Implementation Workshop 10 Feb 2021 Report

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Summary

The Global Health Network and the Special Programme for Research and Training in Tropical Diseases (TDR) hosted an "Implementation Workshop" to understand how best to implement the Essential Research Skills Training Curriculum.

The aim of the study for ***Developing an Evidence Based Essential Research Skills Training Curriculum*** was to identify what constitutes the minimum set of skills, knowledge and key principles that would enable those with limited or no previous experience, to undertake high-quality research for health. The study design was underpinned by a three-stage methodology: a knowledge gap analysis, an e-Delphi consensus building process and this Stakeholder Review Workshop. Over 7,000 participants from across the globe took part in this study including: research teams, healthcare professionals, research organisations, funding organisations and policy makers. The earlier study steps defined this essential curriculum in the form of 13 module titles or topics. Collectively these topics cover the whole research system and therefore, delivering this training to a team will provide the right skills to run safe, high-quality and ethical studies.

The aim of this workshop was to ask the researchers how best to implement this curriculum and turn it into training and teaching resources relevant for the global research community. These are the recommendations from this workshop:

- Interactive educational sessions, problem based learning and discussion with facilitator of mentor would be most effective online learning tools alongside downloadable resources.
- Certificates of completion and course endorsement by leading global health institutions are the strongest motivators for trainees. Additional opportunities such as graduation projects, training progression and collaborations with research institutions would strengthen the curriculum.
- It was important to provide multiple options for delivering training such as: "training the trainer" resources, hand-on experience, networking opportunities, mentorship and access to experts as well as having materials available in multiple languages. Providing access to online management systems and core teams would build a global community of trainers.
- Providing curriculum materials for trainers in module format would help the integration of this framework within existing local research training programs. Linking the training with career development schemes and academic institutions would support the uptake of health research training.
- Embedding this curriculum in global, national and institutional outbreak response plans would guide the development of research training in such emergencies.

The Essential Research Skills Training curriculum will be openly available along with all the supporting data in order that any group, team or organisation could take it forward to guide their training programme. This workshop has generated guidance on implementation so that anyone wanting to design their training around this curriculum can also benefit from evidence-led recommendations on what approaches will work best in their specific context.

Introduction:

On 10th February 2021, The Global Health Network (TGHN), and the Special Programme for Research and Training in Tropical Diseases (TDR) hosted a virtual "*Implementation Workshop*" to determine optimal approaches for implementing the Essential Research skills Training Curriculum. This workshop is the final stage of the study process for *Developing an evidence-led Essential Research Skills Training Curriculum*. In response to the COVID-19 pandemic, the workshop was hosted virtually, using the zoom video conferencing system. Here we report the results of this workshop.

Date of Workshop - 10 February 2021, 13.00-14.30 GMT

Workshop chairing panel

- *Trudie Lang,* Professor of Global Health Research at the University of Oxford and Director of The Global Health Network
- *Pascal Launois,* Research Capacity Strengthening Scientist at TDR and Manager of the Career Development Fellowship programme.
- *Arancha de la Horra,* Clinical Research Specialist at The Global Health Network
- *Bonny Baker,* Regional Programme Lead, The Global Health Network
- *Nicole Feune,* Scientific coordinator, The Global Health Network
- *Sinéad Whitty*, Head of Training, Teaching and Career Development, The Global Health Network,

1. Background to the workshop

The aim of the study for ***Developing an Evidence Based Essential Research Skills Training Curriculum*** is to identify what constitutes the minimum set of skills, knowledge and key principles that would enable those with limited or no previous experience, to undertake high-quality research for health. The study design was underpinned by a three-stage methodology to ensure an evidence-led approach for establishing this evidence-led curriculum. The *Stakeholder Review Workshop* was part of stage 3.

Stage 1: Gap analysis

We conducted a comprehensive review of the responses from a series of research training needs surveys, session evaluations from research training workshops, and feedback submitted on completion of eLearning, collected by The Global Health Network from 2017 to 2019. We analysed the responses of 7167 participants from across 153 countries. This analysis provided us with a range of research skills topics and subject areas that generated a core list of 98 research-training themes.

Stage 2: Two-round e-Delphi

The second step was to find consensus on what constituted the ***minimum set*** of skills, knowledge and key principles that would enable those without previous experience in research, to undertake high-quality health research. We conducted a two round online Delphi survey to prioritise the outcomes of the gap analysis. The Delphi panel for this study was formed of both experts and stakeholders in the field of research for health and research for health training, with heterogeneous expertise and from diverse geographical regions. We sought to include views of researchers, research participants, research training facilitators, members of research advisory committees, research funders, authors of peer-reviewed research training papers, authors of research training books/programmes, journal editors, research policy makers and regulators.

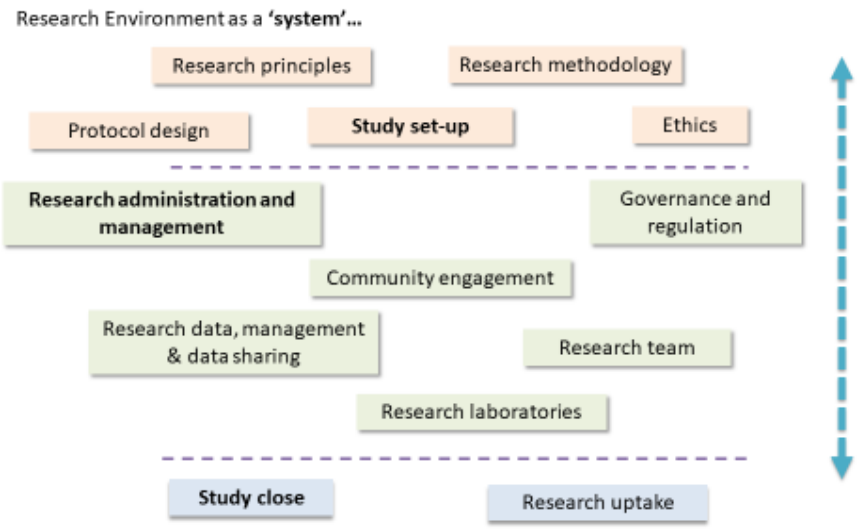
Delphi Round 1 **-** The Delphi Round 1 survey offered an opportunity for panellists to i) indicate which of the 98 themes derived from the stage 1 Gap analysis they considered *essential* for inclusion in the Essential Research Skills Training Curriculum, *and* ii) suggest any themes that might have been omitted.
The themes presented were scored by the panel on the basis of two classifications: [a] relevance (should this topic / theme be included?) and [b] clarity of each statement (is it clear what the category or theme reflected?)
There were 254 members on the Delphi panel for Round 1. The panel reached consensus on 43 listed themes to be *included* in the Essential Research Skills Training Curriculum. No consensus was reached for any theme to be outrightly *excluded* from the proposed framework.
The remaining 55 themes were re-evaluated in Round 2 (including 8 themes indicated as *unclear* in Round 1) and alongside 10 *new* themes generated by panellists in Round 1.

Delphi Round 2 **-** The Delphi Round 2 survey re-evaluated the remaining 55 themes including 8 themes indicated as *unclear* in the first round and alongside the 10 *new* themes generated by panellists in Round 1. For the purposes of Round 2, themes were scored using a nominal scale [yes/no] for both classifications; relevance and clarity. There were a total of 222 panellists participating in Round 2.

At the end of Stage 2, a final list of 108 themes was generated for inclusion in the curriculum. The research team grouped the themes into **13** 'parent modules' which were reviewed by the stakeholders attending the stakeholder workshop.

Mapping the themes- Following the Delphi study, the research team developed a curriculum framework by grouping the 108 themes identified by the panellists. This presented the structure of the curriculum by providing suggested 'parent modules' and the relevant themes generated and included to inform each module. See Appendix I. These theme groupings were initially presented and evaluated at a Stakeholder Review Workshop hosted in December 2020.

The proposed framework:



Stage 3: Stakeholder Review Workshop

In December 2020 we conducted a *Stakeholder Review Workshop*. This session brought together a diverse group of stakeholders from across the globe to consider the implications and applicability of the proposed Essential Research Skills training Curriculum.

The aim of this workshop was to consider the results of the study, to:

i) review the suitability of the theme groupings as an accurate reflection of the content, and
ii) to evaluate the applicability of the proposed Essential Research Skills Training Curriculum findings to the global research community

Further reference material and supporting information are available here:In

Essential Research Skills Training Curriculum webpage

Essential Research Skills Training Curriculum - Delphi survey round 1 report

Essential Research Skills Training Curriculum - Delphi survey round 2 report

Essential Research Skills Training Curriculum – Stakeholders' Review Workshop report

2. Objectives

This workshop was a joint collaboration between TDR and The Global Health Network. The aim of this workshop was to understand how best to implement the Essential Research Skills Training Curriculum by:

i) Determining the best mechanisms for delivering the training modules

ii) Supporting locally-relevant implementation of this training

iii) Understanding how these modules could be utilised in the context of a new outbreak

The research team gave a presentation offering an overview of the methodology undertaken and the findings of this study (see workshop agenda in annex 3). Participants engaged in an interactive polling exercise to add to these findings. This workshop focused on capturing experts' feedback to facilitate the implementation of the Essential Research Skills Training Curriculum.

3. Implementation workshop participants' characteristics:

The workshop was attended by 122 participants. The maximum concurrent view was 105 participants. The following figures describe their role as stakeholders in the field of health research.

a. What type of establishment do you primarily work for?

Stakeholders' work establishment	Total Numbers (n=122)	%
Academia (university, college,...)	55	45%
Commercial Research Organisation	3	2%
Community Health Centre/Facility	3	2%
Consultancy	5	4%
Government Ministry	5	4%
Government research organisation	10	8%
Hospital (Private)	5	4%
Hospital (Public)	13	11%
Industry (including Pharma)	2	2%
International organisation (IGO)	2	2%
Journal / Publishing company	0	0%
Non-government organisation (NGO)	7	6%
Public Health institute	5	4%
Regulatory organisation	0	0%
Other research organisation	4	3%
Self-employed	2	2%
Unemployed	0	0%
Other	1	1%

Table 1: Participants' primary work establishment

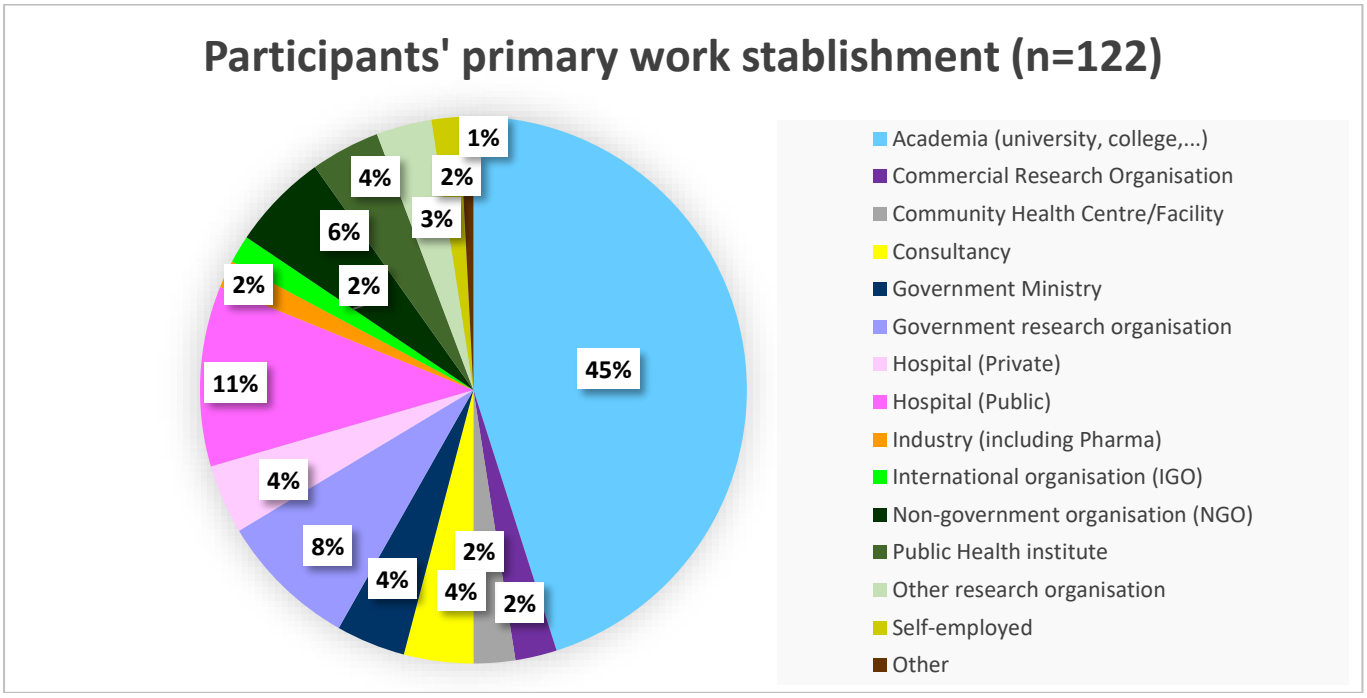


Figure 1: Participants' primary work establishment in percentages

b. Which of the following categories best describes your experience or role in research?

Experience in Research	Total Numbers (n=)	%
I have experience leading research projects	74	61%
I am currently working in research	98	80%
I am/have been the named lead on grant applications	41	34%
I deliver training in health research (e.g. GCP)	61	50%
I mentor undergraduate/postgraduate/PhD students engaged in research	67	55%
I am involved in the design or coordination of training curriculums that include research skills (e.g. undergraduate courses/medical courses)	47	39%
I am a member of a research advisory committee/international review board	28	23%
I work for a research funding organisation (e.g. Wellcome, EDCTP)	7	6%
I have authored and published peer-reviewed research training papers	30	25%
I have authored and published research-training themed books or manuals	9	7%
I am an editor or on the editorial board of a health research journal	20	16%
I am a policymaker or hold a position within the Ministry of Health	7	6%
I work for/have experience working for a regulator (e.g. FDA)	2	2%
I work for/have experience working within commercial industry (e.g. GlaxoSmithKline)	19	16%
Research participant in a research study (i.e. as a patient)	23	19%
Other	5	4

Table 2: Participants' experience in research (* multiple options could be selected)

Figure 2: Participants' experience in research (* multiple options could be selected) (total numbers)

c. What types of research methodology do you have experience in?

Research Methodology Experience	Total Numbers (n=)	%
Clinical trials	74	61%
Post registration / pharmacovigilance studies	20	16%
Epidemiological studies	76	62%
Case studies	51	42%
Observational studies	94	77%
Other quantitative methodology studies	39	32%
Qualitative methodology studies	42	34%
Mixed methods research	44	36%
Evaluation studies	38	31%
Consensus-method studies	9	7%
Action research	17	14%
Document research	21	17%
Not applicable (ie for research participants)	0	0%
Other, please state	39	32%

Table 3: Participants' research methods experience (* multiple options could be selected)

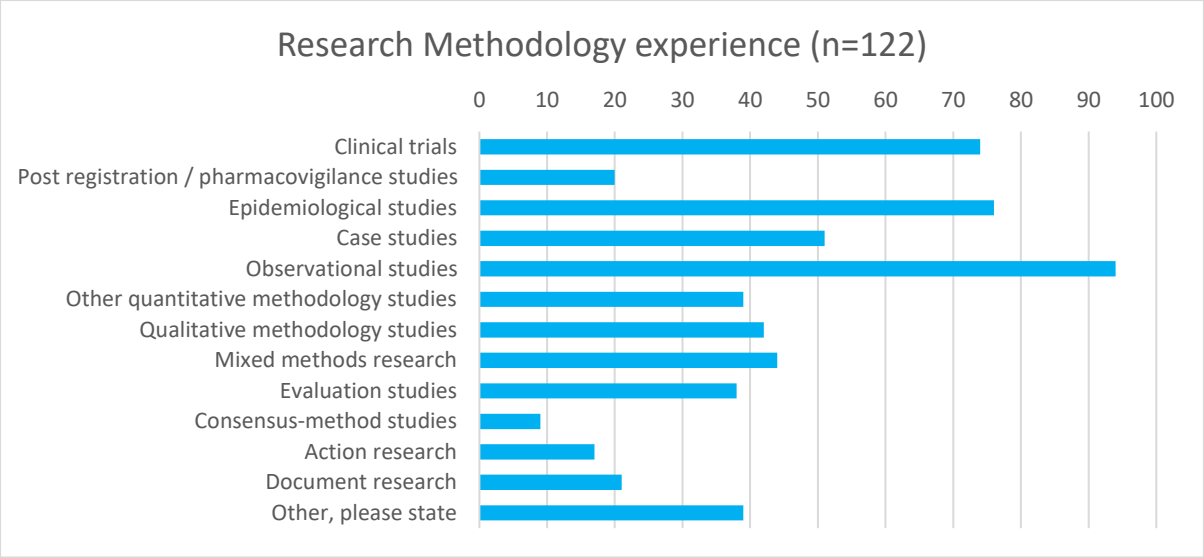


Figure 3: Participants' research methods experience (* multiple options could be selected) (Total numbers)

d. Which country/ies is your work primarily based in? Please list as many as applicable

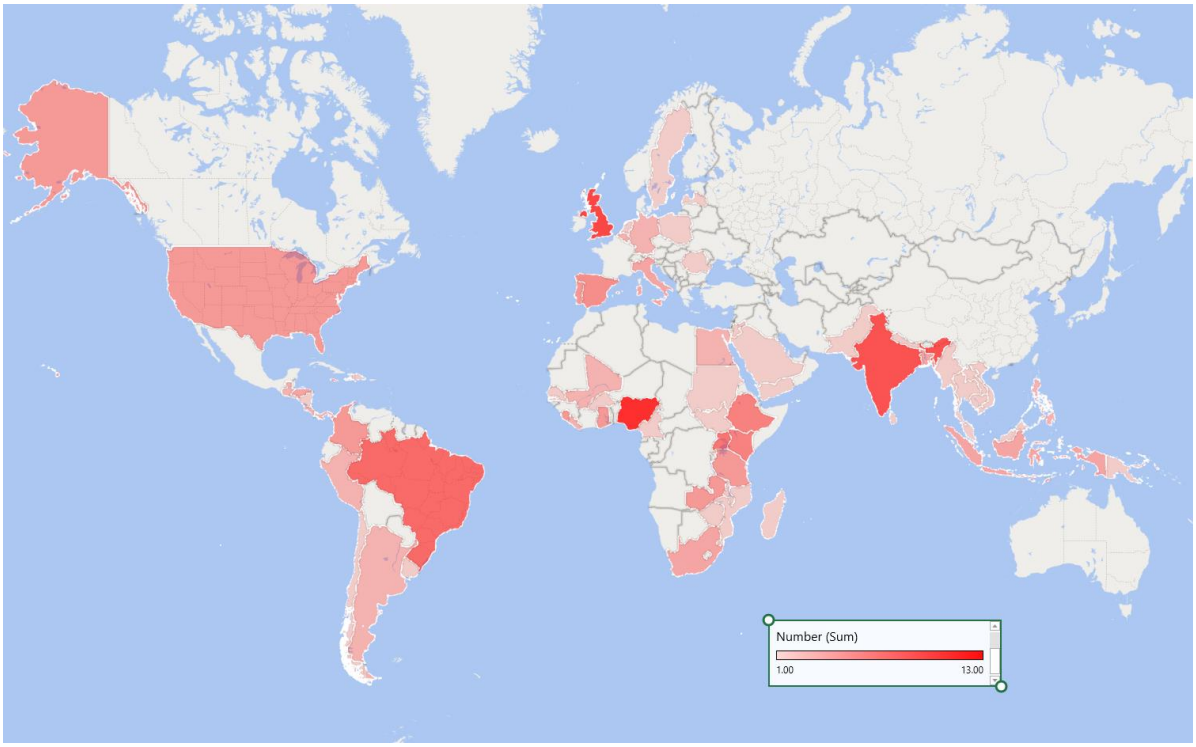


Figure 4: Participants' primary country/countries of work

4. Workshop polling

As part of the workshop, an interactive session sought to capture direct feedback and input from the participants. Each question was presented to the audience in turn, and attendees were asked to answer live by selecting their response on their screens or device. Attendees were also instructed to provide any further details or free-text answers to support their choice, in the Q&A feature of Zoom.

After each poll, the results were calculated and shared live, before moving on to the next question. Attendees had the opportunity to see the collective responses and views from across all participants.

Objective	Live questions
i) Determining the best mechanisms for delivering the training modules	**Question 1** - Which of the following online methods would work best for you in your setting? **Question 2** - What different forms of recognition would be valuable?
ii) Supporting locally-relevant implementation of this training	**Question 3** - What would help you in delivering this training? **Question 4** - How could these modules be presented and adapted to integrate with, or complement, existing research training in your setting?

iii) Understanding how these modules could be utilised in the context of a new outbreak	**Question 5** - How these modules could be utilised in the context of a new outbreak

Question 1 - Which of the following online methods would work best for you in your setting? Multiple options question.

Which of the following online methods would work best for you in your setting? (n=93)	Total	%
Mentoring opportunities	58	62%
Non-interactive educational sessions (formal presentations and lectures)	22	24%
Interactive educational sessions (e.g. workshops / seminars/ debates)	73	78%
Problem-based learning (e.g. case studies and scenarios)	59	63%
Downloadable course material	61	66%
Visual and auditory educational sessions (videos, films, YouTube clips)	51	55%
"How to" toolkits	36	39%
Downloadable standard formats for study documentation (e.g. protocols, check lists, SOPs)	53	57%
Other	3	5%

Table 4: Best online methods for participants 'research settings (* multiple options could be selected)

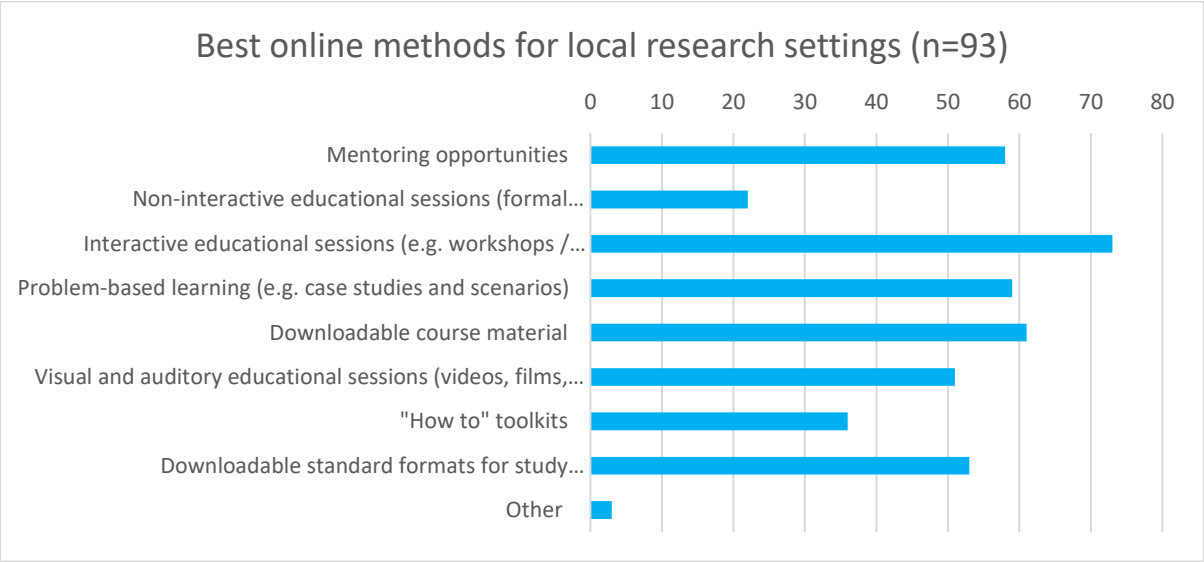


Figure 5: Best online methods for participants' research settings (total numbers)

Participants' comments and quotes

Workshop participants proposed varied mechanisms for implementation. Some preferred module training based on short courses, with a mix of online and offline options, given unstable local internet connections, and with the addition of face-to-face sessions after COVID-19. New suggestions comprised Q&A forums, interactive sessions and a combination of self-learning followed by discussions with facilitator or mentor.

"Blended learning (synchronous and asynchronous sessions), a combination of self learning and then discussion with facilitator or mentor" (Medical Sciences Faculty Professor, Honduras)

"The ability to 'stop/start' and continuation is important. An example is the EPAP training programme" (Patient Research Ambassador, UK)

There was high support for mentoring early career researchers by their local health institutions and for the creation of internships.

Participants also recommended to adapt the way the modules are delivered based on their content: *"For instance critical thinking might be best conveyed with active learning methods with case studies while GCPs are best delivered with online courses." (Scientific Director, Mali)*

"For me, an online set of modules (basic) with examples, videos, content, possibly even quick tests etc., with possibility of doing 'advanced' modules that link to local established learning (e.g. GCP in the UK). Would also like to have an option to visit others learning as well - international summer school would be great for people to mingle, learn and share experiences." (Public and Patient Involvement Facilitator, UK)

Question 2 - What different forms of recognition would be valuable?

Multiple options question.

What different forms of recognition would be valuable? (n=87)	Total	%
Certificates of completion (including details of hours and thematic plan of training completed)	76	87%
A tiered level of award based on attainment at assessment e.g. Pass, merit, honours	31	36%
Recognition by leading global and trusted health organisations	67	77%
Credit towards a formal university course	42	48%
Qualification e.g. Diploma	49	56%
Other	8	9%

Table 5: Most valuable forms of recognition (* multiple options could be selected)

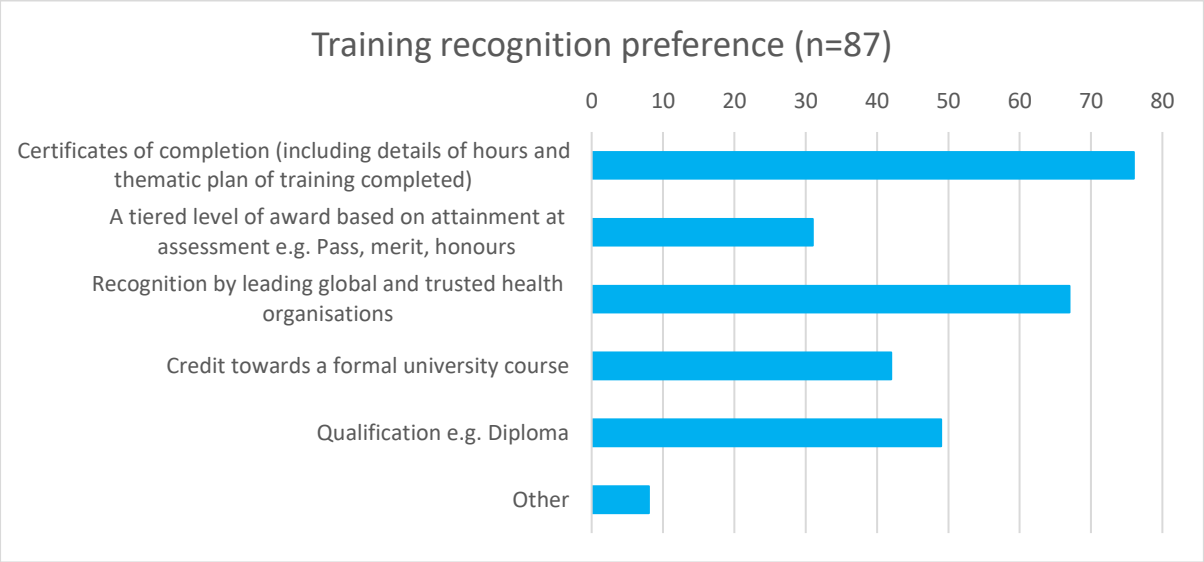


Figure 6: Most valuable forms of recognition (* multiple options could be selected) (total numbers)

Participants' comments and quotes

Evaluations and certifications were identified as incentives for high rates of training completion. Some participants suggested that "levels" would be useful so, some modules would be required to be completed before starting next-level modules.

"A compilation of the short courses can lead to an overall examination where an individual can achieve a higher award /qualification for the course as a whole." (Senior Lecturer, Jamaica)

Opportunity of progression within the training was also valued: "*online short courses that would eventually progress to a Diploma, will be very enticing." (Health Data Analyst, Nigeria)*

New suggestions included offering a graduation project at end of the program, participating in key meetings or conferences and opportunities to apply for fellowships or specialised training.

"Implementation of the curriculum could first online with awarding of certificate and later collaborating with research Institutions to adapt the curriculum in their institutions." (Research Student, Nigeria)

"I know it is silly, but possibly being able to have 'letters after your name' to show people that you have this qualification. Most important is making sure the world knows what this qualification is, what it represents, what it means that someone has passed it etc - no point having a certificate if no one knows how important it is or how good the course was." (Public and Patient Involvement Facilitator, UK)

Question 3 - What would help you in delivering this training?

Multiple options question.

What would help you in delivering this training? (n=95)	Total	%
Materials available in different languages	55	58%
Hands-on experience (pairing / site exchange programme)	67	71%
Mentorship programme	59	62%
'Access to experts' (e.g. Seek direct support from an ethicist, or statistician)	59	62%
Connecting with other researchers – networking opportunities	69	73%
Training resources for training others	70	74%
Other	8	8%

Table 6: Participants' preferred tools for delivering this curriculum (* multiple options could be selected)

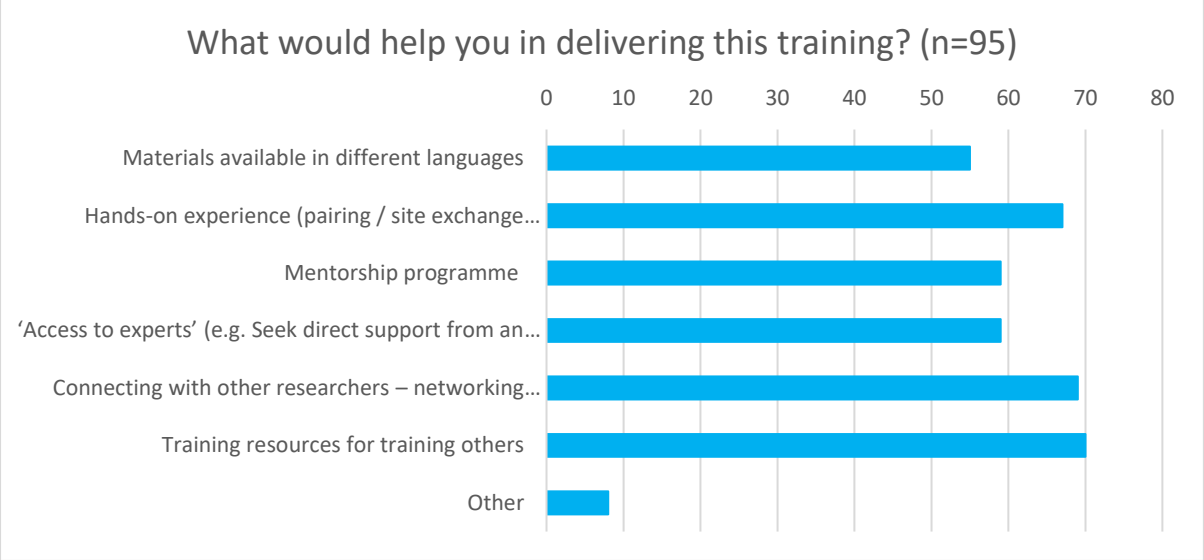


Figure 7: Participants' preferred tools for delivering this curriculum (* multiple options could be selected)

Participants' comments and quotes

Participants stated that they would like special support with *Education Technology* , access to an online learning management system to create professional material where you can also built in exams, create pod casts, etc. Having a referral/core team for trainers to liaise with was also important as well as being to access mentoring by a senior research from an international institution.

New suggestions comprised international summer schools, grouping of course attendees based on their research context similarities and having a global community of trainers. Participants found challenging how to assess, and recognize/certify the "hands-on" experience.

"For other studies we are working on, we see that countries in Latin America are very similar. So I am not sure how you are grouping the countries, if by income, culture, etc. I would suggest to analyse if our countries in Latin America do group together and then think of essential skills by region (cultural, language, geographic). I am asking because I saw Central America as part of North America instead of Latin America."(Professor, Costa Rica)

"Being part of a visible global community - to share ideas, ask for help, make suggestions etc. It is vital to know that there are other people out there in the same situation, and who can help you to adapt the training to your local needs. It would also be good to have a 'finish your learning, mentor someone else' scheme, especially locally, to help spread this within communities from more experienced to less. Get 'Big Names' involved as well as headline figures - possibly locally again - to give credibility and provide expert mentoring. Train us to train others!" (Public and Patient Involvement Facilitator, UK)

"It is surprising that about 50% are not including other languages...this is one of the main barriers for training in research in many countries!!" (Director of Education, Argentina)

Question 4 - How could these modules be presented and adapted to integrate with, or complement, existing research training in your setting?

How could these modules be presented and adapted to integrate with, or complement, existing research training in your setting? (n=95)	Total	%
Make the content available as subject 'modules' or chapters	66	69%
Present the content according to 'stage of study' (e.g. planning, operational, closing)	49	52%
Linking the training with career development schemes or training records	61	64%
Make the material available in a format suitable for learners and trainers	71	75%
Provide materials in multiple languages	47	49%
Other	15	16%

Table 7: Participants' preferred formats to facilitate integration of framework with existing local research training (* multiple options could be selected)

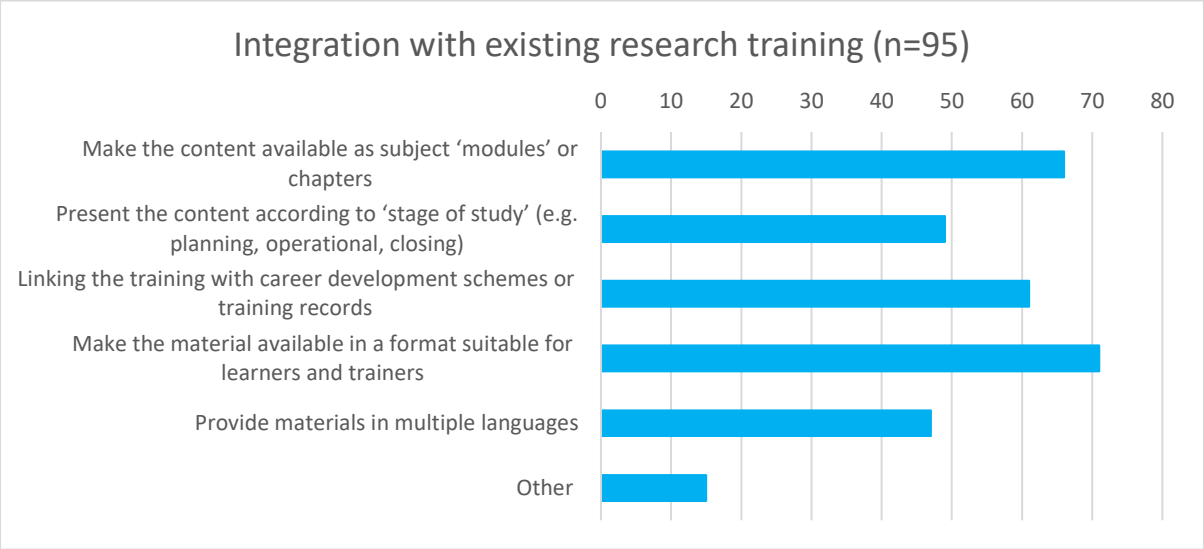


Figure 8: Participants' preferred formats to facilitate integration of framework with existing local research training (* multiple options could be selected)

Workshop participants recommended to:

- Include research training as part of appraisals, ongoing performance reviews and induction to new staff.
- Form partnerships with academic institutions and embed this research training in universities as a module in undergraduate studies in health (nursing, pharmacy, medicine, etc.), postgraduate, masters and doctorates.
  "Involve TDR Regional Training Centres and the Universities involved in the masters degrees (public health or epidemiology) as allies to incorporate this training in their courses."(Medical Sciences Faculty Professor, Honduras)
- Modules could be integrated as training requirement *involving politicians (Professor, Costa Rica)*
- To offer a school-friendly version of research training creating local "research clubs"

"Modules can be integrated as regulatory training by curriculum development authorities making it mandatory for graduate training. eg . National medical commission or national council for medical research." (Professor in Community Medicine, India)

"Delivering research course through the research team based on the organization, different sessions organized throughout the year." (Oncology clinical research nurse, Spain)

"Adaptable training modules that can be tailored to specific cadres or scenarios - for example modifying training on vaccine clinical trials to pregnant women clinical trials - same skeleton, different content." (Professor, UK)

"I think here in Brazil what we really need is to identify "researcher" as a profession and having this core curriculum is a great way to start walking in that direction. This is such a brilliant idea and I think it brings up the need for "formal" training to do research and also a way to value such individuals." (Regional coordinator, Brazil)

Question 5 - How these modules could be utilised in the context of a new outbreak

The preferred type of training suggested for training for new outbreaks was intensive, short and fast training; online based and possibly through phone app providing videos on course topics.
"During this pandemic, I have been able to do training virtually to researchers in hospitals, using their cell phones. It works when the message is focused, short and clear, no more than one hour per session. A fixed schedule along a month also works." (Head of Research Administration Program, Peru)

For those areas without internet a trained-trainer for face-to-face and offline resources would be needed. To have the capacity of face-to-face training in epidemics we would need to create a registry of trained-trainers to contact in these emergencies.
"Bank emergency trainers that will do expedited training when need arises. Make targeted summaries/instruction manuals that are available and easy to follow when need arises. Liaise with ministries of health and education in different countries and start training as soon as the curriculum is available. The more people are trained, the less the need for emergency training." (Medical Officer, Uganda)

Training during/for epidemics would require a bridge course focusing on skills considered more essential to such a situation, providing all those modules online and for free at once. The participants might benefit of undertaking this training having their own research project to work with.

"In outbreak situations in our African setting, researchers have to very innovative given that we don't have all that is needed to fight an outbreak. This training needs to in a realistic form so that peers can make use of the knowledge and devise new ways to manage disease in poor settings." (Researcher, USA)

It was important to facilitate the use of online research platforms*: "Empowering researchers for real time data capture, training through digital [or odk] platform about the new disease so that results can be collated from various regions and published faster. THHN and WHO can lead in setting up platforms." (Professor in Community Medicine, India)*

"Partner with local institutions for mentoring and certifications." (Institute for Clinical Effectiveness and Health Policy Investigator, Argentina)

It would be essential to embed the training in the global / national outbreak response plan. Also work with Health Ministries to provide this training for health professionals nationally, aligning training with regulatory bodies. It was also recommended to train government officials.

"There should be coordination between organizations so these kind of tools are available and are easy handed to countries/organizations so people can access this info ASAP for the management of diseases/outbreaks." (Oncology clinical research nurse, Spain)

Organize and present a summary of the material highlighting the main points as a toolkit specifically directed to the particular outbreak. Rapid pairing with more experienced sites and learn from case studies and similar context situations in order to be down to earth and adapt to the local capacities." (Director of education at Institute for Clinical Effectiveness and Health Policy, Argentina)

"I will align with some comments that talked about training Health Ministry staff, in addition to that Clinical healthcare professionals (hospital staff) interested in Clinical research should be given the opportunity for training too. This is essential in my environment in Nigeria & might be mostly true in SSA. Concentrating on academia isn't enough." (*Molecular Scientist, Nigeria)*

"Make a strong emphasis of listening to people in other disciplines, different from medicine, such as economists and social workers". (Researcher, Argentina)

"Research needs to [be] seen as an every day activity for those working in human health and of course other areas. Structures, Systems, Governance and Incentives need to become part of this process for uptake and delivery. In the event of an outbreak, it is rather 'quick fix' to get things done. We need credible and strong institutions to start discussing difficult questions around implementation and help countries and contexts to shape the requirements and be able to own them…! This curriculum is a good start to grasp the research skills and probably have them broken down into modules…! Everyone shall not [do] everything. Collaboration and supporting each other is the key…Once we have this evidence in hand, will be great to present to research and grant offices of our institutions…" (*Research Coordinator, Sweden)*

5. Other comments from attendees

Attendees were strongly encouraged to submit their comments in support of their voting options. The attendees' comments, suggestions and recommendations were collated and summarised as follows:

Study methodology comments on limitations
• *Could some of these methods that have low consensus be thus because of a lack of understanding of the methods by the respondents? (Professor, UK).* • *To what extent will the level of recommendation influence the inclusion of the topics within each module? For instance, I believe the lab topics are quite essential, although the consensus was low (Senior lecturer, Nigeria / Canada).* • *Would think the inability to conduct in person sessions impacted data quality? (Director, Jamaica).* • *Perhaps one of the limitations of this project is that it was limited to people that have a good command of English. It is assumed that English is the lingua franca for researchers but I have found this is not true for researchers involved in qualitative research in Colombia--- and probably most of South America (Professor, Colombia).*
Curriculum themes & scoring comments
• *My comments on the workshop briefing (V1.0) and the proposed changes to the briefing were arranged in 4 points: a) Adding two new themes influenced by covid-19 pandemic, (Delphi round 1 started prior to the peak of the crisis). b) Proposed changes to the presentation of the parent modules, c) Suggestions for the discussion about writing the curriculum, d) Suggestions for the discussion about practical issues related to the implantation of the curriculum and accreditation (Medical scientist, UK)*. • *I am curious. There was low positive response for "Audit" as part of the curriculum. Shouldn't this be of high importance for any health research? (Senior Clinical Research Associate, Nigeria).* • *The Pandemic has highlighted the introduction of technology in data collection in research i.e. wearables (quality of device) in addition to the quality of data i.e. is the data for*

'monitoring' purposes or for 'clinical' data collection? Should we have included 'Innovation and Technology' in the study? (Patient Research Ambassador, UK). • *Communication skills for all new researchers and the importance in public health work needs to be emphasized (Research Coordinator, Sweden).*
Other comments
• *The results seem very good, despite the limitations. Many excluded topics will be useful when the young researcher gets more experience. We must remember that this is a basic curriculum for young researchers, who will generally be under the supervision of experienced researchers, who will negotiate with stakeholders and observe the progress of the study (Professor, Brazil).* • *The contents are very wide and I believe they are some contents are applicable all the members of the research teams but others may need to be tailored to the roles of the staff (e.g., research methods, laboratories). So it would be good to have a tool to align the curriculum with the roles and profiles that researchers envision for their careers (Clinical Researcher, Germany).* • *I suggest that this should not be the end, the panellists should have a network where they will be discussing important issues in research (Research Student, Nigeria).*

6. Conclusion and Recommendations

This follow-up *Implementation Workshop* has succeeded in its aim of asking research organisations and research training experts what is the optimal way to convert this curriculum into practical teaching and training resources. We set out to ask how to implement this curriculum by determining the best mechanisms for delivering the training modules while supporting locally relevant implementation of this training and understanding how these modules could be utilised in the context of a new outbreak. These are the recommendations from this workshop:

- Interactive educational sessions, problem based learning and discussion with facilitator or mentor have been identified as some of the most effective online learning tools alongside downloadable resources.
- Certificates of completion and course endorsement by leading global health institutions are the strongest motivators for trainees. Additional opportunities such as graduation projects, training progression and collaborations with research institutions would strengthen the curriculum.
- It was important to provide multiple options for delivering training such as: “training the trainer” resources, hand-on experience, networking opportunities, mentorship and access to experts as well as having materials available in multiple languages. Providing access to online management systems and core teams would build a global community of trainers.
- Providing curriculum materials for trainers in module format would help the integration of this framework within existing local research training programs. Linking the training with career development schemes and academic institutions would support the uptake of health research training.
- Embedding this curriculum in global, national and institutional outbreak response plans would guide the development of research training in such emergencies.

This study has brought together health researchers from across the world to identify what constitutes the minimum set of skills, knowledge and key principles that would enable those without previous experience in research to undertake high-quality health research.

We conducted a comprehensive review of the responses from research training needs surveys, session evaluations from research training workshops, and eLearning feedback collected by The Global Health Network between 2017 and 2019 from 7167 participants from across 153 countries. This analysis provided us with a range of research skills topics and subject areas that generated a core list of 98 potential essential research skills training themes. These potential themes were reviewed by health research experts and stakeholders through a Delphi consensus process to assess their relevance as an essential research skill.

Following the Delphi consensus process that provided 108 themes, the research team developed a curriculum framework by grouping the themes identified by the panellists. This presented the structure of the curriculum by providing suggested 'parent modules' and the relevant themes generated and included to inform each module. These theme groupings were evaluated at a Stakeholder Review Workshop. The workshop results showed agreement between the Delphi panel's ratings and the opinions of the workshop stakeholders and supporting **our recommendation of this curriculum as a global standard for health research training.**

This project has established the Essential Research Skills Training Curriculum in the form of a set of topics that any research group, team or organisation could take forward to guide their training programme. This workshop has generated guidance on implementation so that anyone wanting to design their training around this curriculum can also benefit from evidence-led recommendations on what approaches will work best in their specific context.

Further reference material and supporting information are available here:

Essential Research Skills Training Curriculum webpage

Essential Research Skills Training Curriculum - Delphi survey round 1 report

Essential Research Skills Training Curriculum - Delphi survey round 2 report

Essential Research Skills Training Curriculum – Stakeholders' Review Workshop report

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8. Annexes

Annex 1: List of experts that participated in the Implementation Workshop hosted on 10th February 2021

Participants' name	Organization	Job Title	Country/Region Name
Abbas Abel Anzaku	Institute of Human Virology	Program Officer, Laboratory Scientist	Nigeria
Abdulai M Kamara	Ebovac Salone	Study Field Worker	Sierra Leone
Abdullah Yonis	University of Exeter	Medical scientist	United Kingdom
Aboi JK Madaki	University of Jos/Jos University Teach Hospital	Researcher/clinician	Nigeria
Adam Muhammad	Health care	Medical officer	Nigeria
Adela Ngwewondo	Institute of Medical Research and Medicinal Plants Studies	Researcher	United States of America
Aisha Malik	Warwick Medical school	Tutor	United Kingdom
Alebachew Kebede	Addis Ababa University	Bio-informatician	Ethiopia
Alie Eleveld	Safe Water and AIDS Project (SWAP)	Technical Advisor	Kenya
Amadou Seck	WCA BIOINF	Data Management	Senegal
Amanda Wanyana	UVRI IAVI	Medical Officer	Uganda
Ana Castro	University of York	Research fellow	United Kingdom
Ana Polanco	Hospital Nacional de Niños "Benjamín Bloom"	Jefe de Departamento	El Salvador
Angela Papa	PPD	Director	Japan
Anna Jammeh	Ministry of Health	Epidemiologist	Gambia
Anns Issac	World Health Organisation (WHO)	Technical Officer	India
Antsa Rakotondrandriana	Programme National de Lutte contre le Paludisme	Responsable de données du Laboratoire	Madagascar
Ashish Indani	Tata Consultancy services	Head, Research and Innovation	India
Atinuke Olaleye	Babcock University	Senior Lecturer	Canada
Belay Tessema	University of Gondar	Professor	Germany
Bright Sandow	Ghana Health Service	Public Health Researcher	Ghana
Bunu Goso Umara	initiative for Educational Awareness and Economic Development (INEAED)	Administrator	Nigeria
Caesar Mack Kargbo	World Vision Sierra Leone	Research Assistant	Sierra Leone
Chukwunonso Udeh	54gene	Senior Clinical Research Associate	Nigeria

Claudia Marotta	Doctor with Africa Cuamm	Public Health Officer and Researcher	Italy
Claudia Silveira Viera	Unioeste	Professor	Brazil
Cristiane Campello Bresani Salvi	Oswaldo Cruz Foundation	Researcher	Brazil
Cynthia Onyefulu	University of Technology	Professor	Jamaica
Daniel Yilma Bogale	Jimma University	Associate Professor	Ethiopia
Daniela Morelli	IECS	Investigator	Argentina
Dawit Ejigu	St Paul Hospital Millennium Medical College (SPHMMC)	Associate Professor	Ethiopia
Dolores Carrer	INIMEC-CONICET-UNC	Researcher	Argentina
Dr Meghana Kulkarni	Independent Consultant	Freelance	India
Dr Sudhir Prabhu	Father Muller Medical College, Mangalore	Professor in Community Medicine	India
Dr. Salvatory	Hubert Kairuki Memorial University	Lecturer	Tanzania, United Republic of
Eman Sobh	Al-Azhar university	Associate professor	Saudi Arabia
Ethar Abosam	Pharmacy	Pharmacist	Saudi Arabia
Etienne Guirou	Malaria Research and Training Center	Postdoctoral fellow	Mali
Evans Anokye Kumi	Kwame Nkrumah University of Science and Technology	Lecturer	United States of America
Ewurama Owusu	University of Ghana	Lecturer/Researcher	Ghana
Fernando Rubinstein	Instituto de Efectividad Clínica y Sanitaria (IECS)	Director de Educacion	Argentina
Fiorella Gago	Udelar	Professor	Uruguay
Fridah Mwendia	African Academy of Sciences	Senior Programme Officer- Clinical Trials	Kenya
Giorgia Coratti	Catholic University of Sacred Heart	Research Physical Therapist, MSc	Italy
Gloria Palma	Universidad del Valle	Professor	Colombia
Greters Mário Edvin	Pontíficia Universidad Católica de Campinas	Professor Doutor	Brazil
Helen Burchmore	Public and patient Involvement Facilitator	NIHR	United Kingdom
Helma Hofland	Maasstadhospital Rotterdam	Nurse Researcher	Netherlands
Henriette Raventos	Universidad de Costa Rica	Profesora	Costa Rica
Henry Musukwa	CHAPAS-4	Data Clerk	Zambia
Hiwot Amare Hailemariam	Jimma University	Assistant Professor of Medicine	Ethiopia
Ijeoma Victor	FCT- Hospitals Management Board	Health Data Analyst	Nigeria
Imrana Muhammad Arzika	Usmanu Danfodiyo University Sokoto	Research Student	Nigeria
Isabel Melgueira	Centro Hospitalar de Setúbal	Nurse Manager	Portugal

Jackeline Alger	Faculty of Medical Sciences, Universidad Nacional Autonoma de Honduras (UNAH)	Parasitologist, Faculty Member of the Research Unit, board member of the Instituto de Enfermedades Infecciosas y Parasitologia Antonio Vidal	Honduras
Joana Ferreira	NOVA medical School	Master's Degree student in Clinical Research Managment	Portugal
Jorge Acosta-Reyes	Universidad del Norte	Docente tiempo completo	Colombia
Jose Martinez-Raga	Hospital Universitario Dr Peset	Head of Psychiatry	Spain
Joseph Bonney	Komfo Anokye Teaching Hospital/ Kumasi Center for Collaborative Research	Emergency Medicine Specialist/ Research Fellow	Ghana
Juliana Fernandes	Federal University of Pernanbuco (UFPE)	Professor	Brazil
Justin Lana	Clinton Health Access Initiative	Epidemiologist, Technical Advisor	United States of America
Karen Cloete	TASK	Head of QA, Regulatory and Academy	South Africa
Kathryn H. Jacobsen	George Mason University	Professor	United States of America
Kirsty Le Doare	MRC/UVRI	Professor	United Kingdom
laura ciaffi	UMI233 IRD	researcher	Cameroon
Laureano Mestra	The Mast Cell Research Institute	Chief Medical Officer	Colombia
Leonardo Chavane	The Manhiça Health Research Centre (CISM)	Researcher	Mozambique
Lovenish Bains	Maulana Azad Medical College	Associate Professor	India
Luigia Scudeller	IRCCS Policlinico di Milano	Clinical Epidemiologist	Italy
Madia Lourenço Luiza Helena	The Global Health Network	Regional Coordinator	Brazil
Mahamadou Ali THERA	Malaria Research and Training Center (MRTC) /University of Science, Techniques and Technologies of Bamako (USTTB)	Scientific Director	Mali
Malaya Santos	St. Luke's Medical Center College of Medicine (SLMCCM)	Professor	Philippines
Mamoun Ahram	University of Jordan	Professor	Jordan
Marcelo Franco	Oswaldo Cruz Foundation - Fiocruz	Pharmacovigilance manager	Belgium
Maria del Mar Castro Noriega	Centro Internacional de Entrenamiento e Investigaciones Médicas (CIDEIM)	Clinical Researcher	Germany
Mariam Hassan	Shaukat Khanum Memorial Caner Hospital and Research Centre	Clinical Research Administrator	Pakistan

Mariano Andres	Alicante General University Hospital-ISABIAL	Consultant & researcher	Spain
Martínez Díaz-Caneja Covadonga	Hospital General Universitario Gregorio Marañón	Psiquiatra. Coordinadora del grupo de investigación.	Spain
Maryam Rumaney	www.mbrumaney.co	Freelance scientific consultant	South Africa
Masauso Moses Phiri	University of Zambia	Lecturer and Research Fellow	Zambia
Melanie Almonte	Imperial College Healthcare NHS Trust	Research Team Lead/Research Fellow	United Kingdom
Michael Mihayo	Ifakara Health Institute	Clinician	Tanzania, United Republic of
MKDL Meegoda	University of Sri Jayewardenepura	Senior Lecturer	Sri Lanka
Mohammad Sharif Hossain	icddr, b	Research Investigator	Bangladesh
Moses Ngari	KEMRI Wellcome Trust Research Programme	Statistician	Kenya
Muñoz Villaverde Sergio	Institut Hospital del Mar d'Investigacions Mediques (IMIM)	Oncology clinical research nurse	Spain
Musitwa Moses	International medical link	Medical officer	Uganda
Naglaa Arafa	Ain Shams University	Assistant professor	Egypt
Nancy Pollo	Primary Care Research South	Coordinator/ Administrator	United States of America
Nathan Nshakira	Kabale University	Lecturer	Uganda
Neerja Sood	Indira Gandhi National Open University	Assistant Professor	India
Nicole Martin-Chen	National Epidemiology Unit-MOH	Director	Jamaica
Noubar Clarisse Dah	Centre de Recherche en Sante de Nouna	Co-investigator	Burkina Faso
Oladeji Sofoluke	Molecular Laboratory, Ogun State Ministry of Health & African Clinical Trials Consortium, UNN, (ACTC & UNNCECT)	Molecular Scientist	Nigeria
Oluwagbenga Ogunfowokan	National Hospital Abuja	Consultant Physician	Nigeria
Phil Collis	National Institute of Health Research (NIHR)	Patient Research Ambassador	United Kingdom
Prakash Ghosh	icddr, b	Research Investigator	Bangladesh
Primus Chi	KEMRI-Wellcome Trust Research Programme	Mid-Level Social Scientist	Kenya
Rajdeep Dhandhukiya	B J Medical College	Assistant Professor	India
Raluca Pop	SPH Cluj	MBA student	Romania
Ralueke Ekezie	Global Research Nurses (GRN)	Research Nurse	Nigeria
Raman Preet	Umeå University	Research Coordinator	Sweden

Raquel Gil-Gouveia	Hospital da Luz Lisboa	Neurology Department Head	Portugal
Rebby Athembo	AAR health care	Medical officer	Kenya
Rizaldy Pinzon	Bethesda Hospital/ Duta Wacana University	Associate Pofessor	Indonesia
Roxana Lescano	Naval Medical Research Unit No. 6 (NAMRU-6)	Head, Research Administration Program, IRB member, Research Integrity Officer	Peru
Sa'adatu Sule	Independent Consultant	RMNCAH specialist	Nigeria
Samanta Biswas	icddr, b	Medical Officer	Bangladesh
Sanjay Singh	National Tuberculosis Institute, Bengaluru	Researcher	India
Sifiso Nxumalo Eswatini	Columbia University (ICAP Eswatini)	Study Coordinator	Eswatini
Sondashi Davies	Arthur Davison Hospital	Pharmacist	Zambia
Suja Raj L	Sree Chitra Tirunal Institute For Medical Sciences and Technology	Lecturer in Nursing	India
Susilo Wulan	STIKES Tri Mandiri Sakti Bengkulu	Lecturer	Indonesia
Techno Spark 4	Assosa University	PhD candidate	Ethiopia
Tomasz Urbanik	Priv. Cardiology Center	M.D., Ph. D.	Poland
Trokon Yeabah	Division of Infectous Disease/NPHIL	Data Manager	Liberia
Tsogo a Bebouraka Monique Pélagie	University of Yaounde I	PhD Student	Cameroon
Unyuzimana Marie Aimée	GlaxoSmithKline (GSK)	WHO Fellow / CRDL Trainee	Rwanda
Valrie McKenzie	University of Technology	Senior Lecturer	Jamaica
Victor Ayeni	Olabisi Onabanjo University Teaching Hospital, Sagamu	Senior Registrar I	Nigeria
Vijay Kumar Mishra	Public Health Foundation of India	Research Scientist	India
Welile Sikhondze	Eswatini Ministry of Health	Research Advisor	Eswatini

Annex 2: Essential Research Skills Training Curriculum - Delphi themes mapping

Research Principles	
Critical thinking in research	93%
Development of a research question.	91%
Concept of health research.	88%
Good Research practice.	88%
Identifying a research gap.	88%
Understanding the difference between health research and standard of care, audit, evaluation.	86%
Critical appraisal of a research paper	85%
Legal issues in research	84%
How to form a research agenda.	81%
Research governance and regulations	
Monitoring and evaluation	87%
Governance and regulation	83%
Quality assurance systems	65%
Quality management systems	60%
Audit.	59%
Medicines Supply and Regulations	54%

Research Methodology	
Qualitative data collection methods.	93%
Quantitative data collection methods.	93%
Selection of control groups for comparison purposes.	92%
Quantitative sampling methods.	91%
Quantitative methodologies.	90%
Qualitative sampling methods.	89%
Steps to conduct a literature review.	89%
Epidemiological studies.	87%
Clinical trials.	87%
Qualitative methodologies.	86%
Experimental research.	85%
Qualitative analysis.	85%
Implementation research.	82%
Mixed Methods research.	76%
Research designs for outbreaks	75%
Methodology Research (research on research).	74%
Health Policy and Systems Research.	73%
How to search for secondary datasets in different databases.	70%
Social sciences and anthropological studies.	69%
Meta-analysis.	67%
Health economics and economic evaluations.	54%
Operational research.	52%

Protocol design	
Identifying research participants and selection criteria	94%
Definition and methods of randomization	89%
Writing a research protocol	88%
Calculation of participant sample size and sample power	88%
Writing a study budget	85%

Study set up	
Data collection tools (e.g. designing surveys and CRF's).	95%
Study set-up	92%
Writing a grant application and/or grant proposal	87%
Storage of research materials	81%
Development of Standard Operating Procedures (SOPs)	81%
How to set up study training	75%
Identifying various funding agencies/sources	68%

Research administration and management	
Study reporting procedures and practices	91%
Research Project management and planning.	88%
Pharmacovigilance principles and reporting adverse effects.	82%
Participant 'loss to follow-up'.	80%
Budget management.	79%
Research Time management.	79%
Contingency plans for research studies (in situations like pandemics, etc)	75%

Study close	
Study close (archiving data, sample storing, notification of closure processes).	87%
Best practices regarding referencing and plagiarism.	87%
Scientific writing for journal publications.	86%
Use of citation tools (i.e. Mendeley).	81%
Authorship in research	80%
Research registries	74%
Intellectual property rights	74%

Ethics	
Informed Consent and assent.	98%
Participant's confidentiality and privacy.	98%
Ethical practices around data handling/management.	95%
Professional guidelines and codes of ethics which apply to the conduct of clinical research.	94%
Definition of vulnerable populations and ethics of working with these populations.	94%
Ethical issues related to biological samples.	91%
Ethical issues related to genetic procedures.	87%
Setting up an ethical review board or committee.	60%

Research data, management & data sharing	
Definition of data quality	92%
Statistics.	90%
Security issues during data collection and how to manage risk.	89%
Data management systems.	88%
Data presentation.	88%
Data sharing best practices and governance.	87%
Data analysis software (qualitative and quantitative).	85%
Principles of Big data analysis	70%
Mathematical Modelling.	50%

Community engagement	
Community engagement principles and activities.	84%
Good Participatory Practice (GPP).	80%
Participants' retention strategies.	79%
Attrition bias and prevention methods.	79%
How to manage expectations of study communities.	76%

Research laboratories	
Good Clinical Laboratory Practice (GCLP).	79%
Laboratory safety practices.	71%
Laboratory biosafety and how to manage hazards.	71%
Laboratory quality best practices.	70%
Laboratory sample handling and storage.	66%
Laboratory standards and regulations.	66%
Specific laboratory techniques and equipment handling.	60%
Setting up a research laboratory.	55%
Laboratory management.	53%

Research Team	
Teamwork	86%
Developing effective research teams with named roles and responsibilities for team	86%
Building trust within a team	81%
Networking and how to create collaborations	80%
Building your career in research	78%
Leadership in research.	67%
Ability to communicate and meet with funders.	65%
Handling and negotiating with a range of stakeholders	63%
Influencing at institutional level to enable research.	58%
Leading and managing complex research groups.	57%

Research uptake - How to make a difference with your findings	
Communicating research	92%
How to translate research results into policy (policy formulation and reviews).	91%
How to translate research results into practice within healthcare settings.	85%
Research Indexing	56%

Annex 3: Stakeholder Review Workshop - Programme agenda

AGENDA

	Wednesday 10 February 2021 (13.00-14:30 hrs GMT)
Welcome TDR and The Global Health Network	Aim and Objectives
Examining the study process and results	Developing an evidence-led Essential Research Skills Training Curriculum: Overview of Study Methodology Q&A
Polling & Discussion	The aim of this workshop will focus on understanding how best to implement the Essential Research Skills Training Curriculum: • gathering the expectations from potential users of what this training should provide • understanding local contexts, trying to identify barriers and solutions, and • understanding what is valued about research training Discussion section guided by The Global health Network
Reflection and wrap up	TDR and The Global Health Network