



REVIEW ARTICLE

Building operational research capacity in the Pacific

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Operational research (OR) in public health aims to investigate strategies, interventions, tools or knowledge that can enhance the quality, coverage, effectiveness or performance of health systems. Attention has recently been drawn to the lack of OR capacity in public health programmes throughout the Pacific Islands, despite considerable investment in implementation. This lack of ongoing and critical reflection may prevent health programme staff from understanding why programme objectives are not being fully achieved, and hinder long-term gains in public health. The International Union Against Tuberculosis and Lung Disease (The Union) has been collaborating with Pacific agencies to conduct OR courses based on the training model developed by The Union and Médecins Sans Frontières Brussels-Luxembourg in 2009. The first of these commenced in 2011 in collaboration with the Fiji National University, the Fiji Ministry of Health, the World Health Organization and other partners. The Union and the Secretariat of the Pacific Community organised a second course for participants from other Pacific Island countries and territories in 2012, and an additional course for Fijian participants commenced in 2013. Twelve participants enrolled in each of the three courses. Of the two courses completed by end 2013, 18 of 24 participants completed their OR and submitted papers by the course deadline, and 17 papers have been published to date. This article describes the context, process and outputs of the Pacific courses, as well as innovations, adaptations and challenges.

Operational research (OR) in public health has been defined as research into strategies, interventions, tools and knowledge that can enhance the quality, coverage, effectiveness or performance of the health system or disease programme in which research is being conducted.¹ We view OR as a spectrum of activities that encompasses reviews of data already collected in patient registers, treatment cards or patient files, and evaluations of operational practices and the implementation of new strategies, interventions and technologies.²

Since 2009, the International Union Against Tuberculosis and Lung Disease (The Union), in collaboration with Médecins Sans Frontières (MSF), has been running courses designed to build the capacity of national health staff in performing OR. These courses have been convened by leveraging funding that is predominantly for National Tuberculosis Programmes (NTPs). However, as the OR programme has evolved, we have been

able to attract additional funds to expand the focus of OR projects to a range of health issues. The purpose of the course is to teach practical skills for conducting and publishing OR that will contribute to changes in policy and practice that are relevant to local needs.³ The modular-based course emphasises 1) careful selection of participants according to pre-defined criteria; 2) logical progression through the steps of the whole research process, i.e., from creating a research question through to publishing a paper and formulating recommendations for changes in policy or practice; 3) the achievement of milestones to progress from one module to the next; 4) support from employers of participants to allow time and resources for the research; 5) support from experienced public health practitioners who act as mentors; 6) the development of a final product, i.e., a research paper submitted to a peer-reviewed scientific journal (which constitutes the final milestone); and 7) potential for trained participants to become mentors on future courses.⁴ Course graduates are followed up by The Union and MSF after completing the course, and ongoing OR activity is monitored.⁵

There are many reasons why publication is a key focus of the course.³ First, participants learn the process and rigour needed to produce well-argued, concise work for peer review, their work benefits from the quality control and intellectual input provided by peer review, and they gain credibility as first author of a published paper. Second, research results need to be published for greater credibility and national and international dissemination. Third, national and international policy making increasingly uses and cites published scientific papers to underpin statements in policies and guidelines.

The term 'operational research' is often used interchangeably with implementation research. Depending on the definitions used, there may be little difference between the two. The World Health Organization (WHO) defines implementation research, as 'the scientific inquiry into questions concerning implementation' taking into account contextual factors.⁶ OR may differ slightly from implementation research, as OR explicitly seeks to build capacity in local health programme staff to conduct the research. In addition, implementation research is often broader in scope than OR and may use a broader range of research methodologies.⁷ The OR courses have placed an emphasis on the publication of study results so that policy and practice can be influenced, whereas implementation research may tend to focus more on report writing for policy makers. How-

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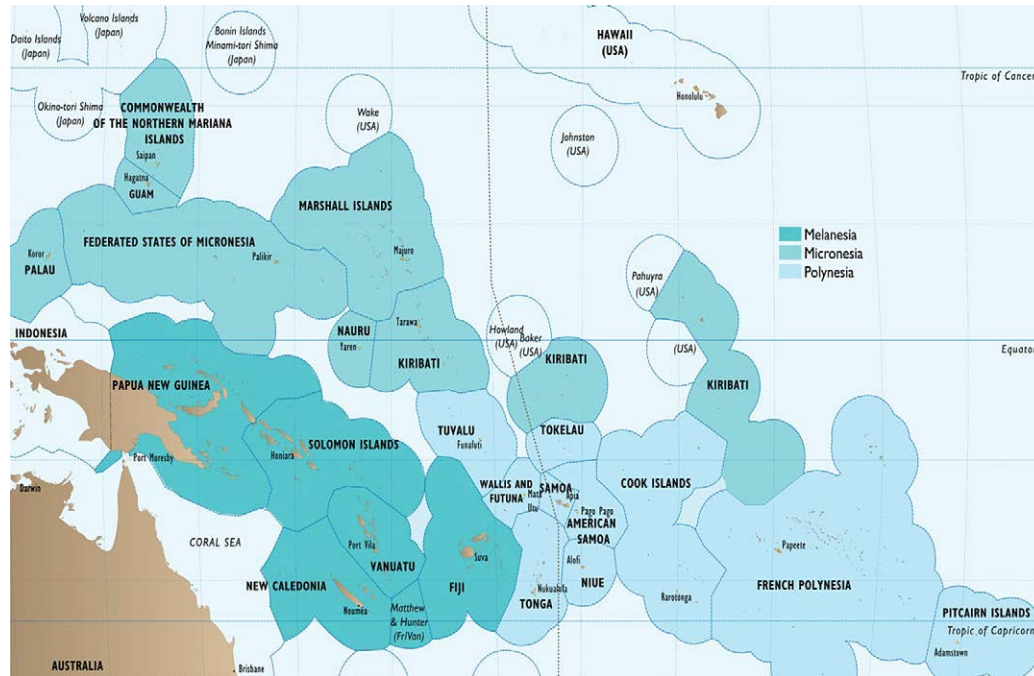


FIGURE Map of the Pacific Island countries and territories (Courtesy Secretariat of the Pacific Community, Nouméa, New Caledonia).

ever, both seek to conduct research that is embedded in a 'real world' setting, with due regard for contextual factors, including the structure of the health system.^{1,6–8}

THE PACIFIC CONTEXT

The Pacific Islands region is composed of 22 Pacific Island countries and territories (PICTs) with diverse populations, cultures, economies and politics. The region is divided into three sub-regions—Micronesia, Melanesia and Polynesia—based on linguistic, cultural and ethnic characteristics (Figure).⁹ The total population is estimated at 10 million. Approximately 50% live in rural areas and outer islands, although there is an ongoing process of urbanisation towards the Pacific Islands' capitals.¹⁰

Challenges in delivering health care

Health care in PICTs is primarily provided by national governments, often supplemented by considerable amounts of international support and with small contributions from the private sector.¹¹ Health care systems are largely based on a primary health care model that is similar in most low- and middle-income countries (LMICs). However, they are often fragile and poorly funded, and at times struggle to meet the health care needs of their populations.¹¹ Curative and tertiary services continue to receive most of the allocated health resources.¹¹ Provision of health care to remote and rural areas is often expensive and logistically challenging. Most PICTs suffer from a shortage of health care workers and other health care commodities.^{11,12}

Disease burden

Rapid changes in the social, economic and environmental situation have significantly impacted the health and well-being of Pacific Island populations. As

health determinants and risk factors have changed over time, there has been an increase in non-communicable diseases (NCDs) across the region.¹³ Diabetes mellitus is of particular concern, due to its relatively high prevalence, debilitating complications and economic costs to governments and society. The prevalence of diabetes among adults (aged 20–79 years) was estimated at 7.6% in 2012, and is expected to increase to 8.6% by 2030.¹⁴ There are large regional differences in diabetes prevalence,^{15–19} with estimated prevalence figures from as low as 6.1% in the most populous country in the Pacific, Papua New Guinea (PNG), to as high as 47.3% in American Samoa.¹⁴

In addition, communicable diseases such as lower respiratory infections and diarrhoea, and neglected tropical diseases such as tuberculosis (TB), leprosy, leptospirosis and lymphatic filariasis, persist in the Pacific, and in some cases are re-emerging. TB case notification rates in some PICTs are often among the highest in the World Health Organization (WHO) Western Pacific Region. In 2011, a total of 16 534 TB cases were notified in the Pacific, with the majority of cases notified in PNG ($n = 14 893$, 90%). In 2011, Kiribati reported the region's highest TB case notification rate, at 334 cases per 100 000 population.²⁰ The burden of TB and other communicable diseases varies greatly by PICT, with some countries moving towards the elimination of TB and other communicable diseases, and others still recording high rates of TB and other communicable diseases.¹²

The evidence for interactions and synergies between communicable diseases and NCDs is growing in the Pacific, with countries at various stages of the epidemiological transition.^{21,22} The association between TB and diabetes has long been a concern for NTPs in the Pa-

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cific. In 2010, it was estimated that approximately 42% of all TB cases in the northern Pacific were attributable to diabetes.²³ Although some NTPs are now implementing TB-diabetes collaborative activities, evidence about the effectiveness, cost and yield of these activities is lacking, and OR may assist PICTs in evaluating and improving TB-diabetes interventions before scale-up.

Rationale for operational research in the region

International public health strategies and plans recommend that OR should become a key component of health programmes.^{24–28} This is reflected in regional disease-specific strategies such as the Regional Strategy to Stop TB in the Western Pacific: 2011–2015, which states that ‘operational research is a crucial tool to evaluate and study the application of various mechanisms, interventions and tools.’²⁹ Our collective experience in international public health has also convinced us that OR is essential. Well-designed, programme-based OR can identify constraints in meeting health programme objectives, investigate them and recommend improvements to enable better functioning of the programme. However, OR capacity in the Pacific has not been well developed, and additional focus is needed to build and sustain this capacity. We believe that OR capacity building should begin with national health programme staff,³⁰ while collaborations are forged between national governments, technical agencies, local and regional academic institutions and others, to support and promote OR in the region.

Operational research: needs and challenges

The adage ‘data rich, information poor’ seems to fit many of the PICTs. Health programmes are collecting a wealth of data on various health indicators.^{31–33} Although these data are used for annual reports by Ministries of Health and regional agencies, there is often little evidence of any further analysis by the local health services themselves, or of use of the data to improve policy and practice. These data are seldom used for carrying out OR, and there appears to be a lack of a research culture within and between countries in the Pacific in general. There may be many reasons for this, including the fact that research is not regarded as high priority; programme staff having limited time, research skills and lacking motivation to do research; difficulty obtaining the necessary resources; and variable quality in the design of studies and in the recording, analysis and reporting of data.³⁴ Additional factors believed to contribute to the failure among programme staff to publish and/or to disseminate the results of any research conducted to a wider audience include limited ethics review procedures, meaning that researchers have little guidance about how to conduct and write up ethical research or transparency about how decisions about ethics approval and accountability are made, and limited scientific paper writing skills and peer review opportunities.³⁴ Cuboni et al. noted that research and the sharing of information between countries is further complicated, among other things, by the Pacific region’s cultural and linguistic diversity, geographical distances and the range of skills among health workers, while highlighting that one fundamental element of getting research done is still ‘the determination to see it done.’³⁵

The lack of a research culture³⁶ may also have been influenced by what has been described in a key paper from the year 2000 as ‘research imperialism,’ in which health research is driven by external agendas, leaving local personnel and communities feeling that research is owned and conducted by ‘outsiders’ who are interested in specific issues, regardless of their relevance to the region’s needs.³⁴

Related to this is the concern that research efforts by international agencies and organisations in the Pacific have not concen-

trated enough on training local researchers.³⁷ A study examining the number of papers authored by Pacific researchers on reproductive health in 14 PICTs from 2000 to 2011 found that only 19 (16%) of 122 multi-authored papers had first authors of Pacific ethnicity.³⁷ A similar review of health research publications in Fiji found that, of 298 papers published between 1965 and 2002, only 95 (31.8%) had one or more Fijians involved in the authorship. Of the total of 815 instances of authorship (including sole, first and co-authorship), Fijian authorship represented only 17.7% ($n = 144$), and of these 144 Fijian authorships, only 38 (26.4%) were first or sole authors.³⁵

Also of concern is the limited availability of personnel with appropriate research skills or qualifications in specific disciplines to conduct the type of research required for evidence-informed policy making. One project that sought to facilitate the achievement of higher academic degrees for Pacific Islanders suggested that being employed in a key role within a Ministry was a major barrier to undertaking further study and research.³⁸ Other barriers were potential financial losses, job insecurity and the need to support family on a doctoral stipend. A project involving collaboration between Samoa and New Zealand included a collaborative health research methods course to strengthen health research capacity in Samoa.³⁹ The authors reported that although Samoan citizens who are sent to be trained in overseas institutions do return, many return with minimal skills in health research, and all return to a work environment that is not yet suited to undertaking or supporting locally led health research.³⁹

In fact, as most Pacific Island nations are not able to provide postgraduate medical training or health research training, many of their health care staff have to go overseas to train. Limited academic preparation is recognised as a barrier to pursuing such training. Geographical isolation continues to pose a challenge for their ongoing training and skill development.⁴⁰ Open and distance learning approaches are often portrayed as low-cost ways to overcome issues of distance. However, these approaches do not necessarily meet local cultural expectations or preferred learning styles.⁴¹

Various factors have been identified to support learning among Pacific people during in-country or overseas training, including having a social structure during learning that allows for group activities and positive peer pressure,^{40,42} and incorporating a hands-on and oral learning style as compared with the more individualised ‘Western’ written educational and testing style.⁴¹

Translating research evidence into policy has been recognised as another challenge facing the region.³⁴ Seeing that few evidence-informed policy initiatives were being undertaken to address the problem of overweight and obesity in the Pacific, one recent research project implemented and evaluated an innovative knowledge exchange intervention between researchers and policy makers in Fiji.⁴³ This resulted in the presentation of 20 policy briefs to high-level decision makers, and the improvement in skills of researchers and policy makers in the research-to-policy processes. Such initiatives, however, appear to be rare, and the research-to-policy-to-practice paradigm does not yet appear to be integrated throughout the general health services, universities and non-government organisations (NGOs) in the Pacific.

OPERATIONAL RESEARCH COURSES IN THE PACIFIC

Since 2011, three Union/MSF OR courses have been organised in the Pacific: Fiji September 2011–August 2012, Fiji May 2013–February 2014, and the Pacific course September 2012–August 2013.

The two courses in Fiji included participants from Fiji only, while the Pacific course included participants from seven PICTs. The Fiji courses were collaborative efforts between the Fiji National University, the Fiji Ministry of Health, the Secretariat of the Pacific Community (SPC), the WHO, The Union and MSF, while the Pacific course represented a collaboration between the SPC, The Union and the University of Auckland. Both courses used the Union/MSF model of OR training. The Pacific course had a focus on TB, NCDs and the interaction between the two, while the Fiji course covered a range of topics related to communicable diseases, NCDs, laboratory issues and health systems.

The Union/MSF's three module approach to OR training was used. This approach is based on the three distinct types of activity involved in the research process: 1) protocol development, 2) data management and analysis, and 3) paper writing. Each 5-day-long module contained content aligned to the sequential activities that the participants need to undertake to make progress with their own research project and to write a paper as first author. The content of each module and the relevant outcomes and milestones are described in Table 1. The maximum number of participants for each course was 12. Each participant was assigned two mentors who worked with them throughout the course, and had access to additional mentors experienced in data management and the software taught during Module Two.

Mentors on the Pacific operational research courses

The mentors for the courses comprised a team of international and regional experts on TB, diabetes, Pacific health and research from several organisations (Table 2). A team of senior mentors was assisted by junior mentors who had participated in the Fiji OR course. The junior mentors were from the Fiji Ministry of Health, the Fiji NTP and the Fiji National University. SPC technical and project management staff provided technical and organisational support throughout the course. The Fiji National University and the University of Auckland were key academic partners for the project, building on an existing relationship between the two institutions.

Over the three courses, we have introduced a number of new mentors to the Union/MSF approach and created a regional pool of mentors who can facilitate on future courses. As not all mentors will be available each year for various courses that may be requested, it will be important to have a pool of mentors who have gone through the course in its entirety. Once mentors have completed an entire course, they have a more in-depth understanding of the ethos, processes, challenges and outputs of the OR course. They are then also able to recommend potential new mentors from among their academic or health services networks. We have opted for a multidisciplinary configuration of mentors; our experience is that it is ideal to have a mix of senior mentors who have extensive experience and highly developed skills in medicine, public health, health care implementation, ethics, OR, policy development, writing, editing and reviewing papers, academic mentorship and adult learning, and junior mentors who are experienced in the delivery of health services in their country and who have some experience in conducting and/or applying research.

INNOVATIONS, ADAPTATIONS AND CHALLENGES IN THE PACIFIC CONTEXT

In the Pacific OR courses, we adapted each course slightly to meet local needs and challenges, while retaining the core course material. The innovations and adaptations are summarised in Table 3

and a selection is more fully described below. The challenges are summarised in Table 4.

Discussion about research questions from participants before Module One

For the Fiji 2011–2012 course, the two international senior mentors spent 5 hours with the group of participants before Module One to discuss their research questions, including relevance, feasibility and data sources. This enabled various issues to be identified and resolved, and some topics were modified before Module One commenced. This was especially relevant for individuals who were not familiar with research methods. In several cases, participants were unaware about the specifics of the data sources that they were proposing to use, for example, which data are collected and how many years of data are available. For the Fiji 2013–2014 course, the local junior mentors held the same type of meeting before Module One. It was not possible to have a preliminary face-to-face discussion with all the Pacific participants. However, some mentors were able to discuss topics with participants during travel to their countries for other professional missions or via e-mail.

A gap of 2 months between Modules One and Two

Courses being held in other parts of the world have been running Modules One and Two back-to-back, which is a change from the previous practice where they were held approximately 2 months apart.⁴⁴ In the Pacific, we have continued to maintain a gap of approximately 2 months between the first two modules. Reasons for this are specific to the Pacific context. First, given the fact that many health programmes have few staff, it would be hard for programmes to send participants away from their posts for what would be almost 3 weeks. Second, we found that the level of previous exposure to data management and research methods, as well as educational level, was on average lower than in participant cohorts in other courses. Written feedback from participants, collected using a structured questionnaire, showed that the majority ($n = 9$, 75%) found Module One extremely intense. This finding was confirmed during the verbal feedback session, where all participants mentioned challenges, with some describing how they had experienced a steep, but fulfilling, intellectual and personal learning curve. They appreciated the time given to recover and digest the learning from Module One before embarking on data management and statistics in Module Two. Third, it enabled three points of contact between participants and mentors instead of two, with two before any data collection. This fitted better with the Pacific context, where it is often said that face-to-face verbal communication is preferred over electronic contact.⁴¹ Fourth, the gap allowed most participants to obtain ethics approval before attending Module Two, so that they could begin data collection promptly. Fifth, it allowed participants to check data sources thoroughly before Module Two, so that the variables entered into EpiData (EpiData Association, Odense, Denmark), the analysis software used in Module Two, corresponded to the data sources. Finally, the gap allowed the participants the time to communicate with their colleagues and supervisors about their research protocol and the philosophy of OR. This served to consolidate support, as well as to set up the expectation for participants to transfer information and lessons learned from the course to their colleagues.

Intensified support for the Module Two milestone

Originally, the milestone for Module Two required participants to send evidence of data collection and analysis to the module and

TABLE 1 Description of The Union/MSF OR course in the Pacific

Timeline	Short description of content	Outcome	Milestone
Before Module One	Pre-module meeting and/or contact between mentors and participants to discuss relevance, feasibility and data sources of participants' proposed OR projects OR symposium to launch the first course in a country, open to all interested parties (piloted in Fiji)	Draft research question and list of issues to clarify before Module One Institutions and individuals aware and supportive of upcoming activity; local feedback about training approach and local OR priorities	
During Module One	Protocol development: 1) Define the research question 2) Authorship, aims and objectives, study population and sampling, definitions of variables and outcomes, ethical issues, draft questionnaire or data collection instrument, logistics, budget	Draft protocol written by the participant and draft completed form for submission to The Union's Ethics Advisory Group	Submit final version of protocol and completed ethics form within 2 weeks of the end of the module
Before Module Two	<ul style="list-style-type: none"> • Participants complete their national or local ethics application, aiming to obtain approval before Module Two • Participants check again the data sources they intend to use, obtaining a sample (e.g., list of variables, or photocopy or electronic sample) of the data sources ready for Module Two • Participants resolve any practical and/or institutional issues, so that data collection can commence smoothly after Module Two • Participants read short pre-module document on statistics • Inter-module meetings led by local junior mentors to advance various aspects of participants' projects (piloted in Fiji; feasible in national courses) 		
During Module Two	Data management and analysis: 1) How to ensure efficient quality-assured data 2) Developing data instruments using EpiData 3) Analysis and presentation of data	Draft instrument for electronic data collection/entry and draft tables and graphs	Present EpiData files and draft tables and graphs at the plenary Submit EpiData data collection files 2 weeks after the module Submit data sets before Module Three
Before Module Three	<ul style="list-style-type: none"> • Participants collect, enter and validate data • Participants analyse data and prepare tables for Module Three • Inter-module meetings led by local junior mentors to advance various aspects of participants' projects (piloted in Fiji; feasible in national courses) 		
During Module Three	Paper writing: 1) Principles of writing scientific papers (including how to write title, abstract, introduction, methods, results, discussion, references, acknowledgments, key words) 2) How to manage the online submission process 3) How to deal with peer review, i.e., point-by-point responses and revision of paper 4) How to use the research to influence policy and practice	Draft research paper	Finalise draft research paper with mentors' support Submit paper to international peer-reviewed journal within 4 weeks of completion of Module Three
After Module Three	Influencing policy and practice: Participants distil their paper into a presentation, practise before mentors and peers, then present during a research symposium answering audience questions (piloted in Pacific course)	A presentation on research findings and implications for policy and practice	

The Union = International Union Against Tuberculosis and Lung Disease; MSF = Médecins Sans Frontières; OR = operational research.

course organisers several weeks before Module Three. More recently, participants had to start creating their EpiData files and 'dummy' tables and figures (draft versions with no data) during the module and send them 2 weeks after Module Two.⁴⁴ We piloted a new way of running this module: time was allocated for helping participants to finish (or almost finish) their EpiData files and dummy tables and figures during the module. Participants were also required to present them for discussion at the plenary on the last day. This allowed for more intense and personalised technical support during the week, as well as peer review and dis-

cussion about analysis for each project individually at the plenary. It also helped participants to start thinking early on about how to prioritise and present their data so that decision makers would pay attention to their findings and recommendations.

Pacific operational research symposium after Module Three

The convention has been for Module Three to finish on day 5 with a plenary session in which participants present their 95% finished papers. For the Pacific course, we asked participants to present their work at a Pacific OR symposium, following course

TABLE 2 List of organisations that supported the Fiji and Pacific operational research courses by providing mentors and/or facilities

Name of organisation	Type of organisation
International Union Against Tuberculosis and Lung Disease	International non-governmental organisation, scientific institute
Médecins Sans Frontières	International non-governmental organisation
Fiji National University, Suva, Fiji	Academic institution
Fiji Ministry of Health, Suva, Fiji	National government
Secretariat of the Pacific Community, Nouméa, New Caledonia	Inter-governmental organisation
The University of Auckland, Auckland, New Zealand	Academic institution
World Health Organization, Division of Pacific Technical Support, WHO Representative Office in the South Pacific, Fiji	Technical agency
United States Centers for Disease Control and Prevention	Federal government
The University of Sydney, Australia	Academic institution
Regional Public Health, Lower Hutt, New Zealand	Regional health service provider
The University of Otago, Dunedin, New Zealand	Academic institution
The University of Melbourne, Melbourne, VIC, Australia	Academic institution
The University of Queensland, Brisbane, QLD, Australia	Academic institution

TABLE 3 Innovations and adaptations introduced in the Union/MSF Operational Research training courses in the Pacific, 2011–2013

Innovation	Description and rationale
Fiji Operational Research Launch Symposium	In 2011, before the commencement of the collaboration on operational research in Fiji, a 2-day symposium was held at the Fiji National University with the participation of Fijian and international partners involved and open to anyone interested in the upcoming course. It explained the course rationale, content and process, and sought local and regional feedback and support. It obtained print and television media coverage.
Discussion about participants' research questions before Module One	As part of the Fiji courses, the senior and junior mentors met with participants before Module One to discuss the relevance and feasibility of participants' research questions. They endeavoured to determine the appropriateness and availability of participants' proposed data sources and to ensure participants had been in contact with the relevant health programmes and stakeholders to gain support for the research question and process. This component allows participants the time to check up and resolve identified issues before Module One.
A gap of 2 months between Modules One and Two	In all three courses, we had a gap of approximately 2 months between Modules One and Two. In other courses, Modules One and Two are now usually run back-to-back. The gap allowed Pacific participants to be away from their workplace for a shorter length of time each time, to learn skills and new knowledge and to advance their project in a staged approach, which was deemed more suitable in the Pacific context.
Intensified support for Module Two milestones	In the Union/MSF courses elsewhere in 2012, the first of two Module Two milestones was submission of EpiData files and draft tables and graphs 2 weeks after Module Two, although completion during the module was not required. In our courses, we allocated time during the module to help participants prepare these files and draft tables and graphs in class and then to present these for discussion in plenary on the last day of Module Two. The intensified support and immediate feedback on files and documents during the course helped participants to prepare for sending their documents 2 weeks later for the first Module Two milestone.
Pacific Operational Research Symposium after Module Three	In the Pacific course, we held a dissemination symposium directly after Module Three. Each participant prepared a 10-min oral presentation on the background, methods, results and conclusions of their study. Participants practised with their mentors and peers, and incorporated feedback before presenting on the day to a large, informed audience and participating in panel discussions to answer audience questions. Thus, participants left with an additional output: improved dissemination skills and a presentation ready for communicating their research findings to Ministry staff and other stakeholders on return.
Inter-module meetings about operational research	In the Fiji courses, the organisers held meetings between the modules to discuss progress with various aspects of the participants' operational research journey, such as the ethics procedures, data collection, entry, analysis, participants' research budgets, and keeping motivated and on time for milestones. A Fiji National University librarian provided a session on finding and using references. The junior mentors organised sessions to facilitate participants' online submission. Meetings were low-cost, as most participants were based in Suva, but it would be well worth continuing the meetings, regardless of where participants are based.
Choice of course venues	For the Pacific course, we chose the University of Auckland as the course venue for Module Three. For the Fiji courses, the Fiji National University was the course venue. These two universities are important for both undergraduate and postgraduate studies in the Pacific Islands region. Our aim was to showcase Pacific-led operational research and to help consolidate links between staff from Ministry of Health programmes, non-governmental organisations and academic staff from these universities and those universities to which the mentors are affiliated.
Introduction of a new session into the curriculum on Excel	We introduced a short session on Microsoft Excel into the Module Two curriculum in the Pacific course. Although we do not recommend using it for data entry, we were aware that some participants had existing data sets in Excel that required some modification before importing into EpiData. The session also recognised the fact that many health data sets in the region use this software and that participants' skills in it were generally poor. Any upskilling might benefit programmes that use Excel for their routine data collection.

TABLE 4 Challenges faced when implementing The Union/MSF operational research courses in the Pacific, 2011–2013

Participant experience	Many did not have a Masters of Public Health qualification and had little or no previous experience in conducting research. A minority seemed to have had limited experience in applying themselves to a project and keeping themselves motivated through to completion.
Local ethics	There were delays in obtaining local ethics approval for some of the projects, which in turn delayed the start of these projects.
Data sources and permissions	One participant was not able to access the data that he thought he could access, and therefore had to withdraw from the course. Many participants in the Fiji 2011–2012 course did not know their data sources sufficiently the week before Module One. For this reason, we requested participation in subsequent courses to bring detailed descriptions of data sources, including variables available.
Mentor role and workload	We are still learning how best to initiate new senior mentors into the course and quantify and manage the commitment required in between modules. The workload can be considerable, which is a challenge for those who do not have full-time financial support from elsewhere.
Support from local researchers and institutions	Many countries are yet to create local networks that can support participants and integrate operational research into their programmes or services. Some institutions are not yet familiar with operational research and do not fully appreciate what participants have committed to. International and local junior mentors are currently the most involved in accompanying participants through the research process.
Data analysis and interpretation	This proved extremely challenging for many participants. They required additional time and assistance in class and between modules for EpiData, data analysis and interpretation.
Co-authorship	Obtaining approval from all co-authors' organisations in time to submit the paper after the end of Module Three was a challenge for some.
Module length	Some participants felt that each of the three modules should be longer so that additional topics could be incorporated into the curriculum or additional time could be given to existing topics.
Funding	The Pacific course budget comprised a mix of funding supplied by various donors and various projects, which resulted in a large administrative workload for the organisers. Longer-term sustainable funding is required if these courses are to continue in the Pacific.
Sustainability of mentor pool	It seems easier for universities than health care services to allow staff permission and time to mentor participants. As we value a mix of mentors from different organisations and with different professional backgrounds, we will need a strategy to show mutual benefit for mentors who are being released from health care services.

completion. The learning objectives were to distil the essentials from a paper into a Powerpoint presentation using a pre-defined template; practise presenting and responding to questions from a wider audience, including academics, health care workers and decision makers; and prepare for dissemination of their results and policy discussions on their return to post. We also aimed to introduce participants to students, staff and other contacts who work on similar topics in the Pacific and to expand awareness about the course in the region.

To develop the presentations, we followed the same procedure as for paper writing: the participant would sit down with the mentors and edit it side-by-side and/or e-mail it to mentors and receive written feedback. A 2-h practice session in four groups was held on the day before the symposium. Participants familiarised themselves with the technical aspects of presenting, checked the length of their presentations, clarity of the slides and verbal explanations, and practised answering questions from the audience. A senior expert opened each session; three to four participants presented their research findings and policy and practice recommendations, and the session finished with a panel discussion, allowing presenters to respond to audience questions.

PACIFIC OR COURSE OUTPUT

Trained participants

A total of 36 participants enrolled in the three OR courses; of the two courses that have been completed ($n = 24$), 17 (71%) passed all course milestones. Seven participants did not complete the course: six did not meet the milestones, and/or had to leave the course for family or professional reasons, and one participant died. The participants came from eight PICTs; the majority ($n = 24$, 67%) were from Fiji, and all had participated in the national Fiji courses (Table 5); 61% of the course participants were female.

The participants were working in a range of professions; the

majority were nurses and physicians ($n = 24$, 67%; Table 5). A wide range of other professional groups were represented, reflecting the multidisciplinary nature of the training (Table 6). All participants were working in the local health system at the time of commencing the course. The participants undertook research projects on a diverse range of locally relevant topics, including TB, NCDs, the association between TB and diabetes, sexually transmitted infections, including human immunodeficiency virus (HIV), laboratory and diagnostic issues, sepsis, nosocomial infections, congenital rubella and human resources for health (Table 7).

Papers

Participants submitted a total of 19 papers to journals, 10 from the Fiji course and 9 from the Pacific course. All participants were the first author on their papers, reflecting their contribution to their research project and the write-up of their papers. To date, a total of 18 of these are either in press or have been published in a range of peer-reviewed scientific journals.^{45–52} The outputs of the two completed courses are summarised in Table 8. Table 9 lists all research projects developed by participants of the three courses.

Trained junior and senior mentors

We endeavoured to train three junior mentors who had been participants in the first Fiji course. Training consists of being paired with a senior mentor and facilitating at least one complete course run by the Union/MSF core team members. Of the three selected, one emigrated before the training opportunity, another has been trained on only one Fiji module so far, and another has been able to train in two Fiji modules but only one of the three Pacific modules. While having local mentors fulfils a very important criterion for local ownership and uptake, this does depend on whether they can be released by employers to complete their training.

Ten new senior mentors have been introduced to the OR course and are now considered part of the pool of senior mentors

TABLE 5 Country of residence of participants enrolled in operational research courses in the Pacific, 2011–2013

Country	<i>n</i>
Fiji	24
Tonga	2
Vanuatu	2
New Caledonia	1
Solomon Islands	2
Federated States of Micronesia	1
Marshall Islands	3
Cook Islands	1
Total	36

TABLE 6 Employment profile of participants enrolled in operational research courses in the Pacific, 2011–2013

Job profile	<i>n</i>
Nurse (clinical and lecturers)	13
Physician	11
Nutritionist	2
Laboratory technician	2
Pharmacist	2
Monitoring and evaluation officer	1
Researcher	3
Physiotherapist	1
Journalist	1
Total	36

TABLE 7 Topics of research projects of those enrolled in operational research courses in the Pacific, 2011–2013

Topic	<i>n</i>
TB	10
Non-communicable diseases	8
TB and diabetes	5
Sexually transmitted infections/HIV	4
Laboratory and diagnostics (TB)	3
Other (leprosy, sepsis, nosocomial infections, congenital rubella, human resources for health)	6
Total	36

TB = tuberculosis; HIV = human immunodeficiency virus.

for any future courses. Although we selected mentors on the basis of their individual experience, skills and approach, we also deliberately created a network that includes a variety of academic, governmental organisations and NGOs, as well as professional disciplines and teaching and mentoring styles.

Increased awareness about OR and expansion of the network

Feedback obtained from participants indicated that the course addresses their individual needs as well as the needs of their institutions and the health programmes in which they are involved. Furthermore, a number of institutional links have been formed and/or reinforced through the courses, with increased awareness among their staff about The Union/MSF approach to OR. In addition, the OR course has been showcased in regional meetings such as the Pacific Stop TB meeting, and is being considered as a component of public health training in the region.

THE FUTURE

Translation of results into policy and practice

Following publication of their research, participants are encouraged to work collaboratively with national Ministries of Health and partner technical organisations to ensure that the results are applied locally and, where appropriate, that they influence the refinement or development of local policies. Dissemination of results is usually the first step. Following the Fiji 2011–2012 course, the Fijian institutions involved organised a research dissemination day in the presence of the Minister of Health and other key policy makers. Several participants from the recent Pacific course have reported that they used their Powerpoint presentations prepared during Module Three to present to colleagues and policy makers on their return. Regarding policy change, the Fiji NTP has recently indicated that several recommendations from the research conducted in the 2011–2012 course have been incorporated into its work plan, including regular cross-checking between laboratory and treatment registers to prevent initial loss to follow-up of smear-positive TB patients, the development of a collaborative TB-diabetes framework and bi-directional screening for TB and diabetes, and improvements in sputum collection and smear examination and related training and reporting. Over the longer term, we aim to document whether changes in policy and practice are being reported in the countries involved.

Ongoing evaluation of output

All participants of the Union/MSF courses are contacted annually to complete a brief questionnaire about their activity related to

OR. We are thus able to follow participant output beyond the course. Our aim is to ensure that all participants continue to conduct and publish OR, to pass on understanding about OR and skills to others, and to contribute to the expansion of a regional network of people using OR to improve health outcomes in the Pacific.

Further courses

Requests to hold further national and regional courses have come from PICTs, but the logistics and funding for such courses need to be determined. Potential funding sources include international donors, philanthropic foundations, health research institutes and co-funding between NGOs or other partners that are focused on specific health topics such as HIV, TB and lung health, diabetes, maternal and child health, etc.

Recognition and integration

We are investigating how the OR course might be recognised by academic and governmental institutions such as universities and Ministries of Health. In January 2013, The Union and MSF OR units joined forces with the WHO Special Programme for Research and Training in Tropical Diseases. The three organisations have developed a blueprint for training public health programme staff under the Structured Operational Research Training Initiative (SORT-IT). This recognition of the course should make it even more appropriate for institutions to consider crediting it towards

TABLE 8 Output from two completed operational research courses run by The Union/MSF and partners in the Pacific, 2011–2013

Indicator	<i>n</i> (%)
Participants starting the course	24
Participants passing the final milestone*	17 (71)
Number of participants' papers submitted to peer review journals†	19
Number of participants' papers accepted or in press by 15 May 2014	18
Number of participants' papers currently under review	0

*One participant from the 2011–2012 Fiji course was replaced by a colleague who completed the course.

†For the 2011–2012 Fiji course, one participant submitted two papers; two participants submitted one paper each but have not yet achieved publication, making a total of 10 papers. For the Pacific course, eight participants submitted by the milestone deadline and one participant submitted after the deadline, making a total of 9 papers. Three mentor-led papers about the Pacific experience are also being published, but are not included in this total.

The Union = International Union Against Tuberculosis and Lung Disease; MSF = Médecins Sans Frontières.

TABLE 9 Publication status of participants' projects developed during Pacific operational research courses, 2011–2014

Participant country	Title of research project	Name of journal	Publication status
Fiji Operational Research Course, 2011–2012			
Fiji	Audit of the practice of sputum smear examination for patients with suspected pulmonary tuberculosis in Fiji	Transactions of the Royal Society of Tropical Medicine and Hygiene	Published
Fiji	Congenital rubella syndrome in Fiji: 1995–2010	Journal of Tropical Medicine	Published
Fiji	Trends in cervical cancer in Fiji between 2000 and 2010	Public Health Action	Published
Fiji	Management and treatment outcomes of previously treated tuberculosis patients in Fiji, 1997–2010	Public Health Action	Not published
Fiji	Prevalence of anaemia, syphilis and hepatitis B in pregnant women in Nausori, Fiji	Public Health Action	Published
Fiji	The trend of tuberculosis cases in Fiji's largest treatment centre over 60 years: 1950–2010	Public Health Action	In press
Fiji	Relationship between education and training activities and tuberculosis case detection in Fiji, 2008–2011	Public Health Action	Published
Fiji	Nurses graduating in Fiji between 2001 and 2010: sufficient supply for Fiji's health service demands?	Public Health Action	Published
Fiji	Primary school compliance with school canteen guidelines in Fiji and its association with student obesity	Public Health Action	Published
Fiji	Screening tuberculosis patients for diabetes mellitus in Fiji	Public Health Action	Published
Fiji	Characteristics of people living with HIV in Fiji	—	Did not complete the course; not published
Fiji	Perception of tuberculosis patients on the quality of health service delivery received during anti-tuberculosis treatment in Fiji	—	Did not complete the course; not published
Fiji	What is the prevalence of non-communicable diseases in the adult prison population in Fiji in 2012	—	Did not complete the course; not published
Pacific Operational Research Course, 2012–2013			
Vanuatu	Tuberculosis case burden and treatment outcome in children, adults and older adults, Vanuatu: 2007–2011	Public Health Action	Published
Vanuatu	Profile of tuberculosis patients with delayed sputum smear conversion in the Pacific Island of Vanuatu	Public Health Action	Published
Solomon Islands	Tuberculosis incidence, case characteristics and treatment outcomes: urban vs. rural in Solomon Islands	Public Health Action	Published
Tonga	Smear microscopy for tuberculosis in Tonga: referral rates and turnaround times in the main and outer islands	Public Health Action	Published
Cook Islands	Characteristics of government workers and their association with diabetes and hypertension in the Cook Islands	Public Health Action	Published
New Caledonia	Describing the burden of non-communicable disease risk factors among adults with diabetes in Wallis and Futuna	Public Health Action	Published
Tonga	The burden and spectrum of disease suffered by diabetes mellitus patients in Tonga	Public Health Action	Did not meet the final milestone; published
Marshall Islands	Screening adult tuberculosis patients for diabetes mellitus in Ebeye, Republic of the Marshall Islands	Public Health Action	Published
Federated States of Micronesia	Screening for tuberculosis and latent infection in diabetes patients, Pohnpei, Federated States of Micronesia	Public Health Action	Published
Marshall Islands	Countrywide intervention for health promotion and active case-finding in Majuro, Republic of the Marshall Islands	—	Did not complete the course; not published
Solomon Islands	Management and outcomes of smear-positive pulmonary TB patients who fail to smear-convert at 2 months of treatment in the Solomon Islands	—	Did not complete the course (deceased); not published
Marshall Islands	Contact investigation among household members of smear-positive pulmonary TB cases in Ebeye Island, 2009–2011: relationship to diabetes mellitus status	—	Did not complete the course; not published
Fiji Operational Research Course 2013–2014			
Fiji	Absolute lymphocyte count is not a suitable alternative to CD4 count for determining initiation of antiretroviral therapy in Fiji	JAIDS	Rejected; resubmitting elsewhere
Fiji	A descriptive analysis of diabetes-related amputations at Colonial War Memorial Hospital, Fiji, from 2010 to 2012	Public Health Action	Under review
Fiji	Evaluation of the implementation of Xpert® MTB/RIF assay in Fiji	Public Health Action	Under review
Fiji	Sputum smear conversion and treatment outcomes for tuberculosis patients with and without diabetes in Fiji	Public Health Action	Under review
Fiji	The spectrum of bacterial pathogens isolated from neonates with suspected sepsis in an intensive care unit in Fiji	Journal of Infection in Developing Countries	Rejected; resubmitting elsewhere
Fiji	Stroke rehabilitation in Fiji: are patients receiving services?	Public Health Action	Under review

TABLE 9 (continued)

Participant country	Title of research project	Name of journal	Publication status
Fiji	A comparison of tuberculosis treatment outcomes by method of treatment supervision in Fiji Islands	Public Health Action	Under review
Fiji	A descriptive study of nosocomial infections in an adult Intensive Care Unit in Fiji: 2011-12	Journal of Infection in Developing Countries	Under review
Fiji	Comparison of treatment response for tuberculosis using fixed-dose combination versus single-drug preparations in Fiji	Public Health Action	Submitted
Fiji	Tuberculosis diagnostics in Fiji: How reliable is culture?	Public Health Action	Under review
Fiji	Demographic and clinical characteristics, co-morbidities and treatment outcome of tuberculosis in Fiji	Public Health Action	In press
Fiji	A descriptive study of urethral discharge among men in Fiji	New Zealand Journal of Medicine	Under review

continuing professional education and degrees such as Masters in Public Health. The major organisations currently involved are keen to see how the OR courses can facilitate enhanced collaboration between the academic, non-government and health care implementation sectors.^{53,54}

Sustainability

It is hoped that the involvement of key individuals and institutions from the region will help to expand OR exponentially. Regionally based mentors can be involved in various ways in promoting OR and providing longer-term support to the graduates of the course. Furthermore, OR may be incorporated into regional policies, strategies, guidelines and funding applications. The involvement of local mentors and experts should facilitate the ongoing development of a cadre of Pacific-based OR experts who can collaborate on future OR projects and continue to apply this knowledge to influence local policy and practice. Holding Module Three and the Pacific OR symposium at the University of Auckland was designed to link participants with relevant university contacts, and motivate them to continue applying their OR skills once they return to their programmes. At the national and regional levels, the OR courses have aimed to promote applied learning and networking that can be further developed and utilised once the course has been completed.

The cost effectiveness of such training as compared to other methods of OR capacity building is an important factor to consider. While we have not carried out a cost-effectiveness analysis, and have not yet been able to monitor long-term outcomes for our participants, we think that our approach to OR capacity building is one of several that can be used. Other approaches might include online learning, one-off training modules that cover distinct pieces of the research process, academic degrees and onsite training in OR during research led by external researchers. All approaches to OR capacity building have cost implications and different outputs, with our approach likely costing more than online learning, but significantly less than an academic degree.

CONCLUSION

Improving OR capacity in the Pacific requires a multipronged approach, with a focus on sustainability and capacity building of local staff who work in health programmes. The Union/MSF OR course, which has a focus on building OR capacity in local staff who conduct and publish OR projects, would seem to complement initiatives that provide Masters and Doctoral scholarships for overseas study.

The Fiji and Pacific OR courses have built capacity for a total of 36 national health programme staff and promoted collaboration between a variety of academic, technical and governmental partners. In addition, junior mentors have been trained and a network of people interested in OR in the region has been developed. Annual evaluations will determine the long-term benefits and impacts of this training. We believe that this model is appropriate for the Pacific context and that it will contribute to the realisation of health programme objectives in the region.

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En santé publique, la recherche opérationnelle (RO) vise à identifier des stratégies, des interventions, des outils et des connaissances susceptibles d'améliorer la qualité, la couverture, l'efficacité ou la performance de systèmes de santé. L'attention a récemment été attirée sur le manque de capacités en recherche opérationnelle des programmes de santé publique dans toutes les îles du Pacifique malgré des investissements considérables dans leur mise en œuvre. Ce manque de réflexion critique pourrait empêcher le personnel des programmes de santé de comprendre pourquoi les objectifs ne sont pas totalement atteints et entraver des progrès à long terme en santé publique. L'Union Internationale contre la Tuberculose et les Maladies Respiratoires (L'Union) a collaboré avec les agences du Pacifique pour offrir des cours de RO basés sur un modèle de formation élaboré par

L'Union et Médecins Sans Frontières Bruxelles-Luxembourg en 2009. Le premier a débuté en 2011 en collaboration avec l'Université nationale de Fidji, le Ministère de la santé de Fidji, l'Organisation Mondiale de la Santé et d'autres partenaires. L'Union et le Secrétariat de la Communauté Pacifique ont organisé un deuxième cours pour les participants des autres îles du Pacifique en 2012 et un cours supplémentaire destiné aux participants Fidjiens a commencé en 2013. Douze participants ont été enrôlés dans chacun des trois cours. En ce qui concerne les deux cours terminés avant la fin de 2013, 18 participants sur 24 ont terminé leur RO et soumis leurs articles avant la date limite. A ce jour, 17 articles ont été publiés. Cet article décrit le contexte, l'organisation et les résultats des cours du Pacifique ainsi que les innovations, adaptations et défis.

La meta de la investigación operativa en salud pública consiste en estudiar las estrategias, las intervenciones, los instrumentos o los conocimientos que fortalecen la calidad, la cobertura, la eficacia y el desempeño de los sistemas de salud. En tiempos recientes, se ha llamado la atención sobre la falta de capacidad de realizar investigación operativa en los programas de salud pública en todas las Islas del Pacífico, pese a una inversión considerable en la ejecución. La falta de una reflexión crítica permanente impide que el personal del programa de salud comprenda las razones por las cuales no se cumple a cabalidad con los objetivos y dificulta además el logro de beneficios a largo plazo en materia de salud pública. La Unión Internacional contra la Tuberculosis y las Enfermedades Respiratorias (La Unión) ha colaborado con entidades del Pacífico a fin de llevar a cabo cursos de investigación operativa, con base en un modelo de capacitación elaborado por La Unión y Médicos Sin Fronteras de

Bruselas y Luxemburgo en el 2009. El primero de estos cursos comenzó en el 2011, en colaboración con la Universidad Nacional Fiji, el Ministerio de Salud de Fiji, la Organización Mundial de la Salud y otros asociados. La Unión y la Secretaría de la Comunidad del Pacífico organizaron un segundo curso dirigido a participantes de otros países y territorios de las Islas del Pacífico en el 2012 y en el 2013 comenzó un nuevo curso, destinado a participantes de las Islas Fiji. Cada uno de los tres cursos contó con 12 participantes. En los dos cursos terminados antes del fin de 2013, 18 de los 24 participantes completaron la investigación operativa, presentaron sus artículos dentro del término previsto en el curso y hasta la fecha, se han publicado 17 artículos científicos. En el presente artículo se describen el contexto, los procedimientos y los resultados de los cursos de las Islas del Pacífico y se comentan además las innovaciones, las adaptaciones y las dificultades encontradas.