical mass and trying to ensure there are enough people in each country/region who can work together to make a change. This is happening in Asia where demand is growing and the course is being run externally to the MSF and the Union
- Sustaining OR capacity in-country through training nationals: There are high numbers of foreign national working in NGOs who do not always stay for long periods of time in one country. If the objective is to sustain OR capacity in-country, then training non-permanent residents will not strategically help to achieve the objective
- Increasing the number of facilitators: There is currently a small pool of highly regarded facilitators. Increasing the number of facilitators would mean that the

courses could be run more frequently or broadened to cover other public health issues, also encouraging new facilitators to set up SORT-IT courses is a good longer-term vision. However there are also funding issues to consider as many organisations are stretched

- Retention of people in OR: In MSF for example, the staff mainly have a medical background and come for one year. If they are trained and made OR-Fellows, even without financial compensation there is more of an impetus to stay working in a related field and to do OR. These types of approaches can help overcome the challenge of not having enough critical mass

The Union's training model could be transferred to other health-related areas and beyond. In general, OR is used to provide evidence and support decision making in complex situations. The guiding principles of OR and the research skills developed in The Union's training model to solve TB/HIV-related problems are transferable. These include prioritisation of topics and developing actionable solutions using a multi-disciplinary (ethical) research approach that involves all parties concerned. Selection of adequate data collection and analysis methods needs to consider timeliness and cost-effectiveness to bring about a positive change in the system. The Union's training model could therefore be adapted and used effectively in other health areas, such as neglected diseases, or capacity building in humanitarian aid. Although these may not be a focus for the current funders, it could be for others.

Finally, The Union's OR training course has shown tangible impacts in both policy-making and practice at the individual, organisational, regional and national levels, altering approaches to evidence-based policy and indicating areas for further research. This is best summarised by a quote from an interviewee:

> *"In a low resource setting we need to embrace evidence to change some of our practices, to become transformative, so that we add value and dissect where the gaps are. At present, that is strengthened adequately. We need to go back and transform the way we do business-as-usual; there is no shortcut and operational research provides the foundation for this."*

5. Conclusions and recommendations

This chapter brings together the findings of the different strands of the evaluation. The findings presented follow the order of the evaluation questions set out in the original terms of reference (Appendix A).

Effectiveness

- The relevance and the quality of the training are high. The learning outcome was measured via the high success rate of the course, the large number of peer-reviewed publications, and the positive feedback from participants. The multiple over-subscription of the courses and the positive change The Union's OR courses have started to make in the local settings support the relevance of the project.
- The pedagogy of the training is of high quality. An expert evaluation of the course material and delivery techniques, as well as participants' opinions expressed in interviews, support this conclusion. The content of the Modules is well integrated, tasks follow a logical flow, and the course gradually builds up the knowledge and skills of participants so that they can efficiently conduct their research project. The Union's model of a holistic training including research protocol development, data analysis, and public dissemination of results is an innovative undertaking that may set the standard for other OR courses.
- The overall quality of the teaching on the courses is high. The teaching material is judged to be of high standard with a fully integrated curriculum. Although it is not possible to separate those teachers who are former course participants from the other members, a high percentage of participants indicate their improved ability of undertaking OR as a consequence of the course. The impact on their skills and career progression are also important indicators of the quality of the course and the teaching. The quality of the teaching is further ensured by the course evaluation and the subsequent action through faculty meetings to improve on any highlighted issues.
- The Union takes into consideration new needs and the results of the course evaluation by participants (as well as the course facilitators and mentors). The current course content and its delivery is the result of continuous improvements in the past five years to achieve maximum impact in a largely cost efficient manner.
- The support provided to participants, both during and after the course, is considered to be good. The access and availability of the mentors and facilitators throughout the course is to be commended. The support is continuous during the nine month period of the course, not just during the training Modules.
- The support given to the OR-Fellows varies in intensity but is also considered to be at the right level. They receive support in many different ways, tailored to their own needs and also indicating the 'open door' policy of The Union and other facilitators for advice and exchange of ideas. If more support could be given, it would be to help them to increase their access to platforms for disseminating their research more widely.
- The project has reached its intended goals in terms of gender balance. There is also evidence in the research projects that gender is considered in the subject matter of research as well as the analysis of the data (taking into consideration gender dimensions).
- The current selection and assessment process does not involve a formal scoring system, but is based on consensus. If there are plans to expand the project, this may pose problems of transparency and accountability to selected and non-selected participants. This will require having more defined objectives as to the competence expected of the participants on the course. In the period under review,

a number of highly qualified candidates were not taken on board due to over-qualification, which can of course be a legitimate selection mechanism but could have implications for the total impact of the programme. Therefore, for example, deciding on whether the objective is to increase critical mass of OR or increase the skills/expertise of existing good researchers is important.

- The project has changed the selection procedure to take into account the geographical location of participants to enable more local capacity building. This is an important change which will positively influence the long-term sustainability of effects.
- The current programme logic is not designed in a way which makes it easy to measure the progress of the project through well designed indicators. The overall objectives are not SMART and the link between the specific objectives and the high level objectives is tenuous.

Impact

- There is a significant increase in the skill levels and behaviour of the course participants having completed the course, according to surveys and interviews with participants. The composition of the 'effect chain' in broad lines does indeed follow the theory of change as envisioned by the programme logic.
- There has been a considerable amount of research activity from participants who have completed a Union/MSF OR-course – a substantial number of course participants who successfully complete an OR-course continue to use OR in their work and champion OR in their organisations.
- The scientific quality of the publications is at international standards. The quality of the research output is also indicated by the high level of citations of the publications. The upward trend in the number of OR publications is notable. The number of different journals in which the course participants published increased considerably over the last years. The journals that received the largest number of publications are internationally leading: PLoS One, the International Journal of Tuberculosis and Lung Disease, Tropical Medicine and International Health, Transactions of the Royal Society of Tropical Medicine and Hygiene and BMC Public Health.
- The courses clearly target participants with lower skills and education on OR in health. The goals of the courses and OR itself are being met as participants not only indicate an increase in their knowledge, skills, and attitude towards OR, but the courses highly influence personal enthusiasm and priority given to OR, the quality of the participants' research and subsequent publications. The OR courses function as a leverage in all four continents (Asia, Africa, Oceania, Europe), on OR publications, OR products, OR in daily work and in institutions, and tend to strengthen effects with time.
- Participants indicate an increasing prioritisation of OR priority in their institutions. Nevertheless, the effect on participation in (research) networks is relatively small and should be addressed in the future. An exception is where a course contributed, in part, to the creation of a national TB and HIV working group. An area for improvement in terms of the personal impact is the networking between the OR-Fellows.
- Numerous survey respondents and most OR-Fellows reported either a promotion within their organisation; a new, but related job; or a change of career path following their participation in a Union/MSF OR-course. This indicates both a positive individual benefit from undertaking a course, and also highlights a trend, suggesting individuals with skills and aptitude in OR are respected and sought after by employers in public health-related organisations. Therefore it can be concluded that there is an on-going institutionalisation of OR.

- The resulting publications will only have actual impact on health systems if they are implemented in practice. Just over half (56%) of the participants have already implemented the results from their OR work, while around one third indicated that they will implement the results in the near future. Only 11% indicated that no implementation has taken place or will take place.
- There is some indication of the impact of the OR leading to improved policies or guidelines. Around one third of participants indicate improved policies and one third also indicate improved guidelines, but it is difficult to attribute changes in policy and practice wholly or partly to the courses. In total 19% of participants indicate that their research led to the improvement of existing treatments, 3% mention the development of a new treatment. The most often mentioned impact is the improvement of monitoring and screening of patients (56%). The scope of implementation varies extensively from between 100-249 patients reached to more than 50,000.
- Numerous participants from a range of countries including Brazil, Bangladesh, Malawi, Ethiopia, India and others reported policy and practice change following publication of their OR as part of The Union/MSF capacity building course. These include national adaptation of upper and lower height cut-off points for children in nutritional surveys, introduction of digital thermometers for measuring temperature, establishing formal links between village chiefs and health officials to maintain birth and death registers, and the implementation of the isoniazid prophylaxis register for children in Cape Town.
- There is substantial reported impact on the OR-Fellows as a consequence of their funding. By taking part in the fellowship programme they have increased their knowledge and experience, allowing them to feel more confident in the use of OR. Several of the OR-Fellows also describe an improved competence to train other people in OR, which they do in many cases, either at The Union/MSF courses or in other ways in their home countries. There are also examples of how OR is leading to better screening protocols and guidelines and how they change the way HIV patients are educated.
- OR-Fellows also positively impact on the availability of training as well as further improve the use of local and national evidence to influence good programme design and delivery. All OR-Fellows have a very good understanding of their role in promoting and undertaking OR and the importance of linking this through to policy and practice.
- The OR-Fellows report that their role increases the visibility of their organisation through disseminating research results. This includes further access to other available funds through the use of OR publications to provide evidence.
- National networking has increased as a consequence of the fellowship programme with a number indicating how they sit on national committees and contribute to spreading OR capacity and also taking information from national policy makers and using it in their institutions. There are also examples of international spill-over effects from the results of this project into other capacity building programmes.
- The links with WHO constitute a very important part of ensuring that the results of this project are sustainable over time and has wider impact. WHO gives access to a wider programme environment and links to other networks and parts of the world.
- There is concern over the number of participants in total and the ability to create enough OR capacity in any region of the world. The number of trained participants is not enough to create a critical mass of OR researchers.

Costs and value for money

- The cost element is very hard to ascertain from the data provided, especially as there are elements of pro bono work by people employed by The Union and also the good will of the faculty in supporting the participants intensively during the course. This good will that is prevalent throughout the implementation of the project increases the value for money.
- Another indication of increasing value for money is the integration of Module 1 and 2. This reduces the travel costs of participants and faculty members. An additional benefit has been gained through participants continuing the first part of the training over an extended period of time, retaining their knowledge and enthusiasm from Module 1 into Module 2.
- Usage of open access software contributes to cost savings in all courses, however, publication of research findings in open access journals represents a significant cost. This latter cost is considered essential to achieve the wisest possible impact through dissemination activities.
- The course costs vary by location, with, as expected, the Paris and Luxembourg course being more costly than those held elsewhere. All locations have their pros and cons; however there is a plan to locate more of the courses regionally in order to give OR a better country focus.
- The ratio of facilitators to participants is high, however on purpose: 8 facilitators for 12 participants for Module 1 and 3.
- Finally, it is stressed that the full costs of implementing the courses are difficult to discern as funding streams related to the human resource cost of permanent staff members and OR-Fellows are separate from the organisation and delivery of the courses. Note that this is also the case at the benchmark organisations. In case the project is to be scaled up in the future, a better accounting system is required to be able to better measure the true cost of individual courses.

Lessons, implications and sustainability

- There is scope for increasing the overall value of this approach through expanding the use of the model. The OR training model delivered by The Union/MSF is well regarded by the funders and participants. Using the SORT-IT brand, there is capacity to apply the model to other training programmes to increase its value in other health domains. This is not necessarily a role for The Union, which remains focused on TB and HIV as opposed to MSF, which has a broader disease focus. Under the existing project, in some cases, it has already proved difficult for facilitators to fully cover the background of the expanding research topics.
- This model would lend itself well to being transferred to other capacity building programmes for which OR is relevant. In many capacity building programmes increased attention to OR would provide relevant additional evidence to help impact on policy and practice.
- Another element of sustainability relates to the availability of expert mentors and facilitators for the course. Scalability could be a potential issue if this project were to expand to more courses (focusing on TB and HIV), or more domains (e.g., diabetes). There is a small pool of individuals with whom The Union/MSF currently work in delivering the OR courses (internal and external). The high quality of the teaching and training relies on these individuals.
- The current project set up relies on key individuals and personal networks. Succession is therefore a potential concern, which could impact on the sustainability of the project. Additionally, a too strong reliance on MSF could also make the project vulnerable if there are changes leading away from supporting OR in the strategy of the organisation.

- There are weaknesses in the current follow up and community building. A significant proportion of the current communication between OR-Fellows and past participants is ad-hoc. Participation in (research) networks is relatively small, although there are examples such as the creation of a national TB and HIV working group. An area for improvement in terms of the personal impacts is the networking between the OR-Fellows.

5.1 Recommendations

This section puts forward recommendations, based on the study's findings which may help to guide the future development of OR courses and address potential issues relating to sustainability, scalability and cost.

Recommendations in relation to the courses

4. A strong country-focused approach to the sourcing of participants is needed to create critical mass and a supportive local network of OR researchers and sustain the course's achievements with maximum impact. The strategy to date has been to source course participants widely, which worked well to raise visibility in the early years of running the OR courses, but has left some newly trained OR researchers isolated.
5. Team-based projects rather than individual projects should be considered as these proved effective in the benchmark cases of OR courses. This delivery method creates shared learning and management practices, and potentially nucleates sustainable networks. This delivery method could be particularly useful when course participants come from the same organisation. It is however important to ensure that teams are small enough that members can learn all aspects of OR to a high standard.
6. The selection of participants and the process of assessment should be made more transparent. An objective scoring system should be established so that potential participants are aware of the requirements at the time of application.
7. There is scope for involving ministries of health and national TB programmes in the course participants' home countries, for instance in selecting the research topics for projects. This should increase the likelihood of projects being aligned to national and regional priorities as well as increasing the influence and potential uptake of results by policy makers. This appeared to be a practice adopted by benchmark OR training courses.
8. Research output and its implementation should be better linked through improved dissemination practices (beyond open access publications). An implementation plan should be drawn up and shared with policy makers as an integral part of the project. Access to established networks through, for example, the WHO and MSF is crucial in this regard.
9. Introduce short courses for OR consumers to facilitate the uptake (and future funding) of OR in national settings. This type of course proved effective at benchmark programmes.

Recommendations in relation to the fellowship programme

10. Develop a clearer structure for the fellowship programme and define roles and responsibilities. Strengthen support to Fellows in their career development by providing access to mentorship, knowledge sharing and skill-development workshops.
11. Encourage Fellows to develop course material relevant to their own region and organise and facilitate OR courses in addition to The Union's courses. This 'spill-over effect' would be a practical way to further spread knowledge regarding OR.

Recommendations in relation to sustainability and value for money

12. Build a wider pool of experts and facilitators with knowledge relevant to the diversity of topics apparent in research projects. This could mitigate against some of the risks associated with reliance on a very small number of people at The Union. Thought needs to be given to succession planning in relation to the pioneers of the project in order to ensure its sustainability.
13. Establish 'training the trainers' and other courses in partnership with universities and research organisations that would continue activities without The Union's assistance after set up. These courses could ensure motivated participants and organisations and have been seen at benchmark organisations to work well. If such partnerships are established, there may be opportunities to introduce new, cost-shared models.
14. Consider reducing the ratio of facilitators to participants, particularly if team-based projects are introduced. This could increase the value for money but needs to be done with due consideration to maintain the current high quality of course delivery.
15. Consider supporting course participants to access further independent funding for future OR projects. Explore whether existing support to proposal writing and budgeting skills in the form of short courses can be further developed.
16. Improve community building among past and new OR practitioners with a Community of Practice IT platform so that virtual networking can take place. This could also store questions, answers, issues encountered and solutions.

Generalisable lessons

17. In the view of the study experts, there is a strong potential for applying The Union's modular training model linked to research projects in other areas of health research and beyond. Therefore it is recommended that DFID considers this training model to support OR development in other projects in their portfolio.
18. Sourcing course participants from selected organisations in a given country may enhance cooperation and cost-sharing of training courses. The Union should consider working increasingly at organisational level, as this was a positive lesson learnt from the benchmark programmes.
19. MSF also has multiple disease areas of interest where OR could be usefully applied. However, additional facilitators would need to be trained as the current Union/MSF pool is relatively specialised on TB and HIV.
20. There is potential for further use of this training model in cooperation with the WHO and their wider programme environment, giving access to networks, policy makers and practitioners, which would widen the model's ability to influence.

Appendix A Terms of Reference

ITT Volume 3

Terms of Reference

Developing Operational Research Capacity in the Health Sector

Project Evaluation

The following Terms of Reference set out the requirements for an independent evaluation of the Developing Operational Research Capacity in the Health Sector project undertaken by the International Union Against Tuberculosis and Lung Disease (IUTB). The purpose of this evaluation is to assess IUTB's performance and impacts during the period of October 2011 – August 2014.

Context and Background

1. The Developing Operational Research Capacity in the Health Sector project is a three year, £1 million programme implemented by the IUTB and funded by DFID. The IUTB partner with Médecins Sans Frontières (MSF) in delivering the programme. The project began in October 2011 and is due to end in October 2014.

2. A key DFID priority for long-term research in health is to focus on Operational Research (OR) to make health programmes more effective. However, one of the constraints to developing OR is the lack of capacity. If this project is successful, it could be used as a model to develop OR capacity in other sectors, acting as a demonstration of best practice in OR capacity building.

3. The main activities of the programme are:

    - Running training courses in Operational Research in Africa, Asia, and Europe
    - Support for in-country Operational Research Fellows

4. The applicants to the courses are implementers (doctors, nurses, paramedical officers, data analysts, M&E officers) who participate in a series of Modules over 10 months covering research questions, data management and paper writing. There are no more than 12 participants per course. The number of applicants has varied from approximately twice to, exceptionally, over 10 times that number (see Annex).

5. In January 2013, the IUTB and MSF joined with the Special Programme for Research and Training in Tropical Diseases (TDR) at the World Health Organization (WHO) to form an initiative called "The Structured Operational Research and Training Initiative (SORT-IT)". Courses that are now run by The Union and MSF will be called SORT-IT courses and will follow the same model that is currently used by the Union and MSF.

6. Each course comprises of three Modules, each of between 5 – 6 days. *Module 1* concentrates on development of study protocols with attention to ethics; *Module 2* focuses on electronic quality-assured data capture and analysis using open and free access software (EpiData software), with the data Module being

tailored to meet the data capture requirements of individual study protocols; *Module 3* concentrates on writing up the paper, providing guidance on how to submit the paper to a peer-reviewed journal and deal with peer review, and finally on promoting and assessing the effects of the research on policy and practice. The training format includes lectures, break-out mentor groups and plenary sessions where participants present their work (protocols and papers in progress) to the whole group and receive feedback from their peers and facilitators. Milestones must be achieved to remain in the course and to receive a course completion certificate all milestones must be completed including the final submission of a paper to a peer-reviewed journal.

7. Strong, hands-on mentorship is a key feature of the course, and this is provided by the facilitators. For *Modules 1 and 3*, there are usually eight facilitators, who work in pairs mentoring three participants in each group. Each pair has a senior and a junior facilitator, the latter ideally being a participant from a previous course who has distinguished herself / himself and is now learning the art of mentoring by being paired up with an experienced senior facilitator. For *Module 2*, there are usually four facilitators with one allocated to a group of three participants. The facilitators help the participants develop their protocols and papers and in between Modules and after *Module 3* they stay in touch with their participants to help them with data collection, data analysis, paper writing, peer review, paper revisions and in the event of rejection, preparation of the paper for a different journal.

8. By June 30th, 2013, 47 participants (17 women and 30 men) from 25 low and middle income countries had been enrolled for the training (this includes courses fully and part funded by DFID). The majority of these participants (N=43, 92%) had completed all their milestones and succeeded in getting 47 research papers submitted to a peer review scientific journal – 39 of the submitted papers were published or accepted for publication by June 30th, 2013. A further 48 participants (24 women and 24 men) are enrolled in on-going courses which are either fully or part-funded by DFID[58].

9. The ultimate **aim** of the project is to improve the health outcomes of poor people in the low income countries where the project is implemented.

10. This will be achieved through the **long term outcomes** of improved health programme performance and health service delivery. The anticipated **medium term outcomes** are increased use of research in health policy and practice, increased incorporation of OR conducted by national personnel in programmes and a sustained capacity to mentor and retain skilled OR personnel. The expected **short term outcomes** are the increased amount of independently conducted policy relevant operational research, the implementation of the findings of this research and improved routine monitoring and evaluation in health systems.

[58] Source: IUTB records 2013. Please note that there is minor inconsistency between these figures and those presented in the Annex. We expect to provide an update with full updated instructions and data for shortlisted applicants.

11. The **outputs** of the projects are graduates of the OR training and mentorship programme; research products; the creation of communities of practice around key health research issues; the expansion of OR skills within the public sector and beyond and an increased capacity to mentor researchers.

12. The following supporting documents provide further background to the programme design and recent recommendations (within DFID's annual review):
    - Business case and intervention summary
    - Logical Framework[59]
    - Annual Review (Feb 2013)

13. These documents can be accessed on the project pages of DFID website: http://projects.dfid.gov.uk/project.aspx?Project=202506.

14. The business case is a useful supporting document to understand the original theory of change and plans for the project. However, the project has evolved in implementation and we do not require the evaluation to focus on assessing the programme against the business case. Rather we wish to concentrate the resources for evaluation on the performance and impacts of the project as delivered.

15. The reviewers commended the programme for its approach to capacity building and noted:
    - The attention paid to the selection of participants – only individuals with an MSc (or equivalent experience) and access to existing operational data are selected.
    - The task-based nature of the training – each participant is expected to work on a research paper over the course of the three training courses and mentoring phases.
    - The requirement for a high level of commitment from participants – there are strict milestones which participants have to achieve before proceeding to the next stage of the training process.

16. A key recommendation of the annual review was that an external evaluation of the programme should be carried out. This proposed investment will also improve DFID's ability to learn about the programme and to share lessons with others thus magnifying positive impacts.

17. Similar models of previous programmes include the Japan Research Institute of Tuberculosis (RIT) course to build programmatic capacity for tuberculosis control. A short evaluation paper was published in 2010[60]. If relevant, further details of similar courses will be provided during the project inception phase of the evaluation.

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[59] Note that we have used impacts – plural and broadly defined – throughout these ToR. These may encompass the 'impact' – singular – within the logframe, but we are not seeking a specific focus on this.

[60] A. Ohkado, E. Pevzner, T. Sugiyama, K. Murakami, N. Yamada, S. Cavanaugh,N. Ishikawa, A.D. Harries, Evaluation of an international training course to build programmatic capacity for tuberculosis control, International Journal Tuberculosis Lung Disease 14(3):371–373

Purpose, scope and objectives

18. The evaluation will assess the project's performance to date (October 2011 onwards) for accountability and lessons learning purposes. The findings will inform decisions on the future direction of this programme and provide valuable lessons to the wider research and development community on this approach to capacity building.

19. The objectives of the evaluation will be to assess:

- the quality and relevance of IUTB's delivery of training and support
- the scale and quality of the resulting research outputs and other activities, and their influence on health policy and programming
- the extent to which observed outcomes are attributable to the programme
- the potential for achievement of longer-term outcomes
- programme value for money

Evaluation questions

20. We expect the following evaluation questions to be addressed, though these will be subject to revision in the inception phase. These centre on **programme effectiveness, impacts** and **value for money**:

How effectively is the programme designed and delivered, including:

- What is the relevance and quality of training and pedagogy in the Modules?
- How well does support provided to participants and Fellows meet their needs?
- How well does the programme mainstream gender?
- What is the quality of the teaching conducted by graduates of the course?

What are the intended and unintended, positive and negative observable impacts[61] of the programme, including:

- Do the courses and other activities change knowledge and skill levels and/or behaviours?
- Do participants undertake and publish more and/or better operational research?
- Do they influence other practitioners to build their skills and conduct OR?
- Do they help institutionalise OR?
- What are the nature and extent of impacts produced by Research Fellows?
- Are any changes beginning to cause enhanced use of OR findings and improved health services?
- To what extent are (early) impacts likely to sustain?

[61] In general, we expect impacts to be assessed against the counterfactual of the project not existing. We would not expect detailed assessment against alternative delivery options, though of course the evaluators' conclusions will have regard to these in terms of potential ways to strengthen the project.

What are the costs and does the programme represent good value for money, including:

- What is the full cost of running OR courses?
- How does this vary by location?
- Does this model of capacity building offer value for money compared to other models of capacity building and other models of generating operationally relevant research?[62]
- What is the cost-effectiveness of this capacity building model?

Lessons, implications and sustainability

21. How can the IUTB strengthen the relevance, quality, effectiveness and efficiency of the programme, sustain and enhance impacts and, if necessary, boost value for money?

22. What are the wider implications for this and other models of capacity building?

23. To what extent will the benefits of the programme continue after the funding has ceased?

Users and audience of evaluation

21. The direct recipients of the services will be DFID's Research and Evidence Division (RED) and the IUTB. The published final report is expected to be of value to the OR community, research capacity building programmes, research funders and others.

Design and Methodology

22. Tenderers are invited to propose an evaluation design and methodology, noting the potential risks and challenges for the evaluation and how these will be managed. DFID has not endorsed particular methodology(ies) for the conduct of research programme evaluation. For this study, we would expect a design that takes a mixed methods approach and systematically triangulates evidence, drawing on existing data sources as well as carrying out primary data collection. Tenderers should spell out with adequate detail the approach and methods which they believe will most effectively and efficiently meet the purpose of the study within the time available.

23. Tenderers will note that it may be possible to compare relevant outcomes for groups of successful and unsuccessful applicants (see Annex). We would welcome consideration of this and/or other options for comparison group analysis. However, inclusion of this method will depend on the merits of any proposed design(s), as well as confirmation (during the inception phase) of feasibility. We have no firm expectation that robust data from valid comparison group(s) can be generated.

[62] We acknowledge that this relies on availability of evidence in relation to impacts and costs of other models which may well prove not to exist.

24. We would like the evaluation to include a case study component, though we have not taken a view on what would be most appropriate. We are not pre-judging whether this method should or should not have a central role in the evaluation approach and analysis.

25. The successful tenderer will refine their proposal within the first month of the contract, in consultation with DFID, IUTB and other relevant stakeholders. Please note that we are committed to quality and rigour in line with international good practice in evaluation. In that regard, wherever possible impact measurement should involve assessment against counterfactuals (though this does *not* equate to a requirement for an experimental design[63]).

26. It would be helpful if bidders explained why they selected the methods they propose to use and briefly outlined what other options they considered, if any.

27. Tenderers may wish to make use of the following online resource, though (to re-iterate) we are seeking a rigorous approach without preconception of the detailed methodology: http://www.ukcds.org.uk/resources/evaluating-the-impact-of-research-programmes

28. The evaluation should ensure that it adheres to the ethical evaluation policies of DFID and the evaluation principals of accuracy and credibility.

29. Assessment of design and methodological proposals will consider:
    - The extent to which, together, these are able and likely to fulfil the evaluation's purpose and objectives
    - Justifications for the selected approach and methods
    - Evidence of having considered other possible options
    - The quality level of each method as specified
    - Clarity, proportionality and value for money

Existing data

30. The Union undertakes programme monitoring activities, collecting data on the following:
    - numbers of applications to each course
    - details of successful and unsuccessful applications
    - student nationality
    - research subjects proposed
    - numbers of participants enrolled in each course
    - numbers of participants completing all milestones
    - numbers of scientific papers submitted to peer review journals
    - numbers of papers accepted for publication and published (for the latter the full citation references)
    - information on whether these research studies have influenced policy and practice

63 See DfID Evaluation Policy 2013. https://www.gov.uk/government/publications/dfid-evaluation-policy-2013

31. Course evaluation forms are also completed by the participants, covering course organisation, content and the format of the Modules. Qualitative responses have also been analysed by The Union as part of their review of the courses.

32. An alumni network has also been established which tracks the participants and is a potential source for collecting further information on capacity building and use of research. Currently, all participants who have been enrolled on all the courses (those supported by DFID and those supported by other donors) have received an email and a questionnaire asking questions about their current job position, whether their course research had any influence on policy and practice, and since the course was finished whether further research has been undertaken. Further information collected includes: papers published; presentations made at conferences; whether facilitation has been undertaken at further operational research courses; papers peer reviewed; funding obtained for operational research and whether their institutions have taken on operational research implementation and capacity building. Responses are being logged on an individual basis and are being entered on an EXCEL data file.

33. Anonymised monitoring data including the completed course evaluations will be made available to the supplier. The inception report should include an analysis of the feasibility of using these existing datasets.

Evaluation team

34. Expressions of interest from suitably qualified organisations and consortia are equally welcome.

35. The supplier will design, co-ordinate and draw together the evaluation findings in a final report. They will quality assure the outputs and validate the data collected. Bidders are encouraged to briefly outline how they will ensure independence in their work in their proposals.

36. It is envisaged that a network of up to 11 Research Fellows will be able *actively* to support the evaluation (without the requirement to fund this time input from the evaluation budget). Not only will Fellows be able to offer country specific advice, information, contacts and perspectives, but they may be able to co-produce elements of the study. For example, Research Fellows may be able to gather and/or analyse certain data, enabling the evaluation team to draw together cross-programme findings. This opportunity could add value to evaluation process and findings and, also, enable the evaluation to incorporate a capacity building activity (for the Fellows).

37. Research Fellows are selected as a result of recommendations from Ministries of Health, Disease Programmes or NGOs and have to have done or will have to do a full operational research course so that they understand the structure and the processes of the capacity building. DFID is currently supporting fellows in: India (2), Malawi, Zimbabwe, Benin, South Africa, Vietnam, Sudan, Kenya, Belgium and UK. They are all full time employees apart from the fellows in Vietnam (part-time) and Benin (part-time). Fellows drive the operational research agenda, facilitate on courses, peer-review papers, present at scientific conferences and try to develop OR within their institutions. The Union will introduce the evaluation team to Fellows, but thereafter liaison will be direct.

38. Options for the involvement of Fellows are to be explored in the inception phase of the evaluation. Tenderers are invited to provide their initial reaction and ideas. However, budgetary implications do not need to be specified.

39. DFID and The Union will also seek to facilitate access to stakeholders who have direct links with the programme, but the evaluation team will have to make direct approaches to other stakeholders and beneficiaries who are in scope of their evaluation design.

Skills and qualifications

40. The essential competencies and experience that the contractor will need to deliver the work are:

- Extensive knowledge and application of evaluation methods and techniques
- Strong qualitative and quantitative research skills
- A good understanding of research capacity building and uptake
- Strong analysis, report writing and communication skills

41. Desirable competencies and experience are:

- Relevant experience in OR in health sector and/or developing countries
- Expertise in gender analysis
- Expertise in assessing value for money

Reporting and outputs

42. The supplier will be responsible for the delivery of the research project and its outputs, and will be required to deliver outputs against pre-agreed milestones. The proposal should outline a clear workplan to produce the following outputs:

- Inception report – including refinements/amendments of evaluation questions, full methodology, identified sources of data, risk management strategy and evaluation communication plan.
- Short progress reports – detailing project progress, spend and raising any risks.
- Interim report - setting out early evaluation findings.
- Final report – responding fully to the evaluation objectives and questions.

43. The final report will be no more than 50 pages long, with a 3 page executive summary, and address all of the evaluation objectives and questions. The report will be in the form of a narrative description, and may include case studies as a separate annex.

44. The supplier will be required to share monthly progress reports with DFID.

Risk management

45. The supplier will be expected to set out their understanding of the most important anticipated risks, with an explanation of their mitigation strategies for them in a full risk register.

Timetable

46. The evaluation will begin in September 2013 and finish by summer 2014. An interim report must be scheduled for early February 2014, as this will feed into to decisions on the future of the programme. Tenders should set out a more specific timetable within this framework.

Figure 1: Evaluation timetable (dates subject to change).

Milestones	Timescales
EOI issued	July 22nd
EOI deadline	August 9th
EOI shortlisting deadline/panel meeting	August 14th
ITTs issued to shortlisted candidates	August 15th
Full bids submitted	September 5th
Tender evaluation panel	w/c 9th September
Preferred tenderer selected	w/c 9th or 16th September
Project setup	w/c 16th or w/c 23rd September
Inception report delivered	w/c 7th October
Interim report delivered	February 2014
Final report agreed	Spring/Summer 2014

Evaluation Management Arrangements

47. The supplier will design and manage the evaluation, including overseeing the activities of the Research Fellows and drawing together the findings for reporting.

48. DFID will manage the contract with the successful supplier through a lead official supported by a small Management Group. This group will be responsible for approving the evaluation outputs, commenting on draft reports and arrange independent quality assurance of the final report. The Management Group will contain the following:

    - DFID lead official: James Rushbrooke (day to day contact)
    - DFID representative(s): Andrew Shaw (evaluation adviser)
    - External representative(s): TBC

49. This evaluation will involve up to three meetings and up to two presentations by the evaluators. These meetings will take place in London, but may involve

teleconferencing or video conferencing with Management group members based in other locations.

Budget

50. We anticipate agreeing a budget for this evaluation in the range £60,000 and £90,000 (excluding VAT). Value for money (in respect of both the overall package of work proposed and the rates for evaluators' time and other costs) will be a key criterion in tender assessment.

Annex

Applications and selections at All Union-MSF Courses:

Name of the OR Course	Date of Module 1	Total number of applicants	Number enrolled	Number unsuccessful
Paris OR 1	03 – 07 August 2009	77	12	65
Paris OR 2	30 Aug – 03 Sept 2010	46	12	34
Paris OR 3 *	01 – 05 August 2011	55	11	44
Paris OR 4 *	09 – 13 July 2012	109	12	97
Luxembourg OR 1 *	25 – 29 July 2011	28	12	16
Luxembourg OR 2 *	02 – 06 July 2012	50	12	38
Luxembourg OR 3 *	08 – 12 July 2013	88	12	76
India PHFI OR 1	07 – 11 June 2010	20	10	10
India Chennai OR 1	10 – 14 September 2012	85	12	73
Fiji OR 1	26 – 30 September 2011	N/A **	12	0
Fiji OR 2	20 – 24 May 2013	21	12	9
South Pacific OR 1	03 – 07 September 2012	25	12	13
Asian OR 1 *	20 – 24 February 2012	50	12	38
Asian OR 2 *	18 – 22	128	12	116

	February 2013			
Africa OR 1 *	12 – 16 March 2012	41	12	29
Africa OR 2 *	11 – 15 March 2013	99	12	87

Source: The Union 2013

Note: minor amendments have been made to the data since the ToRs were issued as part of the EOI stage. These are highlighted in yellow.

* Numbers asterixed are courses supported by DFID

** Participants selected by the Ministry of Health based on our guidelines

Appendix B Counterfactual analysis tables

B.1 Difference-in-difference analyses of participants and non-participants

Table 15 Knowledge indicator comparison (1 = very limited knowledge; 5 = very extensive knowledge, Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-parti-cipants	Parti-cipants	Between p-value	Non-partici-pants	Parti-cipants	Between p-value	Dif-in-dif	Between p-value
Study design	1.8 (2)	1.9(2)	0,63	3.1 (3)	3.67 (4)	0	0,51	0
Ethical aspects	2.1 (2)	2.1 (2)	0,58	3.5 (4)	3.83 (4)	0	0,39	0
Relevant research methods	2.2 (2)	2.2 (2)	0,7	3.3 (3)	3.75 (4)	0	0,41	0
Outcome variables	2.0 (2)	2.1 (2)	0,73	3.1 (3)	3.68 (4)	0	0,53	0
Data collection instruments	2.2 (2)	2.1 (2)	0,3	3.4 (3)	3.8 (4)	0	0,5	0
Statistical analysis	1.9 (2)	2.0 (2)	0,95	2.8 (3)	3.37 (3)	0	0,5	0
Writing and presenting results	2.0 (2)	1.8 (2)	0,3	3.0 (3)	3.63 (4)	0	0,74	0

Source: Technopolis Group (2014).

Table 16 Skill indicator comparison (1 = very low skill level; 5 = very high skill level) Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-partici-pants	Partici-pants	Between p-value	Non-partici-pants	Partici -pants	Between p-value	Dif-in-dif	Between p-value
Identifying gaps	2.2(2)	2.0(2)	0,2	3.5 (3)	3.8 (4)	0	0,49	0
Implementation of research	2.2 (2)	2 (2)	0,13	3.4 (3)	3.9 (4)	0	0,63	0
Supervision of research team	2.2 (2)	1.9 (2)	0,03	3.4 (3)	3.7 (4)	0,01	0,57	0
Collection safe and ethical data	2.4 (2)	2.1 (2)	0,02	3.6 (4)	4.0 (4)	0	0,61	0
Independent and routine data entry	2.0 (2)	1.8 (2)	0,05	3.1 (3)	3.7 (4)	0	0,87	0
Critical analysis	2.1 (2)	1.9 (2)	0,1	3.1 (3)	3.6 (3)	0	0,63	0
Dissemination of results	2.2 (2)	1.9 (2)	0,02	3.3 (3)	3.7 (4)	0	0,74	0

Source: Technopolis Group (2014).

Table 17 Self-assessment of importance of; (1 = Strongly disagree; 6 = strongly agree, Mann-Whitney test)

Indicator	Current mean (median)		
	Non-participants	Participants	Between p-value
Important part of daily work	5.3 (5)	5.3 (5)	0,74
Personal priority	5.1 (5)	5.1 (5)	0,98
Responsibility to teach and mentor others	4.9 (5)	5.0 (5)	0,33
Responsibility to ensure that results are applied	5.1 (5)	5.2 (5)	0,63
I conduct OR sufficiently	4.2 (4)	4.3 (4)	0,59
I am able to apply results from OR	4.3 (4)	4.6 (5)	0,02
I publish a sufficient amount	3.5 (4)	3.9 (4)	0,02
I make sufficient other dissemination effort	3.8 (4)	4.5 (5)	0
I sufficiently mentor and teach others	4.0 (4)	4.3 (4)	0,2
I sufficiently apply the results from my daily work	4.5 (5)	4.6 (5)	0,28
I participate sufficiently in OR network activities	3.9 (4)	4.1 (4)	0,18

Source: Technopolis Group (2014).

Table 18 Activities indicator comparison (1 = Never; 9 = on a daily basis, Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-partici-pants	Partici-pants	Between p-value	Non-partici-pants	Partici-pants	Between p-value	Dif-in-dif	Between p-value
Initiating OR projects	2.4 (2)	1.6 (1)	0	4.3 (4)	4.2(4)	1	1.79 (2)	0
Setting up data collection	3.3 (3)	2.6 (2)	0	5.4 (5)	5.5 (5)	0,52	2.02 (2)	0
Statistical analysis	3.1 (3)	2.6 (2)	0,03	4.8 (5)	5.3 (5)	0,04	1.71 (1)	0
Providing recommendation to colleagues	3.1 (3)	2.4 (2)	0	4.9 (5)	5.2 (5)	0,1	1.8 (1)	0
Contributing to study design phase	2.5 (2)	2.0 (1)	0,01	3.9 (4)	4.0 (4)	0,51	1.47 (1)	0
Reading publications	4.1 (4)	4.1 (4)	0,87	6.0 (6)	6.9 (7)	0	1.97 (1)	0

Source: Technopolis Group (2014).

Table 19 Publication indicator comparison (Average annual number of publications, t-test)

Indicator	Current mean (median)		
	Non-partici-pants	Partici-pants	Between p-value
Total paper submissions	1.7 (0)	3.1 (3)	0
... as lead author	.9 (0)	1.9 (3)	0
Total accepted papers	1.2 (0)	2.9 (3)	0
Paper submission in peer-reviewed journals	1.0 (0)	2.8 (3)	0
Papers Accepted in peer-reviewed journals	.6 (0)	1.6 (0)	0
Papers Accepted in peer-reviewed journals related to OR	.7 (0)	2.3 (3)	0
Submissions with co-authors outside organisation	.9 (0)	2.4 (3)	0

Source: Technopolis Group (2014).

Table 20 Network Activities indicator comparison (annual number, t-test) ; (1 = Never; 8 = on a daily basis, Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-participants	Participants	Between p-value	Non-participants	Participants	Between p-value	Dif-in-dif	Between p-value
Number of joint research projects	.6 (0)	.2 (0)	0,01	2.3 (2.5)	3.0 (2.5)	0,01	1.37 (0)	0
Participation in CoP inside organisation	NA	NA	0	4.9 (5)	4.9 (5)	0,9	NA	0
Participation in CoP outside organisation	NA	NA	0	4.1 (4)	4.0 (4)	0,82	NA	0

Source: Technopolis Group (2014).

Table 21 Use of OR findings comparison (1 = Never; 9 = on a daily basis, Mann-Whitney test)

Indicator	Mean Five years ago (median)			Current mean (median)			Difference-in-difference	
	Non-participants	Participants	Between p-value	Non-participants	Participants	Between p-value	Dif-in-dif	Between p-value
Apply results from own work	3.1 (2)	2.0 (1.5)	0	5.7 (6)	6.1 (6)	0,25	2.64 (2)	0
Apply results from others	3.1 (2)	2.3 (2)	0,02	5.6 (6)	5.9 (6)	0,38	2.5 (2)	0

Source: Technopolis Group (2014).

Table 22 Priorities in organisations; (Likert scale, 1 = very low, 5 = very high; Mann-Whitney test)

Indicator	Current mean (median)		
	Non-participants	Participants	Between p-value
Priority given to OR in organisation	3.4 (3)	3.5 (4)	0,2
Frequency of OR-related topics featuring in meetings	3.3 (3)	3.3 (3)	0,74
OR mentioned in strategy documents (%)	1.3 (1)	1.3 (1)	0,81
Priority given five years ago	2.2 (2)	2.0 (2)	0,09
Frequency of OR-related topics featuring in meetings	2.4 (2)	2.1 (2)	0,03
Own role in higher priority	3.8 (4)	3.8 (4)	0,75
Own role in higher frequency in meetings	3.8 (4)	3.7 (4)	0,51
Own role in OR in strategy documents	3.7 (4)	3.5 (4)	0,24

Source: Technopolis Group (2014).

Table 23 Mentioned career events (%, t-test)

Indicator	Current mean		
	Non-participants	Participants	Between p-value
No major events	14.4	19.6	0,2
Obtained MPH or equivalent	37.4	36.6	0,9
Obtained a PhD degree	5.1	3.6	0,5
Received new position/promotion in my own organisation	53.3	44.6	0,1
Received new position at another organisation	26.2	34.8	0,1

Source: Technopolis Group (2014).

Table 24 Mentioned results of OR findings(%); (t-test)[64]

Indicator	Current mean		
	Non-participants	Participants	Between p-value
No impacts	16.4	13.7	0,52
New treatment	4.8	3.4	0,57
Improvement of existing treatment	15.9	18.8	0,51
Improved monitoring/screening	44.4	56.4	0,04
Improved training / education programme	39.2	23.1	0
Improved national/regional/local guidelines	35.5	34.2	0,82
Improved national/regional/local policy	32.3	33.3	0,85

Source: Technopolis Group (2014).

Table 25 If concrete results, mentioned impacts on improved health outcomes (%); (t-test)

Indicator	Current mean		
	Non-participants	Participants	Between p-value
HIV-AIDS prevention, treatment and care	48.4	26.2	0
Malaria prevention, treatment and care	5.5	6.0	0,88
TBC prevention, treatment and care	60.9	64.3	0,62
Infant mortality	18.0	10.7	0,15
Maternal Health	24.2	9.5	0,01
Findings have not been taken up in practice	8.6	4.8	0,29

Source: Technopolis Group (2014). Differences compared to Figure 25 are explained with the exclusion of the category "other".

[64] A difference between participants and non-participants is that participants refer explicitly to the results of their research related to the OR course, while non-participants talk about their research in general.

Appendix C Survey: Methodology and results

C.1 Survey

C.1.1 Response rates

The electronic questionnaire for participants and non-participants (unsuccessful applicants) has been quite successful in gathering responses from both groups. In total three reminders have been sent, of which one directly by The Union. Out of 190 participants (with 181 valid email addresses), 132 responses were gathered, which is a response rate of 73%. For non-participants, out of 637 participants 244 valid responses were registered, which is a response rate of 38%. Both response rates can be considered more than adequate for the purpose of a reliable estimation of effects and for valid comparison for the counter-factual analysis, as long as the sample of the survey is representing the total population. The next paragraphs will give insight in why the sample is indeed representative.

C.1.2 Sample

In order to draw any conclusions about the survey it is essential that the participant sample measured in the survey is consistent with the total population of participants, and that the non-participant sample is reasonably comparable to the participant sample (before participation). This consistency will be referred to as the survey's representativeness.

To make sure that the sample is representative the distribution of the sample should match the distribution of the total population. To determine the representativeness we took an in depth look at the distribution of gender, continent of origin and course application. After checking the distribution in the survey and the total population the same was repeated when only looking at participants or non-participants, the reasoning here is the use of comparisons between these two groups.

In general the sample of the survey is representing the total population extremely well, the actual numbers show very marginal differences in percentage points and no statistical differences are found. These results are exceptionally good, which is from our perspective as researchers, a great compliment for the community with regard to their participation in the survey. The bullets below give a more in depth view of our analyses.

Gender

The distribution of gender was matched very well. The survey is just slightly biased towards males but the difference is very small. Statistical testing using a Chi^2 test shows no statistical difference between the sample and the total population. The p-value is: (Pr = 0.547), which is clearly above 0.10 and 0.05. For participants the total population has 58% males and 42% females whereas the survey has a distribution of 60% male and 40% female. For non-participants we see a similar trend, having 66% male /34% female in the total population and 70% male / 30% female in the survey. Statistical tests for participants and non-participants again show values higher than 0.10 and 0.05, namely (Pr = 0.724) for participants and (Pr = 0.358) for non-participants.

Continent of origin

The sample is also matching in terms of continent of origin. As expected we do see some differences but these are extremely minor. Statistical testing confirms that there are indeed no statistical differences between the survey and the total population. The p-values are: Africa (Pr = 0.433), Asia (Pr = 0.505), Europe (Pr = 0.391), North America (Pr = 0.520), Oceania (Pr = 0.887), which are all above 0.10 and 0.05. See Table 26 for the difference in percentages (rounded on whole percentage points)

present in the data for participants and non-participants. The statistical tests for participants and non-participants show p-values between 0.228 and 0.957, and thus show no statistical differences.

Table 26 Distribution differences: continent of origin

Continent	Participants		Non-participants	
	Total population	Survey	Total population	Survey
Africa	32%	32%	38%	36%
Asia	35%	39%	52%	56%
Europe	11%	11%	1%	0%
North-America	1%	1%	1%	1%
Oceania	21%	18%	8%	7%
South America	Not present	Not present	Not present	Not present

Technopolis 2014

Courses

To allow for better statistical testing groups of courses were created, grouping all the courses together that are held in the same location. Thus for instance, grouping applicants for Paris 1, Paris 2, Paris 3 and Paris 4. Using this method nine groups were created: Africa courses, Asia courses, Chennai course, Fiji courses, Luxembourg courses, PHFI course, Paris courses, Tallinn course and South Pacific course. When not differentiating between participants and non-participants the statistical tests show p-values between 0.320 and 0.736, and thus show no statistical differences for the courses.

When testing for the participants and non-participants the statistical testing became less reliable as each course has only between 8 and 13 participants. In this regard the grouping of courses helped a lot but some courses were only held once making grouping impossible. Thus for the courses Chennai, PHFI, Tallinn and South Pacific, the 'group' remained small (8-13). The implication is that the statistical tests for sample representativeness will be less reliable, however the given their small size they will also have a very low impact on the outcomes of the survey.

Statistical tests for all the groups accounting for participants and non-participants show again no statistical difference between the survey and the total population, having p-values between 0.277 and 0.934. See Table 27 for the difference in percentages (rounded on whole percentage points) present in the data for participants and non-participants.

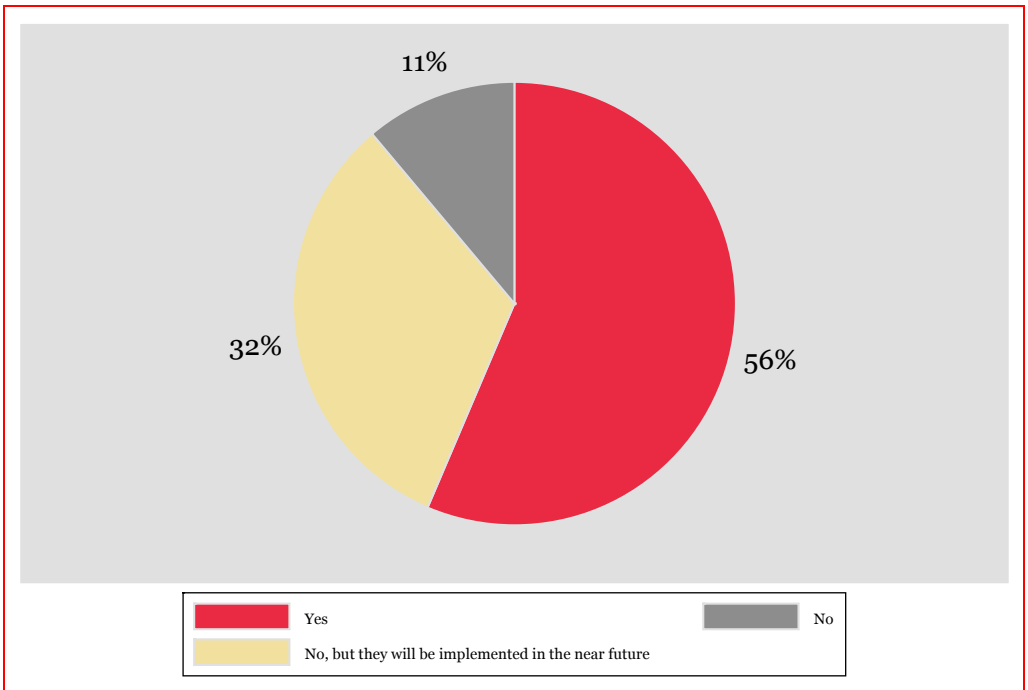
Table 27 Distribution differences: courses

Continent	Participants		Non-participants	
	Total population	Survey	Total population	Survey
Africa courses	11%	12%	17%	20%
Asia courses	11%	11%	17%	20%
Chennai course*	7%	8%	11%	9%
Fiji courses	13%	11%	2%	2%
Luxembourg courses	18%	17%	19%	18%
PHFI course*	4%	2%	Not present	Not present
Paris courses	24%	27%	32%	29%
South Pacific course*	6%	5%	2%	1%
Tallinn course*	6%	6%	0%	0%

Technopolis 2014 *For participants N is between 8 and 13

C.2 Results

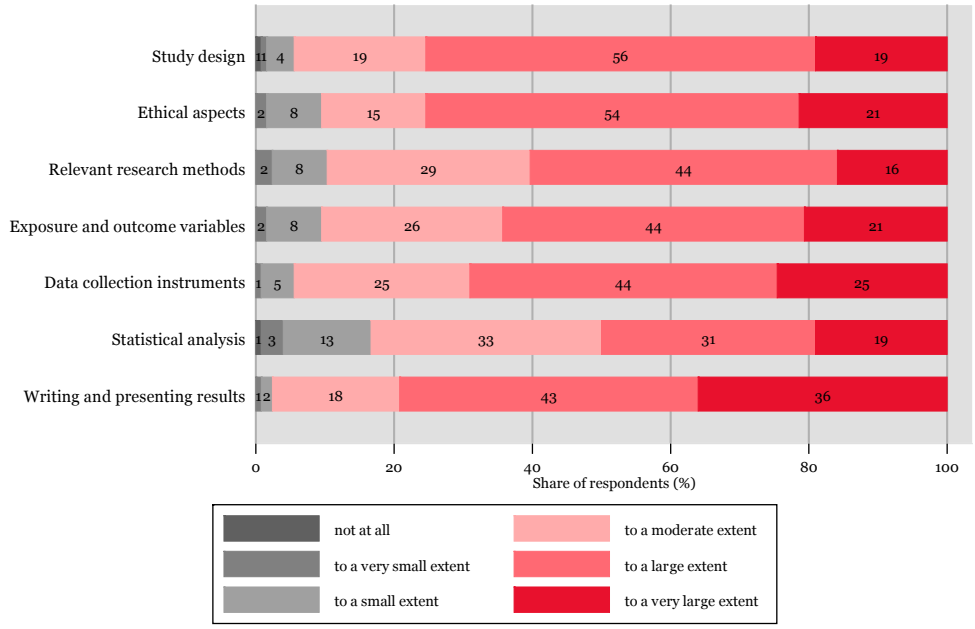
Figure 29 Implementation of results



(N = 117)
Q: Have these results already been implemented in practice to the benefit of patients?

Source: Technopolis Group (2014).

Figure 30 Self-assessment of effect of course on improvement of knowledge

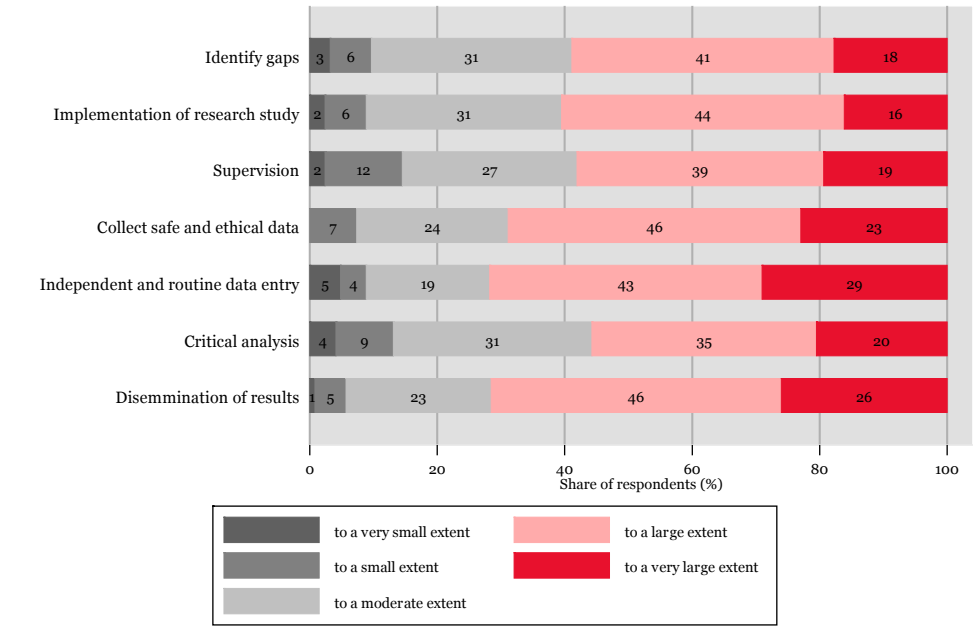


(N = 126)

Q: Please indicate your increase in understanding of the following concepts due to your participation in the OR course.

Source: Technopolis Group (2014)

Figure 31 Skill level improvement of participants

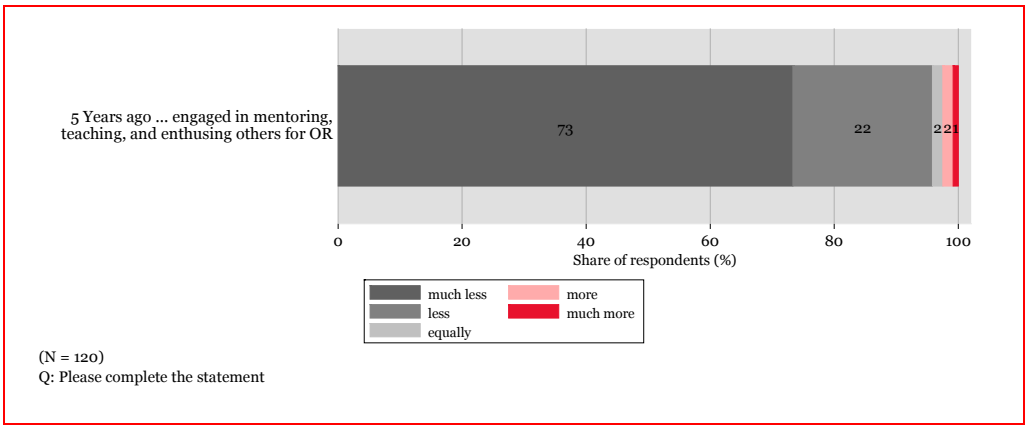


(N = 124)

Q: Please indicate to what extent the course contributed to an improvement in the following practical skills

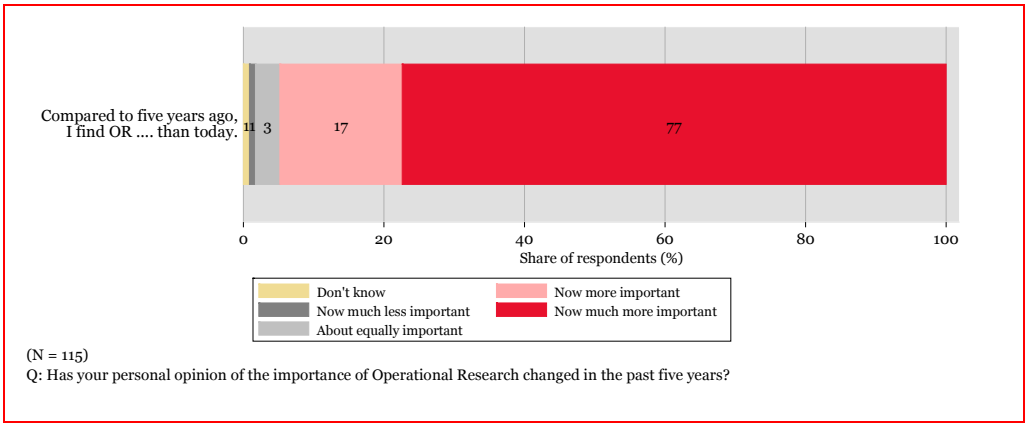
Source: Technopolis Group (2014).

Figure 32 Engagement of participants in mentoring, teaching, and enthusing others



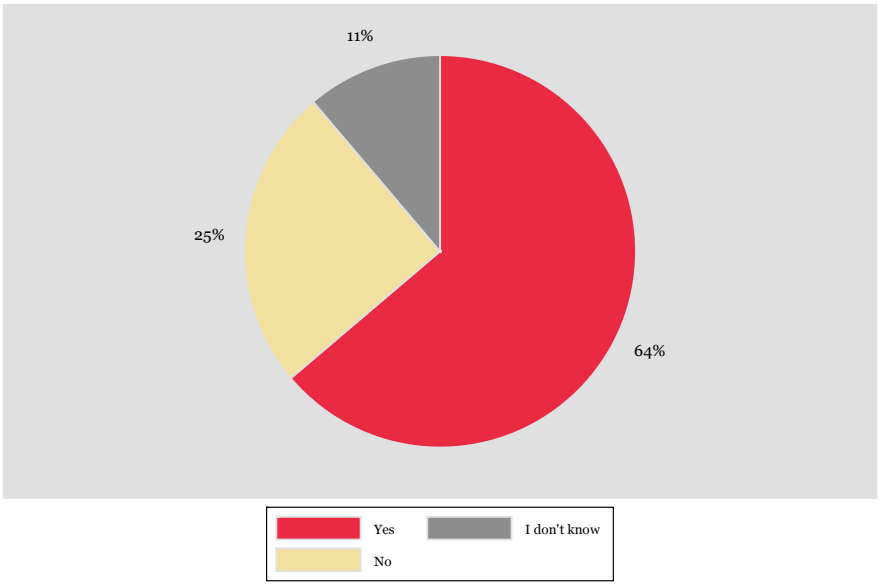
Source: Technopolis Group (2014).

Figure 33 Opinion change of participants



Source: Technopolis Group (2014).

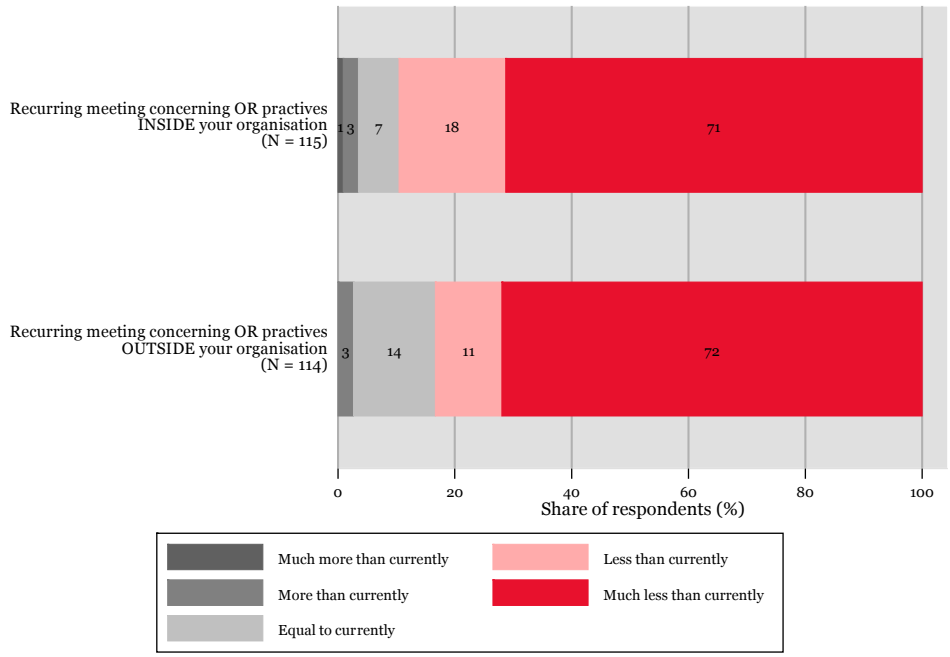
Figure 34 OR in strategic documents of organisations where participants work



(N = 116)
Q: Is OR explicitly mentioned in your organisation's strategy documents?

Source: Technopolis Group (2014).

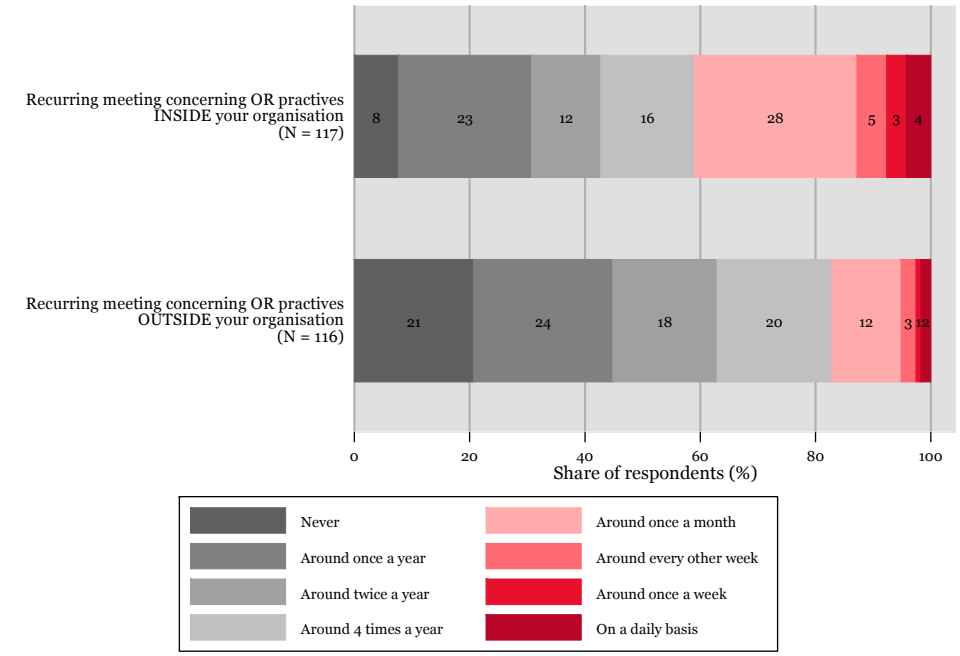
Figure 35 Recurring meeting concerning OR practices of participants in 2008



Q: Five years ago, participating in a 'community of practice', or other recurring meetings concerning OR practices?

Source: Technopolis Group (2014).

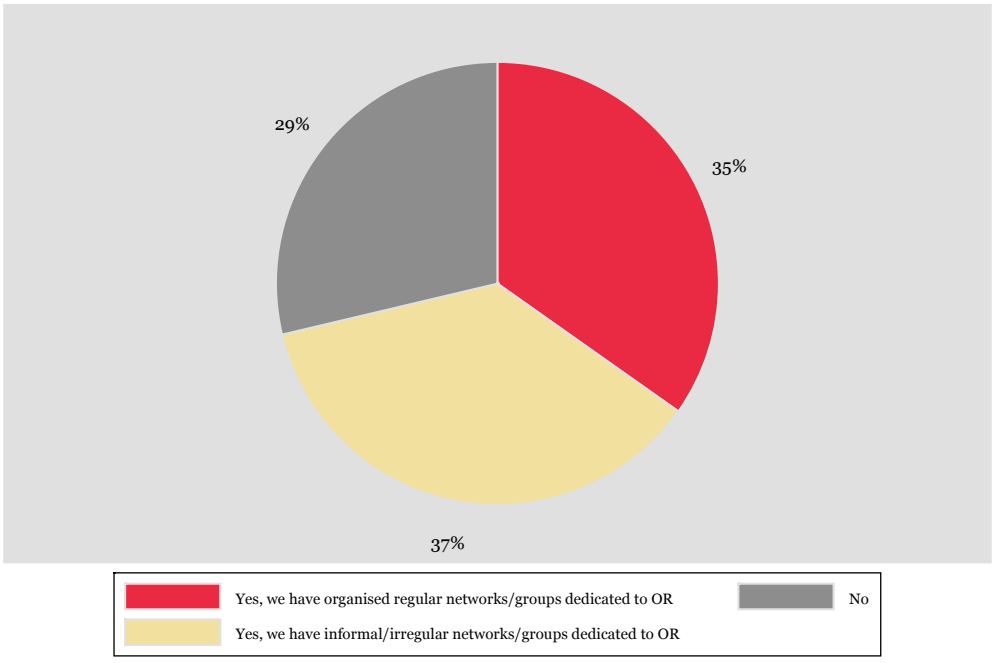
Figure 36 Recurring meeting concerning OR practices of participants in 2013



Q: Currently, participating in a 'community of practice', or other recurring meetings concerning OR practices?

Source: Technopolis Group (2014).

Figure 37 OR internal network at organisations where participants work

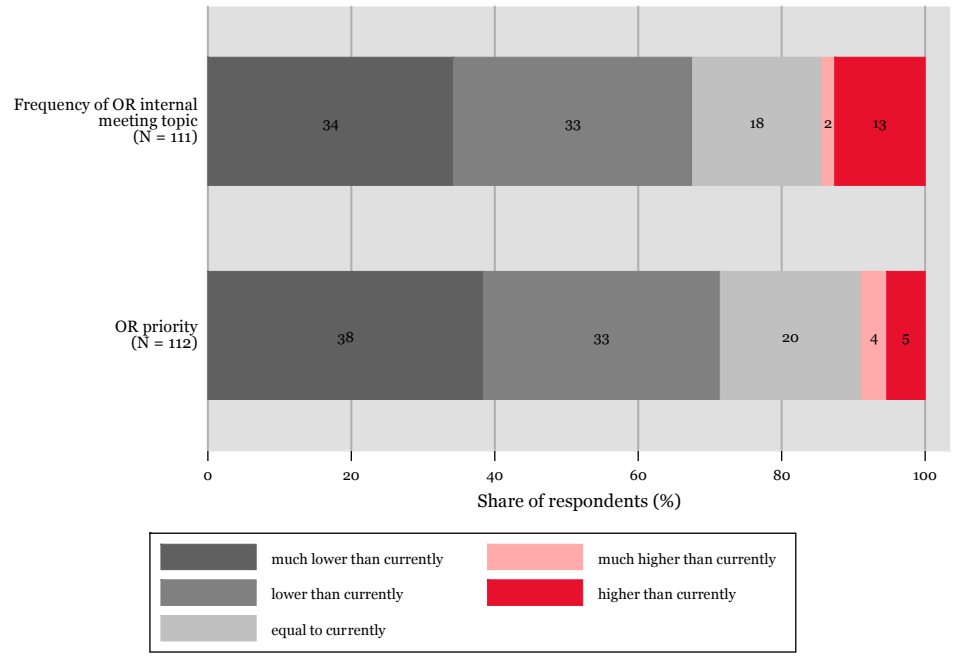


(N = 115)

Q: Do you have internal networks/group dedicated to OR?

Source: Technopolis Group (2014).

Figure 38 Organisational change, in terms of OR, at organisations where participants work



Q: Please indicate how in your view ... within your organisation have changed over the past five years

Source: Technopolis Group (2014).

Appendix D OR Course Management

Announcement of the course

The course is primarily announced through networks and alumni. This is generally done in the form of an email 3–4 months before the date of the course.

The course is not directly advertised through the website but information on the courses can be found at http://www.theunion.org/what-we-do/courses/operational-research/the-unionmsf-9-month-course. This information page states where the course is taking place and that a call for applications and a course brief are circulated widely via e-mail and through contacts. Candidates have to complete an application form by a certain deadline, and that a committee assesses and selects all applications from participants (12 per course).

CALL FOR APPLICATIONS

Union-MSF-Union/SORT-IT Operational Research Training to be held in Paris, France (Closing date for applications is 1st March 2014) This is a call for applications for the Fifth Paris Operational Research Course to be held in July 2014. This will be led by The Union, MSF, and partners and will be held in Paris, France. The following documents are attached:

1.A Course Brief – which gives an overview of the course and its purpose

2. An Application Form – to be filled out by the candidate and which will be used by the selection committee. Please note that a number of supporting documents need to be submitted along with the application.

General comments This is a practical and output oriented course which will be open to anyone interested in learning about operational research and pursuing an OR project. Details of how and where to apply are given in the forms We are looking for applicants holding a Masters in Public Health or an equivalent or someone for whom there is a strong recommendation. Applicants should be actively engaged in the running of a programme or health institution in the field of TB, HIV, lung health, tobacco control or non-communicable diseases and should be committed to return to their programme or relevant health institution after the course. We will not consider applications from heads of programmes, as the course involves too much time away from the duty station.

A total of 12 candidates will be accepted. Selected candidates will receive a full scholarship including travel, accommodation and related expenses. The closing date for applications is 1st March 2014. Completed applications (preferably by email and with attachments) are to be sent to

The Course Coordinator,

International Union Against Tuberculosis and Lung Disease,

68 boulevard Saint-Michel,

75006 Paris,

France

Tel: (+33) 1 44 32 03 60

Fax : (+33) 1 43 29 90 87

Email: cor-courses@theunion.org

The process of advertising the course has evolved but The Union are conscious of the need to ensure they are not inundated with applications, as there are limited resources for processing the information from the applicants.

Additional to the mechanisms of sending out applications though networks, there is a Lung Health Conference held every year where The Union runs an Operational Research Seminar and people can enquire about the courses. There have also been internal discussions on further advertising (for example through the Lancet) but the current mechanisms yield around 100 applicants for the 12 places and The Union would not be able to process many more applications.

Application process

There are two main pieces of information that are sent out to potential applicants: the course brief and the application form. The course brief clearly sets out the purpose of the course: 'to develop the practical skills for conducting operational research and publishing the findings'. Each of the three Modules is described in terms of content overview and output. The selection criteria is also stipulated and great emphasis placed on the fact this course will lead to a research product (a paper which will be submitted for publication) as well as other opportunities for the participants. The application form is set out to ensure that course applicants have to name a supervisor who has to guarantee the permission for carrying out operational research and also indicate their willingness to assist the applicant in completing the course milestones. Of crucial importance in the application is the description of the problem and the formulation of the research questions which are to be explored if accepted onto the course. The Union does not provide any assistance in the development of applications. In the past The Union would go through the applications and if something was missing they would request further information. This is now not possible in terms of time and resources. There are clear stipulations in terms of English language competence as well as computer literacy, since the course involves writing a paper in English and quickly grasping how to use statistical software.

Selection of the applicants

Depending on the location of the course, the applications are handled either by The Union in Paris or through Dr. Ajay Kumar in India. The process takes a whole day and involves course facilitators, Prof. Anthony Harries and Dr. Rony Zachariah.

The following selection criteria are applied:

- Active involvement within a national programme or a public health institution or in a non-governmental organisation
- Written commitment to attend all three workshops of the training
- Formal commitment to return to the programme or institution after the course and implement the knowledge gained at the programme level
- Supervisors' signed and written endorsement that time and opportunity will be given to the participant to carry out research and publish
- A stated and acceptable mentor at country level (if available)
- Candidate has completed a Master in Public Health or equivalent or is strongly recommended proven competency in English language and conversant in the use of a computer
- A statement that research funding, if needed, can be acquired through independent sources other than the course budget
- Submission of a one-page summary of a programme / health system problem and a research question that may be developed into a research protocol. This must accompany the application form
- Participants are usually only selected if routine data from government or non-governmental health facilities are already available for collection, cleaning and analysis

There is not a strict scoring system but each of the evaluators goes through the applications, makes notes and discusses the comments in order to come to agreement. The process is one of consensus building – although individuals from programme settings are favoured and particular attention is given to the relevance of the OR question and the use of programme data, there may be different selection criteria based on the course location and overall profiles/countries applying.

Course delivery

The course material is delivered in a number of different ways to ensure a suitable learning experience for participants. There are formal lectures to introduce the Module topics but also to illustrate it with practical examples and bring the subject matter closer to participants. Group discussions, protocol development and manuscript preparations are all done in the smaller mentor groups before sharing the results with the group in plenary sessions take place. There is also time for individual exercises, in particular, to practice the usage of the EpiData software and to prepare the individual OR project material.

Course and Module coordinators, and experienced facilitators deliver all formal lectures during the teaching blocks. For hands-on support of exercises and research protocol development, two facilitators are assigned to 'mentor groups' composed of three participants. Course materials, including timetable, presentations and resource materials, are provided to participants prior to the Module in electronic format, and during the course in hard copy as well. The EpiData software and the corresponding exercises are also made available to participants during the Modules. Network Attached Storage (NAS) device and DropBox are currently used as modern means to supply electronic copies of the course material to participants. Spare computer is also available during the Paris course. In poor resource settings with intermittent internet access and electricity, Uninterrupted Power Supply (UPS) unit is used to ensure the smooth running of the courses. Participants are continuously supported and mentored in their projects between Module 1 and Module 2 by their facilitators.

Course evaluation

At the end of each Module of each course, participants are asked to give both quantitative and qualitative feedback. The quantitative feedback is to be provided in an end of Module evaluation form and ranks questions on a scale of 1-5. The Union reports on the total marks given to each Module and an overall score, as well as the following additional outputs:

- Number of enrolled participants completing the final milestone – namely submission of their manuscript to a peer reviewed scientific journal
- Number of papers submitted to journals by the final milestone that are accepted, in press or published within 18-months of submission
- Number of participants who complete their projects and provide follow-up information within 18-months on whether their projects benefited policy and practice

The course evaluation forms are administered by The Union and the results are presented to DFID in an annex to the quarterly reports. The evaluation forms are used by The Union to positively improve the course, for example Module one and Module two were merged based on the feedback from participants and discussion with the facilitators.

Post course follow-up

From 2013, there was a post-course follow-up of research alumni attending The Union/MSF OR course that explored:

- Research outputs after participants have successfully completed an operational research course

- The influence of OR-Fellows on these outputs
- The outputs of OR-Fellows stratified by gender, continent and staff position at the time of enrolling

Appendix E OR-courses structure

E.1 Module 1

Aims and learning outcomes

To develop a deep understanding of operational research and to ensure that all participants have a draft research protocol by the end of the Module.

Structure of the Module

- Introduction including contextual description of The Union/MSF model of sustainable OR training, links to policy and practice, challenges and solutions to conducting OR
- Examples of successful implementation of completed OR projects (e.g., OR project on TB and HIV care in Malawi)
- Research terminology, definition of research question, aims and objectives
- Research methodology: design, sampling approach, measureable outcomes, data collection and analysis. Presentation of Open Epi software and protocol templates
- Literature search using PubMed and reference management (Mendeley)
- Practical aspects of research studies: ethics and role of investigators, MSF ethics framework requirements, complete Union Ethics Advisory Group Submission Form
- Participants work on individual research projects and report on progress throughout the Module (min. 3 hours daily); research protocol development in writing and presented orally (10 min) at a plenary session on the last day of the Module
- Module evaluation
- Review of dates and content of milestones and tasks
- Mentor groups meet for plenary feedback

The draft research protocol developed in Module 1 is refined when participants return to their countries and then presented along with a completed Union EAG form within 3 weeks to the Union Ethics Advisory Group (EAG) and the course coordinators.

Milestone 1 (within 3 weeks of completion of Module 1)

- Completed study protocol that has received the agreement of the local mentors
- Ethics clearance: The process varies according to whether the course is a Union-MSF or MSF-Union course (i.e., depending on the leading partner). For the former, a completed Union EAG form must be submitted to the Union EAG along with the final protocol. For the latter, the MSF grants ethics exemption based on six criteria being fulfilled, and these exemption forms along with the protocols are then sent to the Union EAG for Union approval. The Union and MSF ethics committees have reached an understanding in this regard. The Union EAG form must be signed by the principal investigator and the head of the institution where the research is conducted.
- A short CV of the researcher

E.2 Module 2

Aims and learning outcomes

To understand the need for and steps to acquire and analyse good quality data in OR projects using EpiData software and to ensure that all participants have a data collection instrument code book for their individual research projects

Structure of the Module

- Description of variable types
- Double data entry and data validation
- Basic statistics
- Optional multivariate analysis
- EpiData installation and exercise to create files, enter data, and perform summary statistics for various sample data types
- Examples of analysed data presentation
- Participants work on creating files for data entry sheets, dummy tables for their individual projects in mentor groups
- Plenary presentation by participants and discussion of study objectives, outcome measures, data collection instruments
- Module evaluation

Milestone 2 (within 2 weeks of the end of Module 2)

- Submission of EpiData documentation sheet, dummy tables and EpiData triplet files to the Module and course coordinator
- Milestone 3 (6 weeks before start of Module 3)
- Submission of proof of completed data collection when the participants are back in country and before the flight tickets are purchased for Module 3

E.3 Module 3

Aims and learning outcomes

To use the collected and analysed data of individual research projects and learn to write it up as a scientific report or manuscript for publication

Structure of the Module

- Refresher session on EpiData and statistical analysis
- Structure of a scientific article with examples
- Choosing a suitable target journal
- Principles and drafting Introduction and Methods sections
- Principles and drafting Results section with figures/tables
- Principles and drafting of Discussions section
- Principles and drafting of Title, Abstract, References, Authorship, etc
- Managing submission process, peer-review and revision
- Communication of the science to lay people and decision makers
- Module and entire course evaluation
- Next steps (final milestone, certificate, Union membership)

Milestone 4 (within 4 weeks of the end of Module 3)

- Final submitted version of the manuscript provided
- Acknowledgement email of the successful on-line manuscript submission process

Appendix F Tables on OR-course participation

Table 28 Course applicants, participants and acceptation rate

OR-course	Total number of applicants	Number of participants accepted	Application acceptance rate
Africa OR 1	35	11	31%
Africa OR 2	96	10	10%
Asia OR 1	42	10	24%
Asia OR 2	84	10	12%
Chennai OR 1	84	13	15%
Fiji OR 1	12	12	100%
Fiji OR 2	23	12	52%
Lux OR 1	27	13	48%
Lux OR 2	43	10	23%
Lux OR 3	86	12	14%
PHFI OR 1	8	8	100%
Paris OR 1	58	12	21%
Paris OR 2	41	10	24%
Paris OR 3	50	11	22%
Paris OR 4	100	12	12%
SORT-IT EURO Tallinn	13	12	92%
South Pacific OR 1	25	12	48%
Total	*827*	*190*	*23%*

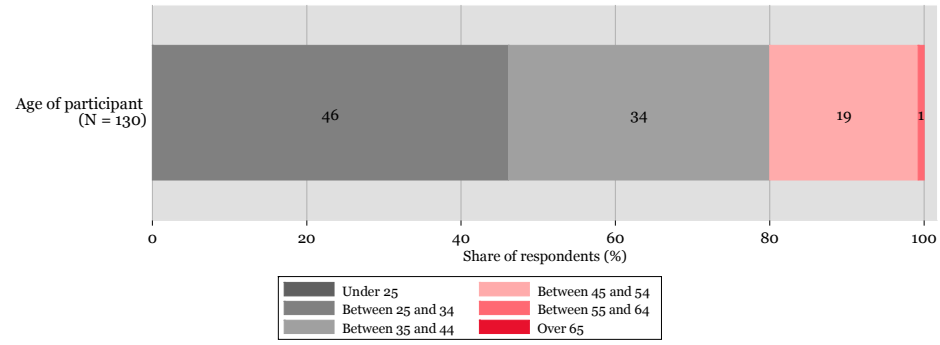
Source: Technopolis Group (2014).

Table 29 Applicants, participants and acceptation rate per continent

OR-course	Total number of applicants	Number of participants accepted	Application acceptance rate
Africa	300	61	20%
Asia	390	67	17%
Europe	25	21	84%
North America	10	1	10%
Oceania	90	40	44%
South America	0	0	-
No information	12	0	0%
Total	***827***	***190***	***23%***

Source: Technopolis Group (2014).

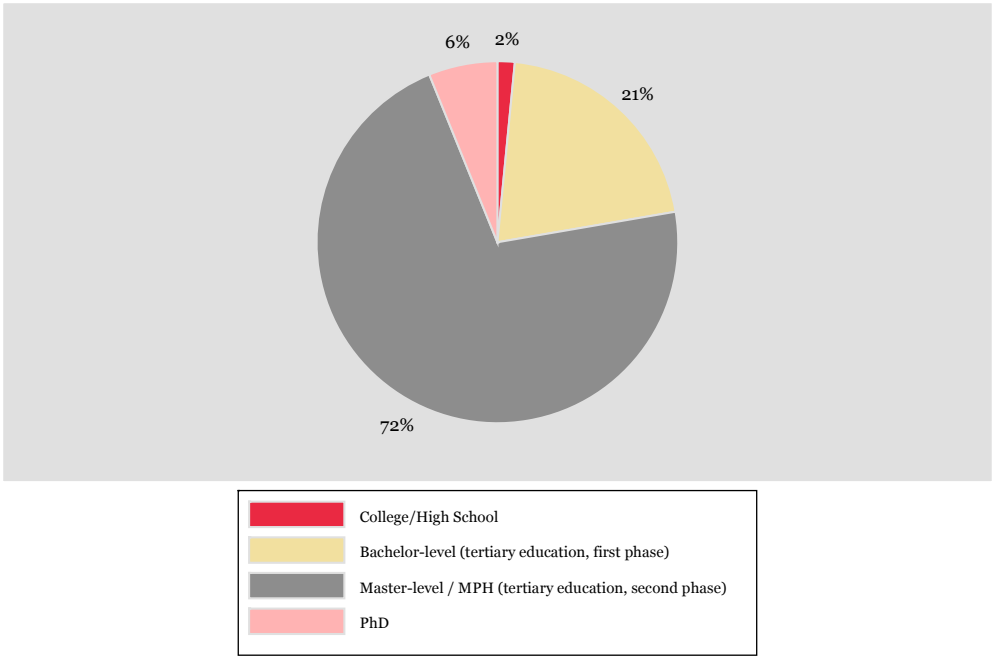
Figure 39 Age of participants



Q: What is your age category?

Source: Technopolis Group (2014).

Figure 40 Education level of participants

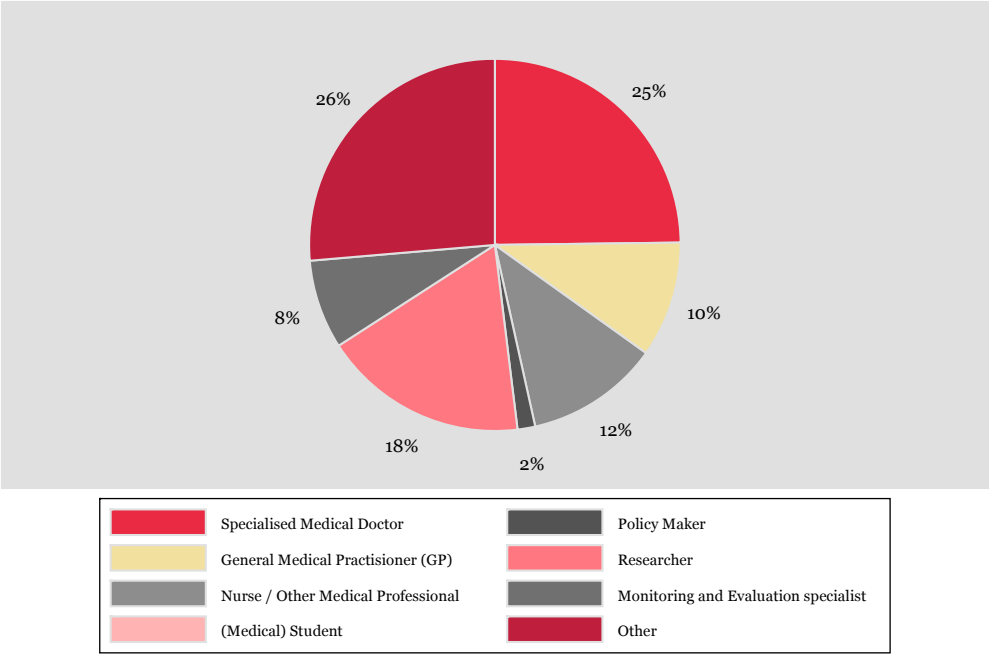


(N = 130)

Q: What is your highest finished level of education?

Source: Technopolis Group (2014).

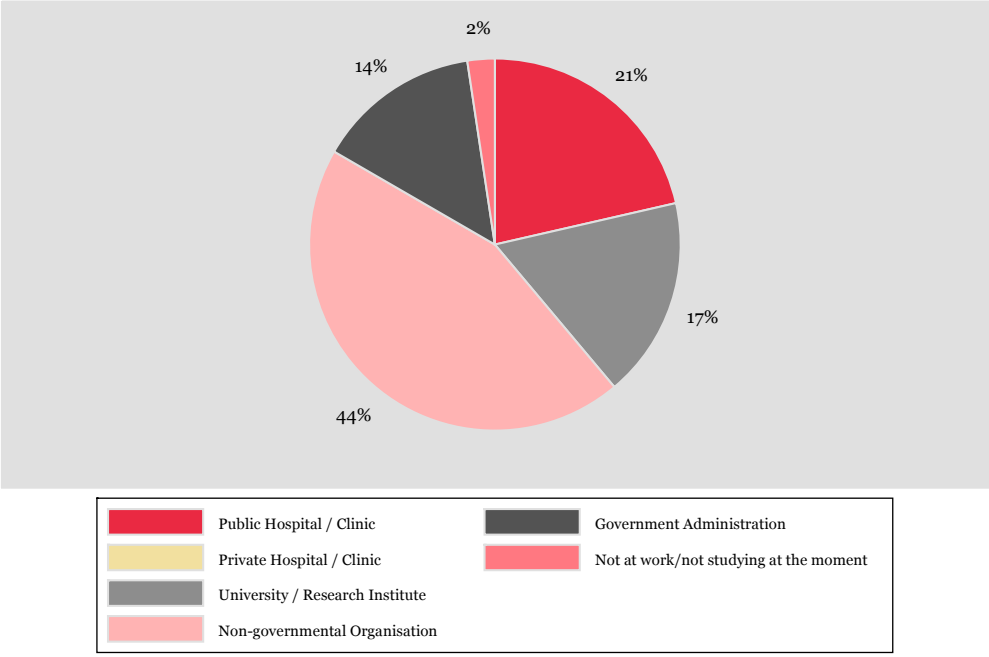
Figure 41 Profession of participants



(N = 129)
Q: What is your profession?

Source: Technopolis Group (2014).

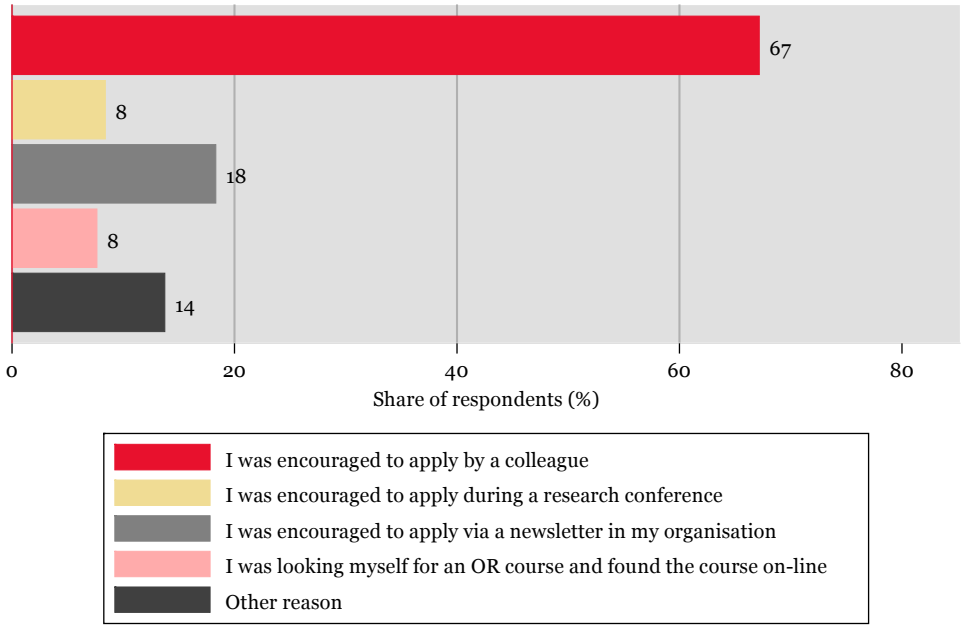
Figure 42 Organisation type of participants



(N = 126)
Q: At what type of organisation do you work (or study)?

Source: Technopolis Group (2014).

Figure 43 How participants were invited to apply for the OR course



(N = 131)
Q: How were you initally invited to apply for the OR course?

Source: Technopolis Group (2014).

Appendix G Bibliometric analysis: methods and results

Bibliometric analysis (or bibliometrics) can basically be defined as the analysis of the number of research papers published for example by a researcher, a research team, an institution or country, or in which scientific disciplines they are active. It can also be an analysis in terms of the impact of the publications – how often they are cited by others. There are different indicators used in bibliometrics to capture a picture of research performance:

- Publication counts is the most basic of the bibliometric methods and measures the total research output. It is the main indicator for productivity but does not tell anything about the quality of the research (Melkers 1993).65 A problem Martin (1996) noted about the use of publication counts is that it is a good measures of scientific production, but an inadequate indicator of scientific quality (even though academic journals rely on quite severe filtering processes by peer review).[66] Most publications provide only – if any – a small contribution to the scientific knowledge, whereas a few seminal papers provide significant contributions.
- Citation counts address questions of quality, influence and transfer of knowledge. It assumes that the most cited publications contain eminent research findings, which contribute the most to science. However, there are many factors challenging this assumption: citation cartels (i.e. a group of researchers cites predominantly work of the cartel members), self-citations, review articles (which receive a high number of citations because of their usefulness as a summary) or negative references (i.e. if a researcher has published an article which states the opposite of the mainstream of a given school of thought. Most likely, he or she will be cited by the mainstream researchers). Still, one of the main purposes of citation analysis is to serve as a proxy for the contribution to scientific progress.
- From the number of publications and their citations, impact factors are derived. Of course, each journal has its own impact factor related to the articles that have been published.
- The h-index (Hirsh-index) is an index that quantifies both the actual scientific productivity and the apparent scientific impact of a scientist. The index is based on the set of a scientist's most cited papers and the number of citations that these papers have received in other people's publications. The index can also be applied to the productivity and impact of a group of scientists, such as a department or university or country.

Publication habits differ largely between scientific fields. While in the biomedical sciences hardly any researcher publishes a book, historians publish about 60% of their research in books rather than in journals (Hicks 1999).[67] A good biomedical researcher will be able to publish around five articles from a given research project while an engineer will hardly be able to publish one.

There are many different databases available for bibliometric purposes. Technopolis Group has a license for the SciVerse Scopus scientific abstract and citation database.[68]

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[65] Melkers, J., 1993, Bibliometrics as a tool for analysis of R&D impacts. In: Bozeman, B., Melkers, J. (Eds.), *Evaluating R&D Impacts: Methods and Practice*. Boston: Academic Press.

[66] Martin, B.R., 1996, The use of multiple indicators in the assessment of basic research. *Scientometrics* 36 343–362.

[67] Hicks, D., 1999, The difficulty of achieving full coverage of international social science literature and the bibliometric consequences, in: *Scientometrics*, 44, 2, pp. 193-215.

[68] http://www.scopus.com/.

This database, comparable to the Thomson Reuters ISI database, currently contains almost 22,000 journal titles with more than 53 million articles.

G.1 Some additional tables from the bibliometric analysis

Table 30 Publication output across subject fields

Subject Category	2000–2004		2005–2009		2010–2014		Total	
Medicine	3	9%	49	82%	263	97%	315	86%
Immunology and Microbiology	1	3%	8	13%	63	23%	72	20%
Biochemistry, Genetics and Molecular Biology	7	21%	3	5%	50	18%	60	16%
Agricultural and Biological Sciences	-	-	3	5%	44	16%	47	13%
Materials Science	22	65%	1	2%	-	-	23	6%
Social Sciences	-	-	1	2%	8	3%	9	2%
Chemistry	6	18%	1	2%	-	-	7	2%
Nursing	-	-	2	3%	4	1%	6	2%
Computer Science	-	-	1	2%	3	1%	4	1%
Engineering	2	6%	-	-	2	1.%	4	1%
Pharmacology, Toxicology and Pharmaceutics	-	-	2	3%	2	1%	4	1%
Other	5	15%	6	10%	11	4%	17	5%

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

Table 31 Citation scores of course participant's publications

Year	# of publications	# of citations (excl. self-citations)	# of citations (excl. self-citations) in first 3 years after publication	Average # of citations per publication
2000	14	407	71	5.1
2001	3	505	70	23.3
2002	4	92	3	0.8
2003	7	189	16	2.3
2004	6	133	23	3.8
2005	3	38	7	2.3
2006	4	39	10	2.5
2007	14	128	26	1.9
2008	19	112	47	2.5
2009	20	213	107	5.4
2010	40	433	252	6.3
2011	61	264	243	4.0
2012	75	164	-	-
2013	78	49	-	-
2014	18	1	-	-
Total	**366**	**2,767**	**875**	**2.4**

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

Table 32 Affiliations contributing to course publications

	European institutions	#	Non-European institutions	#
1	International Union Against Tuberculosis and Lung Disease	85	World Health Organization	30
2	London School of Hygiene & Tropical Medicine	64	Ministry of Health, Malawi	28
3	Prince Leopold Institute of Tropical Medicine	21	Polytechnic University - Brooklyn	27
4	Institute of Social and Preventive Medicine	14	University of Stellenbosch	22
5	University of Bergen	14	Ministry of Health and Family Welfare, India	22
6	Royal Netherlands Tuberculosis Association	12	Lighthouse Trust, Malawi	19
7	Academic Medical Centre, University of Amsterdam	10	University of Washington Seattle	18
8	Liverpool School of Tropical Medicine	8	South-East Asia Regional Office	11
9	Operational Centre Brussels	6	Moi University, Kenya	10
10	Karolinska Institutet, Sweden	6	Medécins Sans Frontières	14

Source: The Union/DFID, analysis Technopolis Group/Scopus (2014).

Appendix H Impact case study - profiles

BOX 1 An individual case of personal development impacts of the programme – Dr. Ajay Kumar

Dr Ajay Kumar was a participant in the 2010/11 Paris course, at the time working as a consultant for the World Health Organization (WHO) in India. Focusing on the prevalent issue of HIV and TB co-infection, Kumar was able to hone in on a public health problem that was dealt with by both the National TB Programme and the National HIV programme in India. The high salience of this issue enabled Kumar to build a research team with representation from each of these programmes, ensuring the consistent relevance of the research project.

Kumar held The Union/MSF course in very high regard, citing the practical aspect: "It was always about getting things done", as well as highlighting the remarkable implementation as "a very fresh approach". This, coupled with Kumar's specific choice of research topic enabled him to develop his OR capacity far beyond its initial reach.

Prior to the course Kumar – educated to Masters level – had no research publications, but the course changed his approach to and consideration of OR. His HIV and TB co-infection study was seen to create a policy change prior to its publication, and results – following publication – were quickly disseminated. The impact of Kumar's work has undoubtedly aided his own career progression: In 2012 Kumar joined The Union as a fellow, enabling him to focus full time on OR. Since then, Kumar has been listed as a leading or co-author on close to 60 publications and has been promoted as Deputy Director (Research). "I've had a great experience [as a fellow], and have been able to be part of a number of research projects".

Moving beyond research publications, the technical skills and knowledge the Paris 2010/11 course provided Kumar with has enabled him to share and grow OR capacity, conducting two OR courses every year in India and one course for the South-Asian region besides facilitating other courses in Europe, Africa and South-Pacific. These courses serve individuals who work for WHO and national health programmes and in public health policy. More than just enabling capacity, Kumar cites the way in which the courses in India are locating individuals with a particular talent for OR, who go on to facilitate more courses, following a trajectory of personal development similar to his own.

BOX 2 Realised, potential, and spill-over impacts of the programme – Rural health services, Malawi – Elizabeth Geoffroy

Ms Elizabeth Geoffroy – an HIV monitoring and evaluation specialist within the not-for-profit Global AIDS Interface Alliance (GAIA) – participated in the most recent course in Luxembourg 2013/14: The first to come entirely under the auspices of SORT IT. Geoffroy applauded the course's "facilitator to participant ratio, which you don't get in a lot of workshops", and outlined the way in which the notion of learning operational research is particularly helpful to not-for-profit organisations, due to their budget constraints.

Geoffroy's research centred on three mobile clinics that GAIA operates in Malawi, focusing on how services are utilised and considering specific trends. Though yet to be published due to its recent completion, Geoffroy is optimistic about the piece's publication and future research she and GAIA will undertake, citing a programme of collecting electronic medical records for patients, which "particularly lends itself to operational research". GAIA, as a result of Geoffroy's operational research training will now follow up all patients that use the mobile clinics, to note the way in which medication is taken, and further care is taken up.

Geoffroy and GAIA have also noted the potential for a wider impact through the Malawian Ministry of Health. At present the Ministry have rural health care facilities that open intermittently and are ill-placed to reach the majority of the rural population: "the model they are working with isn't the most effective for rural health care. If they were to switch to more of an outreach type model they would more effectively and efficiently reach the population they are trying to help." Research, and its dissemination by Geoffroy through the SORT IT course can effectively communicate and share this message with the Ministry of Health to catalyse further change.

Though this national affect is still to be seen and change in practice is inevitably dependent on finance and politics alongside useful ideas, optimism about the use of operational research is not premature. Geoffroy states that analysing pre-existing data is useful for finding differences between populations and demographics, allowing for an understanding of trends that are easily missed in health research and healthcare. This process has appeared to have had a significant impact in Geoffroy's and GAIA's own research, and as such the Malawian district's potential healthcare outreach: "We saw [a gender divide] way back in December, and now we have students in the University of California San Francisco researching men's barriers to accessing health care, learning about HIV and HIV attitudes … there is a gender difference … and realising that was a great benefit from this work that was not intended."

BOX 3 Linking knowledge to action: Implementing vital registration in traditional societies – Emmanuel Singogo

Mr Emmanuel Singogo's research, undertaken as part of the Paris course in 2012, focused on vital registrations. This focus came about following the Malawi government's 2005 implementation of a program for national registration, piloted in two districts. Singogo's working district was a traditional area targeted for vital registration. "We realised the focus for our project was to try to understand the challenges people face when they are entrusted with registering deaths and births." Singogo discussed at length the chief system of Malawi. "The chiefs have the responsibility, but most of them are illiterate. This presents challenges for documentation, so we were interested in how this registration was being carried out."

Singogo's research uncovered the use of secretaries in traditional societies for registration, which often led to inconsistencies, particularly when compared to facilitator records. Understanding this however, allowed the government to be more proactive in their thoughts and actions about how national registration should proceed, particularly where registrars are illiterate. The main tangible impact was the "government decision to recognize secretaries in a formal way, … overcoming the struggles with writing".

Singogo also cited the link that has been made between health officials and chiefs. "This has meant that deaths have stopped just being noted at the village level. The link means that the hospital is notified after any death in the village, helping to understand disease outbreaks."

The system has since been expanded to birth registration, pertinent in a country where the majority of rural dwellers choose to have children at home. More than just increasing and improving records, Singogo cited the educational impacts registration has for traditional societies. "Where health facilitators see deaths rising they can look into possible pandemics and increase civic education, encouraging the use of health services and increasing early intervention. […] Chiefs have also started to form 'Healthy Village Committees', and the Chiefs foster these relationships."

BOX 4 Scaling-up and a longitudinal approach to operational research for policy change – Ajay Kumar

Dr Ajay Kumar, previously an employee of WHO India, and presently employed as an operational research fellow by The Union chose to focus his initial piece of research on ART guidelines for HIV and TB. "A policy change came about and it was the decision that all HIV infected patients should receive ART irrespective of their CD4 count." Kumar stated that the trend of individuals receiving ART therapy over the years has been increasing, partly due to the research: "We cannot attribute the increase to the policy change alone […] but this was one more condition that facilitated the process".

This research led Kumar to coordinate two further studies on HIV and TB, making the initial operational research longitudinal. These cumulated in a policy recommendation stating that in all high HIV settings in India, routine testing should be provided for all TB suspects. Kumar stated the problems of implementation, and how operational research was used to train people, allowing for successful implementation, monitoring and recording. This policy was later expanded to "all TB suspects in the country routinely being offered HIV testing".

The impacts have been specifically on "the diagnosis rate of HIV in TB patients and the number of patients receiving ART. We are saving lives through early intervention across the country. Complications are delayed and physical degeneration occurs later." Kumar also cited trickle down effects, including civic education, understanding of symptoms and signs, and understanding of links with other diseases such as diabetes. "All of this will have long term effects in preventing complications."

BOX5 – Future directions for research: Quality in maternal care – Dr Anne Kihara

Dr Anne Kihara is a trained gynaecologist, as well as teacher and, since undertaking The Union/MSF course, an operational researcher. Kihara spoke about the ways in which research was built upon following her participation in the course, and her continual espousing of the qualities and benefits that operational research provides.

Kihra's research focused on the role of antenatal services in Kenya, specifically the role and benefits such services have for women in informal settlements in Nairobi. The practice, though privately run, benefits from a partnership with Kenya's government. Though yet to be published (Kihara submitted her paper in June 2014), many things can be noted from the research that was unexpected: "What's very clear is that you can see quality gaps, and these things need to be addressed in the facility. We must look at the broader picture." It was thought that other facilities may provide a good benchmark for such quality considerations.

This emphasis on quality, Kihara suggests, is a key topic for further research. "We knew women were coming late to the hospital. I expected to find that. But the quality, the structure [...] there are gaps and these need to be addressed." Kihara pointed towards more in-depth qualitative research that would need to follow operational research to understand these gaps, as well as continued late treatment for women despite free provision of maternal care, amongst other things. Kihara also stated that the clinic may benefit from a greater interaction with Kenya's Ministry of Health: "There are gaps in care that need to be addressed, and thinking about the holistic packages for women to, and who already do, access care is an important next step."

Appendix I Financial overview

5.1.1 Actual spending

In this sub-chapter an in depth view of the actual spending is presented. Table 33 shows the overview of spending in all categories. Please note that quarterly forecasts are provided to DFID for the entire grant period, however, DFID reimburses The Union on actual expenditures made after reviewing the financial reports on a quarterly basis. Although forecasts are not ideal to use when talking about real spending it is necessary to use these in order to compare the costs of spending categories to the budget of these categories. It is also hard to compare the costs to the budget of just the first two years as the costs information is often spread over multiple years making it hard to contribute costs to a specific year (2011/12 or 2012/13 or 2013/14).

Table 33 DFID cost realisation in main categories

	2011/2012	2012/2013	2013/2014*	Total	% of budget
Courses & support	£189,116.97 (+£50,000)	£207,850.74	£196,122.15	£543,089.87 (+£50,000)	91%
Fellows	£45,828.23	£89,852.42	£159,059.14	£294,775.78	87%
Alumni support officer	£0	£4,190.06	£15,644.75	£19,834.81	76%
Open access publication	£20,000	£4,787.14	£15,127.57	£39,914.71	100%
Indirect costs (10%)	£28,327.24	£34,075.60	£42,883.73	£105,290.57	100%
Total	£283,272.44 (£50,000)	£340,755.98	£428,837.33	£1,052,905.74 (£50,000)	95%
% of budget	89%	76%	128%	95%	

Source: Technopolis Group (2014). *2013/14 numbers are based on predictions

Please note that the actual spending on courses is distributed very differently from the way it was budgeted. The reason for this is that some of the Modules are given in one year but the costs are paid in a different year. Therefore, when looking at the distribution please consider that some costs may have shifted to the next year. The costs for the Asian course are also increasing steadily over time as the funds from Bloomberg, covering the publications, was running out, the funds from DFID were used to fill this gap.

Also the costs for the Fellows show a distribution shift. As stated before additional funds were added to the initial budget to support the Fellows that were initially supported by Bloomberg. We can see that the cost for covering the Fellows surpasses the 100%, which may point to a tight budget. This might be the case considering that the additional funds from DFID to cover the five Fellows previously supported by Bloomberg is only £63,750. In the budget chapter we can see that for the initial Fellows a rate of £15,000 was reserved for their first two years increasing to £20,000 in the third year. For the 'Bloomberg Fellows' the rate is considerably lower as it is only £12,750, note that these Fellows have been funded before and therefore are at least in their second year. A different part of additional funds, £20,000, went to 'skill building for Fellows', here we see that the budget is hardly spend (38%) making it questionable why Fellow budgets are so tight.

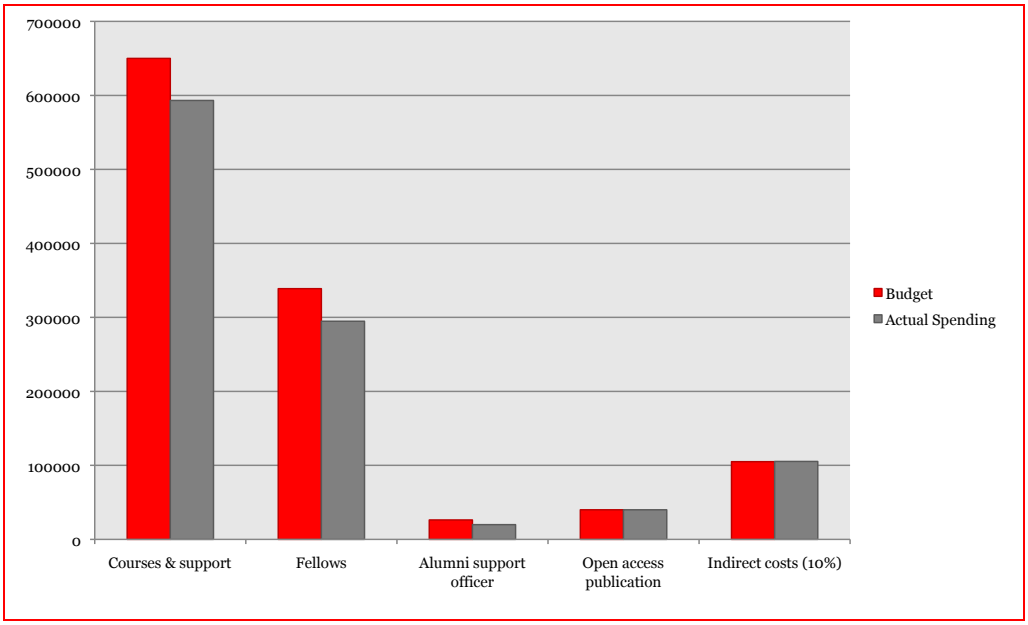
In the remaining categories, the cost realisation for open access publication shows a one-time expenditure of £20,000.- in the first year, this part of the budget is spend on

front loading support for public health action open access journal. Afterwards the budget is used to support open access publication.

The cost realisation for the alumni support officer is covering two years while the budget was only noted in the second year. The alumni support officer got in touch with about one hundred OR course participants through a survey to record the progress made after the course. The officer was funded with the additional funds added later into the budget table, which is why they were not properly spread over two years in the budgeting phase.

Most spending categories show reasonable spending compared to their budget (Figure 44). The spending of the courses show the highest discrepancies compared to the budget not only when it comes to annual spending but also spending per course. From the spending per course it is interesting to see the costs differences between the courses. It is clear that it is quite expensive to organise a course in Paris, and it is clearly a lot cheaper in Asia. Whether this means that courses should not be held in Europe is debatable as such decisions go way beyond just costs. At least it is important to consider for future budgeting. Overall the courses balance out quite well, as the other courses are cheaper than expected.

Figure 44 DFID budget and actual spending*



Source: Technopolis Group (2014). *Actual spending of the last year is based on a forecast

The other costs for the alumni officer and the publications are generally straight forward and do not require explanation.

In conclusion it is important to mention again that the actual spending is based on a forecast for the last year. This means drawing conclusions at this point should be done very carefully and cautiously: The few statements made in this conclusion should be verified after completion of the program. As overall the spending balances out well, it is still a little early to tell the whole story. Overall spending is managed well within the categories that were set in the beginning, as can be seen in Table 34, Table 35, Table 36, Table 37 and Table 38. When looking at the budget for the fellows it is clear that The Union looks carefully at the cost categories that were initially agreed upon with DFID. This can be derived by seeing that the costs of the fellows are very tight while the costs for training are not fully used. Although on first sight this shows that not the optimal distribution of funds has been agreed upon it also shows that The Union has an honest approach to using the funds only within their assigned category.

Table 34 DFID budget for OR courses

	2011/2012	2012/2013	2013/2014	Total
OR course Paris	£80,000	£80,000	£80,000	£240,000
Coordination & logistics support OR course Paris	£20,000	£20,000	£20,000	£60,000
OR course Asia	£70,000	£70,000	£70,000	£210,000
Logistics support OR course Asia	£10,000	£10,000	£10,000	£30,000
Support for Union facilitators OR course Luxembourg	£10,000	£10,000	£10,000	£30,000
Support for Union facilitators OR course Africa	£10,000	£10,000	£10,000	£30,000
One time contribution to MSF	£50,000			£50,000
Total	£250,000	£200,000	£200,000	£650,000

Source: Technopolis Group (2014).

Table 35 DFID cost realisation for OR courses

	2011/2012	2012/2013	2013/2014*	Total	% of budget
OR course Paris	£127,641.94	£94,821.83	£48,331.64	£270,795.41	113%
Coordination & logistics support OR course Paris	£18,388.58	£19,786.20	£21,759.77	£59,934.54	100%
OR course Asia	£32,694.68	£61,294.82	£79,330.18	£173,319.68	83%
Logistics support OR course Asia	£10,391.77	£8,926.41	£9,922.62	£29,240.80	97%
Support for Union facilitators OR course Luxembourg	£0	£15,203.43	£14,500	£29,703.43	99%
Support for Union facilitators OR course Africa	£0	£7,818.06	£22,277.93	£30,095.99	100%
Total	£189,116.97	£207,850.74	£196,122.15	£593,089.87	99%
% of budget	95%	104%	98%	99%	

Source: Technopolis Group (2014). * 2013/14 numbers are based on predictions

Table 36 DFID budget for OR-Fellows

	2011/2012	2012/2013	2013/2014	Total
New OR fellow / OR course coordinator India	£25,000	£25,000	£25,000	£240,000
New junior OR-Fellows + *Covering Bloomberg's fellows*	£30,000	£108,750	£55,000	£193,750
Laptop and logistic support for fellows + *Skill building for fellows*	£15,000	£40,000	£15,000	£70,000
Total	£70,000	£173,750	£95,000	£338,750

Source: Technopolis Group (2014).

Table 37 DFID cost realisation for OR-Fellows

	2011/2012	2012/2013	2013/2014*	Total	% of budget
New OR fellow / OR course coordinator India	£16,689.42	£22,441.62	£34,992	£74,123.50	90%
Two new junior OR-Fellows + *Covering Bloomberg's fellows*	£26,645.14	£60,369.63	£113,343.06	£200,357.83	103%
Laptop and logistic support for fellows + *Skill building for fellows*	£2,493.66	£7,041.16	£17,053.76	£26,588.59	38%
Total	£45,828.23	£89,852.42	£159,059.14	£294,775.78	87%
% of budget	65%	52%	167%	87%	

Source: Technopolis Group (2014). * 2013/14 numbers are based on predictions

Table 38 DFID cost realisation for alumni support and open access publication

	2011/2012	2012/2013	2013/2014*	Total	% of budget
Alumni support officer	£0	£4,190.06	£22,073	£26,250	76%
Open access publication	£20,000	£4,787.14	£15,127.57	£39,914.71	100%

Source: Technopolis Group (2014). * 2013/14 numbers are based on predictions

Appendix J Benchmarking case study: FRONTIERS

Frontiers in Reproductive Health Programme (FRONTIERS) focussed exclusively on family planning and reproductive health service delivery from 1998 up to 2008. A key component of the programme was to provide training courses to stakeholders of operational research, in partnership with various organisations. The capacity building programme was active in 72 countries, including 20 countries in Europe, Central Asia, and Middle East, 28 in Africa, 13 in Asia, and 11 in Latin and North America.

Information collected

Telephone interviews were conducted with each of the directors of the programme, John W. Townsend (1998-2005) and Ian Askew (2006 -2008). Joanne Gleason, Associate Director, Reproductive Health at the Population Council provided extensive documentation about the programme that was subsequently analysed.

J.1 Aims

The aims of FRONTIERS was to institutionalise operational research and establish evidence-based best practices by transferring relevant skills so that public and private organisations in developing countries can learn to conduct OR independently, and ultimately use the research findings to inform policies and practice. For this to happen, FRONTIERS strategy was to increase both the demand for and supply of OR activities through:

- Expansion of the "consumer base" that is the number of local organisations that fund and utilise the outputs of OR activities, primarily targeting managers
- Expansion of the number of individuals and organisations capable of teaching OR via specialised courses and hence providing increased number of field researchers.

J.2 Programme design

Adoption of OR findings relies on lowering the barrier to knowledge transfer between producers and users of OR. Managers must be able to appreciate, commission, and understand OR. Health workers must be equipped with skills to identify research problems, design OR projects, chose suitable research protocols and seek new evidence to improve service delivery. Key features of the FRONTIERS approach were

- Selection of a small number of organisations in priority countries. Organisations had to demonstrate that their funding source is varied (not exclusively USAID) and capable of attracting students from the region
- Providing long-term commitment to organisations to build up infrastructure, incorporate teaching material in curricula, and accumulate suitable training experience
- Leveraging resources from other donors and local cooperating agencies to deliver health services in a sustainable manner
- Selection of course participants carried out with local policy makers, mostly from the same country, to include 3-4 participants from a given organisation
- Diverse, country-specific training offered
- Decreasing technical and financial assistance from FRONTIERS and forming independent OR training and delivery centres

J.3 Results

J.3.1 Curriculum development

Operations Research for Managers (5 days) course focuses on collaborative practices between managers and researchers, identification of programme priorities, and description of relevant methods available for OR. Teaching material in English, Spanish, and Russian.

Operations Research Proposal Development Workshop (10 days) uses a standard protocol for participants to develop a competitive OR proposal to international funders. Managers and researchers from the same organisation jointly design such studies, ensuring alignment of research problem and programme priority, and, if intervention is successful, increasing the chances for implementing the OR results.

Scientific Writing for Reproductive Health (3 days) course helps researchers to write clear and structured reports for managers, and manuscripts for peer-reviewed journal publication. Teaching material in English and Spanish.

Financial sustainability workshop (5 days) developed in partnership with Family Health International (FHI) teaches researchers and managers to conduct basic economic evaluation (cost analyses and pricing decisions) of projects. FRONTIERS provides small grants to support implementation of projects developed during the course.

Willingness to pay (WTP) course (1 day) developed in partnership with the Futures Group International help to design surveys for researchers to evaluate clients' WTP for health services and managers to understand findings. Teaching material in English, French and Spanish.

J.3.2 Fellowships and Internships

The fellowship programme (one or two years) aimed at providing training to graduate field researchers for employment at non-FRONTIERS research centres. Fellows are residents of the country where they work supervised by FRONTIERS staff members. Fellows normally work on ongoing OR projects and manage data collection and analysis and present results at conferences. The internship programme supported graduates of the Tulane University International Health Programme for one year to supply OR professionals to US-based donor and service delivery organisations.

J.3.3 Reporting and monitoring processes

Record of course participants, country of and organisation of origin and their funding source for each course were registered. At the end of each workshop, participants were asked to evaluate the course by filling out an anonymous evaluation form on (i) clarity of topics covered; (ii) usefulness of topics for their future work; (iii) parts that participants enjoyed most; and (iv) suggestions for improvement.

In addition, two surveys were conducted: pre-test survey on the first day of the course, while post-test survey one year after the course. Response rates were usually lower than 50% of course participants and hence their analysis may not lead to reliable results. Response rates for fellows and interns were significant higher (60-85%). Surveys inquired if new skills were used during course participants' work, if the number of OR projects conducted by the participant before and after the course changed, if project grant proposals (to non-FRONTIERS funding) were submitted after the course, if peer-reviewed journal articles were published, and if OR was introduced in further training programmes.

The number of views and downloads of reports and training manuals from the Population Council website was monitored in the period of 2007–2008.

J.3.4 Programme outputs

Institutionalisation

FRONTIERS sustained collaboration with a number of local training centres in priority countries, including the International Program for Population Studies (Mumbai, India), Cairo Demographic Center (Cairo, Egypt), Reproductive Health Research Unit (University of the Witwatersrand, South Africa), Regional Centre for the Quality of Health Care (Makerere University, Uganda), Institute for Health Economics (Dhaka University, Bangladesh), and FUNDEVI, University of Costa Rica (Costa Rica). In each case, FRONTIERS researchers developed a detailed work plan and budget in partnership with the organisation's team, based on which technical assistance was provided to design and deliver OR training courses tailored to local needs. As an illustrative example of success, it is remarked that the OR training course at RHRU in South Africa is still being offered some 15 years after the collaboration with FRONTIERS started.

FRONTIERS also collaborated with the WHO Reproductive Health and Research Department (2001–2008) in course development on scientific writing, proposal development.

Courses and participants

FRONTIERS funded and/or provided technical assistance for a total of 63 courses with 1,171 participants over 9 years between 1999 and 2008. This represents 7 courses per year with an average of 19 participants per course and ranging from 5 to 42. In terms of the major segmentation of participants across the courses, 30% followed the OR for Managers course, 30% the OR Proposal Development workshop, and 20% the Scientific Writing for Reproductive Health course. Participants came from 72 countries from all regions of the world. Participants were fairly evenly distributed among managers and researchers: in SE Asia courses 43% were managers and 57% researchers from NGOs, government health programmes, donors, universities and research institutions.

Fellows and interns

FRONTIERS trained seven international fellows and four interns during the 10-year period of the programme.

FRONTIERS website visits

The course material OR for Managers was downloaded 267 times over a 5-month period, while the Scientific Writing course 51 times over a 12-month period during 2007/8. It should be noted that this may not reflect the true demand for the material as the time the courses were posted on the internet and then monitored may contribute to the intensity of the website activities at a given time period.

Peer-reviewed publications by course participants

FRONTIERS did not monitor publications as the main purpose of the OR training courses was to change program practice rather than disseminate research output.

J.3.5 Programme outcomes and impacts

FRONTIERS contributed to a number of tangible impacts that contribute to the long-term success of the programme:

- OR teaching continued without FRONTIERS assistance at five local training centres
- WHO continued to establish new training centres, FRONTIERS-trained facilitators ran workshops and used FRONTIERS course material
- Increased use of OR in WHO's HIV Department and at the Global Fund within service delivery projects

- Capacity building courses (17) developed at organisations after staff attended FRONTIERS course
- Thirty-four OR proposals (out of 192 activities) developed at 7 OR training workshops were funded by non-USAID/RTU sources
- Twenty-four WTP studies have been conducted by organisations with non-FRONTIERS funding
- Interns continued to carry out research, publish papers, work for healthcare NGOs and funding bodies. Fellows continued their work in OR in either new or their original organisations (country office of Population Council, World Bank, ministries of health, research institutes, and universities)
- Established international networks that bring scientific evidence and analysis to bear on changes in practice: INTACT (www.intact-network.net), INDEPTH (www.indepth-network.org) and FHI360 (www.fhi360.org).

FRONTIERS however also encountered a number of challenges along the programme. For example, regulations, administrative limitations and contact point preferences led to termination of contracts with FRONTIERS in two instances: Institute for Health Economics (Dhaka University, Bangladesh) and University of Costa Rica (Costa Rica). Former director John Townsend mentioned among the challenges faced during the programme the perception in public health institutions that clinical studies matter more than implementation of care and organisational issues. In his view the small grant programme that was used for diverse OR projects often did not lead to useful outcomes as it was cumbersome to manage and researchers felt isolated in practice. Another former director, Ian Askew feels that fully funded training courses often attract the wrong people who lack motivation but selected by their Ministries of Health.

J.4 Value for Money

OR training courses delivered within Population Council's FRONTIERS programme were usually jointly financed by FRONTIERS and donor organisations such as USAID, UNFPA, DFID, and Save the Children. FRONTIERS normally provided staff time and materials amounting to 50% of the total costs (Asia) but in certain cases donor funding amounted to 100% of the course costs (USA, Africa, Europe, and joint WHO courses). Funding for direct costs for local organisations amounted to $295,000 (55%) for core funding and $237,000 (45%) for field support across 8 countries. This cost of institutionalisation was strongly leveraged by USAID Mission (50%) resulting in low overall proportion of FRONTIERS funding spent on capacity building (less than 6% between 1999–2002).

In the case of SE Asia region, a capacity building programme active between 2001 and 2005, a total of $119,000 was spent on the nine capacity building workshops, not considering the corresponding operational and FRONTIERS staff costs. The average cost per workshop is thus $13,250 and the per participant cost was $760 inclusive of transportation and per diem. This figure was said to be representative across most developing countries.

As for the cost of FRONTIERS staff time devoted to capacity building worldwide, it was estimated that it required an annual average of $200,000.

In hindsight, former director Ian Askew believes that OR courses could be run on a cost-share basis where participants pay a certain fee for participation. This could select for motivated organisations and individuals to attend the courses, offer better value for money for funders and sustain the course long term.

J.5 Lessons learnt

The example of FRONTIERS programme shows that OR capacity building is a relatively inexpensive activity due to the exploitation of existing health data and the potential to leverage additional resources.

Universities often found it hard to finance the introduction of new OR courses into the curricula. FRONTIERS followed the strategy that OR courses should not contain standard research topics countries (e.g., sampling and statistical techniques) that are generally available but focus on intervention.

Research centres were however more flexible to institutionalise OR and attract additional funds by offering such short courses. Looking back, FRONTIERS consider working at the organizational level as a highly positive experience in that country partners enthusiastically engaged in and took ownership for OR training. In addition, many cooperative agencies and institutions were willing to provide funds to train their staff in OR courses organised by FRONTIERS. The training delivered by FRONTIERS actively encouraged OR project proposals to be submitted for third-party funding as a measure of quality and achieving sustainability.

FRONTIERS emphasised (but in separate workshops) the research design, collaboration between managers and researchers throughout the research project, and dissemination of the ensuing results. In their view, course material posted on the internet in multiple languages can also provide easy access for students and hence multiply the effect of traditional training courses (for example WTF courses).

Training and mentoring were two separate activities offered by the FRONTIERS programme. However, Ian Askew now believes that a joined model "would be the ideal model [...] as it combines the strength of ongoing mentoring, interaction, engagement and learning by doing, together with some structure, formal sessions on protocol development, data analysis and report writing".

Appendix K Benchmarking case study: KNCV

KNCV Tuberculosis Foundation (KNCV) delivers OR courses locally to build sustainable capacity in TB control. Since 2006 KNCV has built research capacity in over 20 countries in Europe, Africa, Asia, and Latin America. KNCV also delivers 'on the job' training, supervision of MSc and PhD students, and a 'Training of Trainers' programme.

Information collected

Telephone interview and multiple email exchanges with Susan van den Hof, senior epidemiologist at KNCV. Extensive documentation was then collected about the programme and analysed.

K.1 Aims

The primary objective of KNCV is to support the development and implementation of OR via building long-term research capacity. KNCV aims at building a critical mass of researchers, primarily within the National Tuberculosis Programme (NTP) but also in collaborating academic institutions to conduct OR projects in TB and improve TB control; stimulate the creation of national networks; promote utilisation of data and data-driven policy change. KNCV's research capacity building programme provides support to learners in conducting all steps in a research project: formulation of research questions, protocol writing, development of data collection tool, data collection and analysis, dissemination of results, and translating results into recommendation for evidence-based TB policies. KNCV organises 9-15 month long OR courses in countries upon requests of the NTP or other partners including local universities and research institutions. KNCV also provides tailor-made short topic-specific courses and curriculum development, and on the job training.

K.2 Programme design

Since 2012 KNCV develops OR training courses based on participants' needs assessment conducted during the selection process. Most participants in KNCV's OR courses have no or hardly any previous research experience (i.e., they have never co-authored peer-reviewed research publications).

A typical course has at least 12 participants (but can be up to 30 as it was the case in Ethiopia), and they are usually programme staff or researchers at national TB programmes and research institutions from a particular country. There is no formal requirement for any research background to participate in the course. However, there is a strong encouragement that participants obtain authorisation from their managers to dedicate 15-20 hours a week to the 9-15 month long course. Course participants need to complete a 'learners need assessment' form and in teams of four members (NTP with local partners such as local academia/Ministry of Health, MoH) prepare a couple of potential research topics during the application phase. Working in teams is a cost- efficient way of conducting the research project and building long-lasting relationships for future research. Successful participants are required to engage in monthly supervision calls, mentoring programme, and, more recently, in an online community of practice (CoP). In some cases course participants are selected by local partners based on criteria supplied by KNCV, however compliance is not always observed. More recently, KNCV has had a bigger role in selecting course participants.

Participants receive and complete a self-study module on introduction to OR and ethics before the first in-person sessions. The next step is to delineate the research topic/question and develop a research protocol for each of the teams. The protocols are submitted for ethical review and (if needed) funding is made available through the MoH or donors upfront. This first teaching block normally lasts 1-2 weeks and involve protocol development (prioritisation of a research topic, development of a problem,

statement, selection of appropriate study design etc) and learning about data collection tools and data entry. The next phase is the fieldwork to conduct the actual research in teams lasting about 6 months with support provided by the facilitators and, funding permitted, 1 week of monitoring visit. It should be noted that KNCV promote the utilisation of existing data as much as possible since these are often underutilised. However, such existing data may not provide answers to the questions the program staff rated with the highest priorities. Participants often propose to collect data beyond routine data in their research projects, which therefore take longer to complete. In particular, intervention studies take longer, because the intervention needs to be designed, implemented and only afterwards, data on its effect can be collected. The second in-person sessions (1-2 weeks) are held after data collection, and involves data analysis & reporting workshop. In some cases (depending on available funding) an additional 1-week scientific writing workshop is delivered. There are few formal milestones to be met in the programme design. However, it is encouraged that research results are written up as scientific manuscripts and submitted for publication. KNCV also ensure dissemination to NTP leadership and incorporation of results in guidelines.

KNCV builds long-term research capacity by building institutional capacity through the following activities:

- Strengthening individuals and providing career options via training
- Collaborations with academia and research institutes
- Involvement with data management units in relevant institutions
- Creating networks and coordinating bodies
- Building the capacity of ethical review committees (by developing those from scratch or identifying such committees for use by NTP)

K.3 Results

K.3.1 Curriculum development

The basic OR training draws on the comprehensive two-volume modular textbook entitled "*Designing and conducting health system research projects*' developed by the International Development Research Centre in 1991, and revised with KIT (Royal Tropical Institute in the Netherlands) in 1999.[69] The modules are summarised below. KNCV has since updated the curriculum with new TB methods and strategies and constantly adapts it to local needs.

[69] Varkevisser CM, Pathmanathan I, Brownlee A. Designing and Conducting Health Systems Research Projects. Volume I: Proposal Development and Fieldwork, Volume II: Data analysis and report writing. WHO / International Development Research Centre, KIT Publishers, 2003. Available at http://archives.who.int/prduc2004/Resource_Mats/Resource_Materials.htm Accessed on 1/9/2014

Table 39 Proposal Development and Fieldwork Modules

Module	Title
1	Course orientation
2	Introduction to health systems research
3	Identifying and prioritising problems for research
4	Analysis and statement of the problem
5	Review of available literature and information
6	Formulation of research objectives
7	Introduction to health systems research methodology
8	Variables
9	Study types
10	Data collection techniques (research instruments, interview skills, focus groups)
11	Sampling
12	Plan for data collection
13	Plan for data processing and analysis
14	Pre-testing the methodology
15	Work plan
16	Budget
17	Plan for administration, monitoring and utilisation of results
18	Finalising and reviewing the research proposal
19	Fieldwork activities
20	Field work report

Table 40 Data Analysis and Report Writing Modules

Module		Title
21		Orientation to the workshop on data analysis and report writing
22		Description of variables
23		Analysis of qualitative data
24		Cross-tabulation of quantitative data
25		Measures of association based on risk
26		Dealing with confounding variables
27		Preparation for statistical analysis: Measures of dispersion, normal distribution and sample variation
28		Choosing a significance test
29		Determining differences between groups: Analysis of unpaired observations
30		Determining differences between groups: Analysis of paired observations
31		Measuring associations between variables: Regression and correlation
32		Writing a research report
33		Dissemination, communication and utilisation of research findings

KNCV has developed an additional teaching block on manuscript writing that includes the following themes:

- Manuscript topic and key message(s)
- Choosing a journal
- Writing the Introduction and Literature review
- Writing the Methods and Results section
- Writing the Discussion and Conclusion
- Figures and Tables
- Writing the Abstract and Cover letter
- Reference list and reference software
- Dealing with journals, submission, rejection, reviewers

K.3.2 Facilitators/mentors

Facilitators (2 per course with 4 to 7 teams) are senior epidemiologists employed by KNCV head office who run the workshop together with a few in-country KNCV staff or representative from in country universities as co-facilitators (in recent years courses were often funded by TB CARE I/USAID, earlier courses were funded through

different donors like DfID or GFATM). This way the training courses also contribute to local capacity building. A good example of capacity building is Indonesia that already runs its own training courses.

Facilitators establish personal relationships with participants and guide their learning and research process. Facilitators should have over 5 years of OR experience, having published in peer-reviewed journals, good knowledge of local language, and willingness to spend on average 1-3 hours a week with a team of course participants.

K.3.3 Supervision of MSc/PhD students

The objective of student supervision is to build capacity and knowledge about TB and operational research. PhD students after graduation often contribute to teaching others. Most PhD students come from countries that have established partnership with KNCV. Students conduct research in country settings at parent organisations but with co-supervision by staff at KNCV. Most students get their degree from the University of Amsterdam if they satisfied requirements such as five first author publications in peer-reviewed international journals.

There were 13 PhD students supported and supervised by KNCV between 2010-2014. Four completed their studies and obtained their degrees in the Netherlands, three completed their degrees in their home countries, three international PhDs and three national PhDs are still on-going. Students publish their research in international journals including BMC Infectious Diseases, Int. J. Tuberc. Lung Dis., Trop. Med. Int. Health, Emerg Infect Dis. and PLoS One.

K.3.4 Reporting and monitoring processes

No pre-set milestones exist for the participants related to progression and project monitoring. However, it was acknowledged that introduction of milestones may be a useful way to drive effectiveness. Reports are normally written in English together with a summary in the local language with implementable recommendations for policy makers.

K.3.5 Programme outputs

Institutionalisation

KNCV is part of the STOP TB Partnership Research Movement: A collaborative forum for funders and implementers (including The Union) to coordinate plans and actions with the aim to engage researchers, programme managers and affected communities. KNCV and The Union are also coalition partners in the global USAID TB project (TB CARE I in the last 4-5 years, and TBCAP and TBCTA in the 10 years before). KNCV and The Union work together on technical TB assistance, research projects and courses: examples include joint OR courses in Ethiopia, SORT-IT course in Central Asia, and a one-week OR course in China. KNCV also participates in several Union working groups. KNCV and The Union appear to have mutual respect and collaborate on research projects and courses, but sometimes they also compete for funding.

KNCV also collaborates with local institutes to deliver capacity building, not necessarily through OR courses: examples in Indonesia include the University of Indonesia, Sutomo Hospital, Makassar Provincial Health Office, and the WHO Indonesia.

Peer-reviewed publications by course participants

Examples of publications of research projects written by course participants together with facilitators include the following:

- Indonesia 2005/6 course resulted in 3 publications: BMC Health Services Research,2007; BMC Public Health. 2009; BMC Pulm. Med. 2009. It is noted that KNCV delivered on average 4 OR courses in Indonesia between 2005 and 2012.

- China 2007/8 OR course resulted in 4 publications: BMC Public Health, 2010; BMC Public Health, 2011; BMC Health Services Research, 2011; submitted.
- China 2009/10 OR course resulted in 1-2 publications: BMC Health Services Research, 2011; manuscript in preparation.
- Ethiopia OR courses resulted in 7 publications: 6 research papers and 1 overview accepted in a special issue of the Public Health Action. It is noted that The Union is involved in this OR course under the USAID TB CARE I program.
- From recent courses in Cambodia, Ethiopia, Namibia and Nigeria on average 3 publications per country are in preparation at the moment.

Conference participation

Projects results are often disseminated at national and international conferences, such as the Annual TB Research Advisory Committee (TRAC) conferences in Ethiopia and the international and regional Union conferences.

K.3.6 Programme outcomes and impacts

A clear example of sustainable capacity building by KNCV is the institutionalisation of OR teaching in Indonesia where local partners now deliver the OR courses independently.

KNCV uses key strategic indicators to evaluate success of their programme:

- Proportion of KNCV core countries with a TB research agenda and/or a TB research capacity building plan available, to which KNCV has contributed. There were 10 countries that meet this requirement: Botswana, Ghana, Ethiopia, Indonesia, Kazakhstan, Kenya, Namibia, Tajikistan, Vietnam, and Netherlands in 2010-2013.
- TB research capacity developed to which KNCV contributed through funding and/or guidance. Approximately 170 participants received training in OR courses supported by KNCV in 2010-2013.
- Percentage of KNCV core countries with at least one completed research project supported by KNCV through mentoring or support in which the local principal investigator contributed significantly. Twelve out 17 countries fulfilled this requirement in 2010–2013.
- Percentage of research reports in KNCV core countries of which the recommendations were taken up within three years. Eight out of 17 countries fulfilled this requirement in 2010–2013.

K.4 Value for Money

We received financial information for OR courses delivered in China. In 2007/8 the budget for TA by KNCV was £34,300 (contract with DfID); in 2009/10 the budget for TA by KNCV was €37,401 (contract with GFATM). Both budgets were for a 2-week data-analysis workshop, 1-week monitoring visit, 2-week data-analysis and reporting workshop, and 1-week scientific writing workshop; the budget did not include costs by China NTP/MoH for travel and stay of participants and for research implementation costs.

K.5 Lessons learnt

- The successful examples of KNCV OR courses across the globe show that employing just 2 facilitators per course involving 4 to 7 local research teams, is a cost-efficient way of conducting OR courses.
- The OR course teams composed of four members from academia and NTP staff contribute to building sustainable local links for future training and research. Note that local partners now deliver the OR courses in Indonesia independently.

- It is practical and sustainable to use mentors from the regional universities supporting the OR course teams with the international KNCV team backstopping the mentors.
- It is good practice to obtain approval of participants' time commitment for the course from their line managers.
- Selection of participants requires careful attention so that skills learned will be utilised in further research projects after the conclusion of the course. Note that participants that do not already have research experience (as shown by international publications) will learn more during the course, but successful finalisation of research projects including publication may be more challenging.
- It is not necessary to provide funding to course participants
- Language skills are an essential component of active learning. Suitable level of English is a requirement but KNCV trainers speak Spanish, French, Portuguese, and Russian besides English. In other cases specialist translators need to be involved.
- Internet access represents a challenge in some African countries if online preparations are necessary to deliver effective courses there.

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