Report of the third meeting of the Technical Advisory Group on NCD-related Research and Innovation

Virtual meeting
October 2–3 2023
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## Acronyms and Abbreviations

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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>AHPSR</td>
<td>Alliance for Health Policy and Systems Research</td>
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<td>CFIR</td>
<td>Consolidated Framework for Implementation Research</td>
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<td>COVID-19</td>
<td>Coronavirus disease 2019</td>
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<td>GACD</td>
<td>Global Alliance for Chronic Diseases</td>
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<td>LMICs</td>
<td>Low- and middle-income countries</td>
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<td>NCD</td>
<td>Noncommunicable disease</td>
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<td>PHC</td>
<td>Primary Health Care</td>
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<td>TAG-NCD R&amp;I</td>
<td>Technical Advisory Group on NCD-related Research and Innovation</td>
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<tr>
<td>TEPHINET</td>
<td>Training Programs in Epidemiology and Public Health Interventions Network</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Introduction

The Technical Advisory Group on NCD-related Research and Innovation (TAG-NCD R&I) was established in July 2021 as an advisory body to guide the World Health Organization (WHO) on its leadership and coordination role in promoting and monitoring global action on noncommunicable disease (NCD) research and innovation. The Terms of Reference for TAG-NCD R&I are provided here.

As an advisory body to WHO, the TAG-NCD R&I is expected to:

- identify and describe current and future challenges in relation to NCD research and innovation;
- advise WHO on strategic directions to be prioritized;
- advise WHO on the development of global strategic documents; and
- propose other strategic interventions and activities for implementation by WHO.

Twelve globally recognized researchers from across all WHO regions were appointed to the TAG-NCD R&I for a 2-year term in July 2021. Eleven members accepted the invitation to serve another 2-year term as a member of the TAG-NCD R&I in July 2023. The third virtual meeting of the TAG-NCD R&I took place on October 2-3, 2023 (see agenda in Annex 1), with 10 members in attendance. The meeting was organized by the WHO NCD Programme, which serves as the Secretariat for the advisory body. The TAG-NCD R&I members were joined by staff from WHO headquarters, representatives from Regional Offices, the Alliance for Health Policy and Systems Research (AHPSR), the Global Coordination Mechanism on NCDs, and external observers from the Global Alliance for Chronic Diseases (GACD) and Norwegian Institute of Public Health. RTI International provided technical support to the Secretariat (see list of participants in Annex 2).

A concept note summarizing the key recommendations and activities from the second TAG-NCD R&I meeting, along with pre-reading on subgroup activities, was circulated to all TAG-NCD R&I members. The concept note provided background information (including background documents) to guide the discussions of the third meeting of TAG-NCD R&I (Annex 3). The subgroup report included the Terms of Reference of the subgroup and updates of the work to date (Annex 4). The pre-reading summarized the findings of a systematic review on implementation science research for WHO NCD packages (Annex 5) and an institutional mapping of implementation science research on NCDs in five countries (Annex 6).

This report provides a summary of the third meeting of TAG-NCD R&I, with a focus on the strategic discussions and recommendations of TAG-NCD R&I to WHO. The TAG-NCD R&I Chair and members reviewed the report.

Objectives of the third meeting of TAG-NCD R&I

The objectives of the third TAG-NCD R&I meeting were to:

1. Review the progress and activities to date relating to previous TAG-NCD R&I recommendations;
2. Inform WHO of opportunities for capacity strengthening at the individual and institutional levels for NCDs and implementation research;
3. Inform plans to update the existing prioritized research agenda for NCDs with a renewed focus on health policy and systems research and implementation research;
4. Explore opportunities to research and capture innovative interventions for NCDs; and
5. Develop an agenda for the TAG-NCD R&I for the next 2-year term.
Session Summary

Day 1

Day 1 of the meeting began with introductions and opening remarks. Professor Adnan Hyder was appointed as the new chair of the TAG-NCD R&I group for the next 2 years, succeeding Professor Srinath Reddy. At the start of the opening session, Dr Sarah Rylance (Medical Officer, WHO Global NCD Programme) presented the Declaration of Interests of the TAG-NCD R&I members. Two members had declared interests, which were considered minimal and unlikely to affect their judgment on the issues under consideration in the meeting.

Dr Bente Mikkelsen (Director, WHO Global NCD Programme) opened the meeting and provided an update on the NCD agenda at the United Nations General Assembly 2023. She highlighted the importance of implementation science research on NCDs. This was followed by keynote remarks from Dr Jérôme Salomon (Assistant Director-General, Universal health Coverage, Communicable and Noncommunicable Diseases). He emphasized that Member States are not on track to achieve Sustainable Development Goal targets and the need for stronger efforts to accelerate progress on prevention and control of NCDs. He highlighted the recommitment to WHO’s NCD implementation roadmap by the Heads of State Group at the United Nations General Assembly and pointed out that science is one of WHO’s five priorities. Finally, Dr Salomon underscored the importance of integrating NCDs into primary health care (PHC) as a key element to build resilient health systems.

Dr Jeremy Farrar (Chief Scientist, WHO) outlined the vision and focus of the Science Division at WHO. He emphasized the critical need for horizontal collaboration within various systems, including the WHO and health systems globally. He acknowledged the multiple challenges we currently confront, such as inequalities within and among nations, demographic shifts, and the health impacts of climate change, all converging on a global scale. He stressed the importance of political systems capable of addressing these complex challenges.

Furthermore, he highlighted the significance of the Nobel Prize in Medicine awarded for the development of mRNA vaccines. He noted that the success of COVID-19 vaccines was the result of several decades of scientific advancements and sustained investments in capacity building. Dr Farrar posed essential questions about how to ensure that scientific progress benefits the maximum number of people in an equitable manner, especially given the increasing inequity observed over the past few years. He emphasized that the convergence of NCDs and communicable disease issues affects everyone, presenting a significant opportunity for action.

Dr Farrar expressed his enthusiasm for participating in the discussion and collaborating with colleagues at WHO. He also discussed the reorientation of the Science Division work, focusing on norms standards, guidelines, and pre-qualification in the near term. Additionally, he emphasized the importance of enhancing domestic support for science within countries’ political and societal systems. Lastly, he mentioned the significance of common goods related to digital and data and their accessibility in an open and transparent manner. He noted mental health as an area of importance.

Following the first meeting, the TAG-NCD R&I subgroup was formed to action some of the recommendations that emerged from the meeting, focusing on providing coordinated country support for NCD-related implementation research, including capacity strengthening.

Professor Tiina Laatikainen (Subgroup Chair) introduced the activities supported by the subgroup (Annex 4). Dr Ishu Kataria and Dr Rachel Nugent (RTI International) summarized the findings from (i) a systematic review on implementation science research for WHO NCD technical packages (Annex 5) and (ii) an institutional mapping of implementations science research on NCDs in five countries (Annex 6). Dr Sarah Rylance presented on implementation research activities supported through the WHO Norway Flagship Initiative on NCDs in Ethiopia,
Ghana, India and Nepal. Professor Tiina Laatikainen closed the session by sharing the key messages from the activities supported by the subgroup.

The second half of the meeting focused on strengthening capacity for implementation research. Three breakout groups discussed the following issues: (1) facilitating the use of implementation science research to inform the adoption and scale-up of recommended NCD interventions; (2) utilizing existing research networks for the identification of resources for implementation science research on NCDs; and (3) exploring ways to build capacity of implementation research teams and nurture links between implementers, researchers, health system planners, and policymakers. Reuniting as a group, TAG-NCD R&I members then reflected on the information presented by each group and explored the themes detailed in subsequent sections of this report.

Day 2

Day 2 of the meeting opened with a summary of the discussions and recommendations from day 1, provided by rapporteur Professor Tiina Laatikainen. Dr Kumanan Rasanathan (Executive Director, AHPSR) provided opening remarks on the potential of implementation science research on NCDs to contribute to stronger health systems. He emphasized the need to institutionalize research and support it domestically to reduce dependence on external donors and increase sustainability. Dr Robert Marten (Strategy and Partnership Officer, AHPSR) led a discussion on renewing the WHO research agenda for NCDs, previously developed in 2011 (1). Three breakout groups discussed the following issues: (1) identifying the key stakeholders to engage in developing the research agenda; (2) key thematic areas and regional priorities to consider; and (3) methods and approaches that could be leveraged for consultations. Professor Adnan Hyder led the final session of the day on capturing innovations in prevention and control for NCDs. This included gathering inputs from TAG-NCD R&I members on how to capture innovations that are not documented, discussing innovation cycle, and ways to document them for appropriate transfer of knowledge.

In the following sections, the discussions from both days of the meeting have been synthesized into four thematic areas.

**Thematic area 1: Implementation research on NCDs in LMICs — systematic review and institutional mapping**

Implementation science is an emerging practice in global public health, including for NCDs, playing a critical role in supporting countries’ efforts to adapt and effectively implement WHO technical packages for NCDs. As per recommendation from the sub-group, RTI International carried out a systematic review of the literature on implementation research on WHO technical packages relating to NCD management in low and middle-income countries (LMICs), to identify common approaches and best practices (see Annex 5) and mapped key stakeholders and resources available to support implementation research in African and South-East Asia Regions and in Norway-supported countries (see Annex 6).

The systematic review included WHO PEN or WHO PEN Plus, WHO HEARTS, WHO MPOWER, and WHO SHAKE technical packages. Of the 92 studies that were retrieved, 56 met the full inclusion criteria, thus, were included in the analysis. Several important issues emerged. First, of the eight studies that included any kind of framework, only one used an implementation science framework, such as the Consolidated Framework for Implementation Research (CFIR). The studies that reported on barriers to implementation of WHO technical packages indicated a general lack of essential medicines in healthcare facilities, a lack of medical supplies (e.g., testing devices and
strips), inadequate training of healthcare workers (particularly for diabetes care), a lack of digitized health systems, poor or absent screening programs, and patient distrust in services. Reported facilitators included support from senior leadership at healthcare facilities, standardized treatment protocols, continuity of care and follow-up in healthcare systems, and team-based care and task-shifting roles at PHC facilities. None of the studies specifically analyzed barriers and facilitators to conducting implementation research on the technical packages.

Through the WHO Norway Flagship Initiative on NCDs, funded by the Norwegian Agency for Development Cooperation (NORAD), the NCD Department and AHPSR are supporting implementation research projects in Ethiopia, Ghana, India, and Nepal. Linked to this initiative, and to enable research capacity building, facilitate researcher connections, and strengthen future research within this field, RTI mapped funders, researchers, and research institutions that had supported and conducted implementation science research for NCDs in the last 5 years in these five countries. This involved a systematic process using an inclusion and exclusion criteria to identify relevant information from publicly available databases, WHO collaborating centers, and key informant interviews with relevant experts (see Annex 6). The mapping revealed that India and Ghana both have a diverse range of academic and research institutions conducting implementation science in addition to several medical facilities and civil society organizations contributing as research partners. In contrast, implementation science research was concentrated among a limited number of institutions in Ethiopia (and Myanmar and Nepal to a lesser extent). Funding in these five countries for implementation science research has grown over the last 5 years. In particular, India and Ghana saw significant growth in the disbursement of funding for implementation science research for NCDs. The most consistent funders of this research were the U.S. National Institutes of Health, United Kingdom Medical Research Council, GACD, and the European Commission. Additionally, the United Kingdom National Institute for Health and Care Research disbursed a large amount of relevant funding across research projects in Ghana, India, and Nepal in 2022.

Key takeaways

- Implementation science research referencing the WHO technical packages is limited and is usually not being carried out using a research framework
- Most of the included studies failed to evaluate the standard implementation science outcomes of acceptability, reach, adoption, fidelity, implementation cost, and sustainability
- There is a disconnect between traditional implementation research outcomes and those reported as outcomes in studies, including those using WHO packages. This indicates an urgent need for capacity building on implementation science research at the national level
- Institutional mapping is a replicable process that could be used to map NCD implementation science research and funding trends in other countries and regions
- Institutional mapping can help to support the development of networks for knowledge sharing, capacity building, and coordination between institutions
Thematic area 2: Strengthening capacity for NCD-related implementation research

There is a huge gap in capacity for implementation research in LMICs, particularly related to NCDs. Implementation research can provide locally relevant, evidence-based solutions for policymakers, enabling them to use limited resources for maximum impact. Structures and opportunities need to be created for knowledge sharing and establishing partnerships. The TAG-NCD R&I deliberated on how implementation science research can inform the adoption and scale-up of recommended NCD interventions.

Members emphasized the importance of stakeholder engagement, throughout the research projects, to secure buy-in. Embedding implementation research interventions, co-created with inputs from stakeholders, is a useful strategy that can be employed to ensure sustainability. However, it is essential to develop monitoring frameworks to complement WHO NCD technical packages. Domestic financing for local research needs to be increased; donor priorities should be directed toward generating relevant knowledge with global applicability - such as for humanitarian emergencies and climate change - with additional donor support for the needs of the lowest-income countries.

Utilizing established research networks to promote awareness of available resources (e.g., funding opportunities, training programs) can significantly support NCD implementation research. This collaborative effort may involve national research networks, Ministries of Health, government research entities, university research offices, global alliances, and civil society groups dedicated to NCDs (e.g., NCD Alliance, GACD), NCD Lab (Global Coordination Mechanism on the Prevention and Control of NCDs, WHO), and WHO Collaborating Centres. The TAG-NCD R&I underscores the importance of enhancing the capabilities of implementation research teams to foster connections among implementers, researchers, health system planners, and policymakers. To achieve effectiveness, this capacity-building work should be contextualized and decentralized. It is crucial for the WHO to assess national capacities for implementation research and strengthen credible institutions supporting health systems planning and policy. Notably, coalition building has proven to be a promising strategy, exemplified by initiatives like the Southern Africa Human Capacity Development (SA-HCD) Coalition, which successfully enhanced the delivery of HIV/AIDS services by strengthening various stakeholders in Africa. Furthermore, extending grant periods and increasing grant sizes could contribute to the stability of grantees within an institution, optimizing project efficiency. Valuable lessons can be drawn from successful models in communicable diseases, such as the Special Programme for Research and Training in Tropical Diseases for neglected tropical diseases, the National Institutes of Health Fogarty model, and the AHPSR model for embedded research (1–3).

**Key takeaways**
- Promote a team-based approach to capacity strengthening, at institutional level, for greater sustainability
- Use multiple strategies for capacity building in implementation research
- Engage stakeholders and increase the grant period and amount of grants to make implementation science research more sustainable
- Learn from other existing models of capacity building in the domain of communicable diseases
Thematic area 3: Reframing the WHO research agenda for NCDs

*A Prioritized Research Agenda for Prevention and Control of Noncommunicable Diseases* is the most current WHO resource pertaining to NCD-related research priorities (4). In previous TAG-NCD R&I meeting, members have supported a proposal to update and reframe the agenda to include translational research and health systems implementation research. With the goal of revising and updating the NCD research agenda to strengthen policy-relevant and system-level research for equitable, effective, efficient, and quality delivery of NCD services, the TAG-NCD R&I members discussed three objectives proposed by the AHPSR and NCD Department:

1. **Facilitate integrating NCD research into policy and practice**: Offer guidance for developing national NCD research efforts into actionable policies.
2. **Strengthen local research capacity of LMICs**: Define, adapt, and adopt evidence-driven practices and policies tailored to the specific needs and contexts of individual regions.
3. **Contribute to the achievement of universal health coverage and Sustainable Development Goals**: Support the realization of universal health coverage, underpinned by robust PHC systems, and work toward meeting the NCD-related targets outlined in the Sustainable Development Goals.

Members of the TAG-NCD R&I suggested the following as key thematic areas and regional priorities that the research agenda should consider:

- focusing on methodological aspects of implementation research;
- integration of NCD implementation research into existing country NCD prevention and control programs;
- identification of gaps in implementation of WHO technical packages and key interventions;
- identification of the role of primordial prevention with other prevention levels; and
- including cross-cutting issues such as equity.

Members emphasized the importance of multisectoral engagement as the avenue for shaping the research agenda. They stressed the need to involve non-health sectors like the commercial sector, industry, and policymakers focused on climate change and NCDs, in addition to traditional stakeholders. Clearly defined roles and goals in partnership and engagement are deemed essential for this collaborative effort. The spectrum of stakeholders should encompass communities, healthcare workers, and system managers at all levels of care. However, setting clear objectives for the process, specifying the target audience for the agenda, and articulating reasons for engaging different stakeholder categories are critical considerations.

Qualitative methods, such as focus group discussions and key informant interviews, were identified as valuable tools in developing the research agenda. Adopting a sociopolitical approach and incorporating people with lived experiences were deemed essential. Collaboration with international, national, and subnational groups and leveraging their networks can facilitate this inclusive approach. The members proposed various avenues for organizing consultations and gathering feedback from a variety of stakeholders, such as the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) NCD capacity assessment and planning tool by International Association of National Public Health Institutes (5), U.S. and Africa Centers/Centres for Disease Control and Prevention courses and meetings, International Association for Adolescent Health, and the Society for Urban Health.

Overall, this renewed research agenda could be used as an advocacy tool that can support regional and country level implementation research to deliver impact in terms of equitable delivery of services.
Thematic area 4: Capturing innovations in NCD prevention and control

The concluding session of the meeting centre on the identification and amplification of innovations in NCD prevention and care. Professor Adnan Hyder introduced the innovation cycle (see Figure 1), highlighting a pivotal transformation in the dynamics of innovation during the early stages of the COVID-19 pandemic. This transformation was characterized by a bidirectional crossover between high-income and low-income countries. Professor Hyder underscored the importance of systematically documenting innovations in NCD implementation, focusing on those originating outside traditional research institutions or academic centres.

Fig. 1. Innovation cycle. Source: CIMIT, 2021

To facilitate the discussion, he presented the group with three key questions:

1. How do we find these innovations?
2. How do we study them?
3. How do we document them for appropriate transfer of knowledge?

TAG NCD R&I members emphasized the need to establish a clear definition of innovation before embarking on capturing initiatives. They underscored the significance of documentation, advocating for the encouragement of

<table>
<thead>
<tr>
<th>Key takeaways</th>
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<tbody>
<tr>
<td>• A WHO-promoted implementation research agenda for NCDs could help to stimulate political will and funding</td>
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<tr>
<td>• Multistakeholder engagement for the development of implementation research agenda is critical</td>
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<tr>
<td>• Tapping into various existing opportunities to engage stakeholders for gathering their perspectives on implementation research is essential</td>
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</table>

To facilitate the discussion, he presented the group with three key questions:

1. How do we find these innovations?
2. How do we study them?
3. How do we document them for appropriate transfer of knowledge?
this process through funding calls supported by small grants spanning various sectors. The members provided global examples of innovation capture, citing city observatories, India’s Honey Bee Network, and initiatives leveraging the mapping of institutions conducted by the TAG-NCD R&I subgroup, WHO Collaborating Centres, and similar entities. Additionally, members proposed exploring non-traditional avenues, such as social media, to effectively capture and document these innovations.

TAG-NCD R&I members provided illustrative examples of NCD-related networks, capacity-building initiatives, and innovations. These examples encompassed diverse efforts such as the domestication of the WHO Intersectoral Global Action Plan Against Epilepsy and Other Neurological Disorders in the WHO African Region. Furthermore, other instances of impactful domestication were highlighted, like the integration of the Updated Appendix 3 WHO Global NCD Action Plan 2013-2030 for expanding digital technologies in stroke and cardiovascular disease prevention. Additionally, other initiatives include the Accelerating African Control of Hypertension through Innovative Epidemiology and a Vibrant Ecosystem (ACHIEVE) project, as well as the pragmatic solutions to reduce the global burden of stroke, a collaboration between Lancet Neurology Commission on Stroke, WHO, and World Stroke Organization (6-8). China’s efforts in building capacity for implementation research include active participation in WHO projects since 2019 in collaboration with China Centre for Disease Control and Prevention (CDC). This involved collaborating with postgraduate students, organizing training sessions with universities, conducting international comparative studies, and engaging domestic and foreign experts to enhance capacity. Additionally, the China CDC conducted a qualitative interview study in 2022 on hypertension and diabetes management, incorporating training sessions on implementation research for grassroots personnel, thereby enriching their capabilities. These initiatives are complemented by the integration of implementation research into the China-WHO Country Cooperation Strategy and collaborative workshops, contributing to the systematic enhancement of scientific research capacity. Innovative measures for chronic disease prevention and control in China encompass a robust policy framework, dynamic monitoring, early intervention services reaching over 4 million residents annually, and widespread health promotion initiatives, such as the China Healthy Lifestyle for All (CHLA) program. These examples showcased a global commitment to advancing NCD initiatives and learning experiences for systematic enhancement.

The meeting closed with final remarks and appreciation to all participants offered by Professor Adnan Hyder, as Chair, TAG-NCD R&I and the WHO Secretariat.

In a final closed section of the meeting, TAG-NCD R&I members discussed logistics relating to future meetings and the group’s composition.

The TAG-NCD R&I provided valuable inputs and suggestions to enhance implementation research for the effective adoption and implementation of WHO NCD technical packages, policies and interventions, define methods and processes to develop the NCD research agenda, and identify good practices to strengthen networks and build institutional implementation research capacity.

Summary recommendations were shared on behalf of the TAG-NCD R&I to the WHO as follows:

1. **Facilitate integration of implementation research into NCD interventions**
   - Integrate implementation research into WHO NCD interventions and packages. Strengthen the capacity of country and regional offices to provide robust support in this regard.
   - Develop robust implementation research tools that align with priority NCDs interventions. These tools should emphasize the use of relevant frameworks and consider implementation outcomes.
• Tailor implementation strategies to accommodate diverse contextual needs, including emergencies, such as humanitarian crises and climate change-related challenges.

2. Showcase the value of implementation research and multistakeholder collaboration

• Actively engage with international and domestic funding agencies to underscore the significance of embedding implementation research in the adoption and scale-up of priority interventions, encouraging equitable distribution.
• Enhance policymakers’ interest and motivation to engage in implementation research, facilitating stronger ties between policymakers and researchers.
• Identify and highlight successful examples of multistakeholder implementation research teams as models of good practice.

3. Facilitate capacity strengthening and resource sharing

• Leverage global experiences and lessons learned in identifying and enhancing institutional capacity for implementation research.
• Identify and endorse best practices, resources, and opportunities for training and funding in implementation research.
• Collaborate with other WHO initiatives that share a common goal of promoting this approach.

This document reports on the third meeting of an external advisory group and is the product of virtual deliberations. It represents the opinions of members of the TAG-NCD R&I. It does not represent the position or opinions of WHO or its Member States, nor the official position of any WHO staff members.
References


### Annex 1: Agenda for third meeting of TAG-NCD R&I

#### Monday 2nd October

<table>
<thead>
<tr>
<th>Session 1</th>
<th>13:00-13:30</th>
<th>Welcome</th>
<th>Director, WHO NCD</th>
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<td></td>
<td></td>
<td>Opening Remarks</td>
<td>Assistant Director General (video recording)</td>
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<td>Introduction and confirmation of Chair and rapporteurs</td>
<td>Director, WHO NCD</td>
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<td>Housekeeping (including Declaration of Interests)</td>
<td>WHO Secretariat</td>
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<td>Recap scope of TAG-NCD R&amp;I</td>
<td>TAG NCD R&amp;I Chair</td>
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<td>Outline of meeting objectives</td>
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<td>Introduction to Science Division – including clinical trials resolution</td>
<td>Jeremy Farrar, Chief Scientist</td>
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**Session 2**

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<tr>
<th>13:30-14:30</th>
<th>Updates on TAG-NCD R&amp;I recommendations</th>
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<tr>
<td></td>
<td>Introduction to the TAG-NCD R&amp;I subgroup (5 mins)</td>
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<td></td>
<td>Summary and recommendations from systematic review and institutional mapping on implementation research (10 + 10 mins)</td>
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<td></td>
<td>Implementation research activities through Norway Flagship initiative (10 + 10 mins)</td>
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<td></td>
<td>Key messages from TAG-NCD R&amp;I subgroup and questions to the wider group (15 mins)</td>
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**14:30-14:40** Comfort break

**Session 3**

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<th>14:40-15:40</th>
<th>Strengthening capacity for implementation research</th>
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<td>Introduction to discussion</td>
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<td></td>
<td>Discussion (Breakout rooms): Responding to TAG-NCD R&amp;I subgroup questions (30 mins)</td>
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<td></td>
<td>Discussion (plenary): Report from group discussions (20 mins)</td>
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**15:50-16:00** Summary of day 1
Plan for day 2 | Chair, TAG-NCD R&I
WHO Secretariat |

#### Tuesday 3rd October

<table>
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<tr>
<th>13:00-13:10</th>
<th>Welcome</th>
<th>Chair, TAG-NCD R&amp;I Rapporteur</th>
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<tr>
<td>13:10-13:20</td>
<td>Opening Remarks</td>
<td>Dr Kumanan Rasanathan</td>
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**Session 4**

Research agenda for NCDs |  |  |
<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
<th>Presenter/Leader</th>
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</thead>
<tbody>
<tr>
<td>13:20-14:20</td>
<td>A renewed research agenda for prevention and control of NCDs – Next steps (5 + 5 mins)</td>
<td>Dr Robert Marten</td>
</tr>
<tr>
<td></td>
<td>Discussion (breakout rooms): Thematic areas, Methods, Stakeholders, Regional priorities (30 mins)</td>
<td>Facilitators: Ishu Kataria, Robert Marten, Sarah Rylance</td>
</tr>
<tr>
<td></td>
<td>Discussion (plenary): Report from group discussions (20 mins)</td>
<td>Chair, TAG-NCD R&amp;I All</td>
</tr>
<tr>
<td>14:20-14:30</td>
<td>Comfort break</td>
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<td></td>
<td>Session 5</td>
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<tr>
<td>14:30-15:30</td>
<td>Capturing innovations</td>
<td></td>
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<tr>
<td></td>
<td>Documenting innovative models of prevention and care for NCDs (10 + 10 mins)</td>
<td>Chair, TAG-NCD R&amp;I</td>
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<tr>
<td></td>
<td>Discussion: How to capture those innovative models? (40 mins)</td>
<td>Chair, TAG-NCD R&amp;I</td>
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<td></td>
<td></td>
<td>All</td>
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<tr>
<td>15:30-16:00</td>
<td>Summary of day 2</td>
<td>Chair, TAG-NCD R&amp;I</td>
</tr>
<tr>
<td></td>
<td>TAG-NCD R&amp;I agenda for 2-year term Plan for next meeting and closing</td>
<td>Director, WHO NCD</td>
</tr>
</tbody>
</table>
Annex 2: List of participants at the third meeting of TAG-NCD R&I

<table>
<thead>
<tr>
<th>Technical Advisory Group Members</th>
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</thead>
<tbody>
<tr>
<td>Dr Abeer Al Saegh</td>
</tr>
<tr>
<td>Professor Valery Feigin</td>
</tr>
<tr>
<td>Professor Adnan A. Hyder</td>
</tr>
<tr>
<td>Professor Tiina Laatikainen</td>
</tr>
<tr>
<td>Professor Liming Li</td>
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<tr>
<td>Dr Yodi Mahendradhata</td>
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<tr>
<td>Professor Jaime Miranda</td>
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<tr>
<td>Professor Mayowa Owolabi</td>
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<tr>
<td>Professor Srinath Reddy</td>
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<tr>
<td>Professor Richard Sullivan</td>
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<tr>
<td>Professor Salim Virani</td>
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</table>
World Health Organization (WHO) Headquarters Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Bente Mikkelsen</td>
<td>Director, Noncommunicable Diseases (NCD) Department</td>
</tr>
<tr>
<td>Dr Jérôme Salomon</td>
<td>Assistant Director-General, Universal health Coverage, Communicable and Noncommunicable Diseases</td>
</tr>
<tr>
<td>Sir Jeremy Farrar</td>
<td>Chief Scientist, World Health Organization</td>
</tr>
<tr>
<td>Dr Slim Slama</td>
<td>Unit Head, NCD Management</td>
</tr>
<tr>
<td>Dr Sarah Rylance</td>
<td>Medical Officer, NCD Department</td>
</tr>
<tr>
<td>Dr Hongyi Xu</td>
<td>Technical Officer, NCD Department</td>
</tr>
<tr>
<td>Dr Robert Marten</td>
<td>Scientist, Alliance for Health Policy and Systems Research</td>
</tr>
<tr>
<td>Dr Téa Collins</td>
<td>Cross-cutting Lead, Global NCD Platform</td>
</tr>
<tr>
<td>Dr Guy Fones</td>
<td>Head, Global Coordination Mechanism on NCDs</td>
</tr>
<tr>
<td>Dr Kumanan Rasanathan</td>
<td>Executive Director, Alliance for Health Policy and Systems Research</td>
</tr>
<tr>
<td>Giulia Loffreda</td>
<td>Consultant, NCD Implementation Research</td>
</tr>
<tr>
<td></td>
<td>NCD Department &amp; Alliance for Health Policy and Systems Research</td>
</tr>
<tr>
<td>Dr Ishu Kataria</td>
<td>Consultant, RTI International</td>
</tr>
<tr>
<td>Dr Rachel Nugent</td>
<td>Consultant, RTI International</td>
</tr>
</tbody>
</table>

WHO Regional Offices staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Kouamivi Agboyibor</td>
<td>Technical Officer, Regional Office for Africa</td>
</tr>
<tr>
<td>Dr Heba Fouad</td>
<td>Surveillance Officer, Regional Office for the Eastern Mediterranean</td>
</tr>
<tr>
<td>Dr Bishnu Giri</td>
<td>Technical Officer, Regional Office for South-East Asia</td>
</tr>
</tbody>
</table>

Observers

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Kjersti Blom-Bakke</td>
<td>Senior Scientist, Norwegian Institute of Public Health</td>
</tr>
</tbody>
</table>
Annex 3: Concept note for the third meeting of TAG-NCD R&I

Background
The Technical Advisory Group on NCD-related Research and Innovation (TAG-NCD R&I) was established in July 2021 as an advisory body to further WHO’s leadership and coordination role in promoting and monitoring global action on NCD research and innovation. Two meetings have taken place to date, in February and November 2022. In July 2023, eleven TAG-NCD R&I members accepted to serve another 2-year term on the advisory group.

The composition of the TAG-NCD R&I, Terms of Reference, and the previous two meeting reports can be found here: [https://www.who.int/groups/who-technical-advisory-group-of-experts-on-ncd-research-and-innovation](https://www.who.int/groups/who-technical-advisory-group-of-experts-on-ncd-research-and-innovation)

The TAG-NCD R&I meeting is organized by the WHO NCD Department, which provides the Secretariat for the advisory body. The TAG-NCD R&I members are joined by staff from relevant departments in WHO headquarters, representatives from Regional Offices, the Alliance for Health Policy and Systems Research, the Global Coordination Mechanism on NCDs and external observers.

Meeting Objectives
1. Review the progress and activities to date relating to previous TAG-NCD R&I recommendations;
2. Inform opportunities for capacity strengthening at the individual, and institutional levels for NCDs and implementation research;
3. Inform plans to update the existing prioritized research agenda for NCDs with a renewed focus on health policy and systems research and implementation research;
4. Explore opportunities to research and capture innovative interventions for NCDs;
5. Develop an agenda for the TAG-NCD R&I for the next 2-year term.

Background Documents
- TAG-NCD R&I reports:
  - First meeting (February 2022) [https://www.who.int/publications/i/item/9789240050082](https://www.who.int/publications/i/item/9789240050082)
  - Second meeting (November 2022) [https://www.who.int/publications/i/item/9789240070226](https://www.who.int/publications/i/item/9789240070226)
- Report on TAG-NCD R&I subgroup scope, activities and recommendations
  - Summary of findings from systematic review and mapping exercise
- Advancing the global agenda on prevention and control of noncommunicable diseases 2000 to 2020: looking forwards to 2030: [https://www.who.int/publications/i/item/9789240072695](https://www.who.int/publications/i/item/9789240072695)
- NCD Country Capacity Survey [https://www.who.int/teams/ncds/surveillance/monitoring-capacity/ncdccs](https://www.who.int/teams/ncds/surveillance/monitoring-capacity/ncdccs)
Summary of Recommendations and Activities of the Second TAG-NCD R&I Meeting

The TAG-NCD R&I recommended that WHO support Member States to identify research priorities, create an enabling environment for research at national level, and advocate for greater investment in implementation research. A sub-group of the TAG-NCD R&I would focus on providing coordinated country support for NCD-related implementation research, including capacity strengthening.

A summary of recommendations and activities can be found below. Detailed report of the second TAG-NCD R&I meeting can be found [here](#).

1. **Prioritization of implementation research in low- and middle-income countries**
   - Implementation research needs to be prioritized in low- and middle-income countries (LMICs). WHO can highlight the benefits of investment in implementation research for greater impact of limited resources.
   - Reframing implementation research for better reception by LMICs could prove helpful in bringing it to the forefront.
   - Lessons from implementation research experiences in LMIC can be shared and used to build a case for investment.

2. **Capacity building for NCD-related implementation research is needed in LMICs**
   - Promote a team-based approach to capacity strengthening, at institutional level, for greater sustainability.
   - Learn from existing resources on implementation research in infectious disease and adapt them for NCDs.
   - Mapping implementation resources and expertise at country and regional level will facilitate needs-driven technical assistance, within national and regional networks.

There was agreement that WHO should support national implementation research capacity building in LMICs through the work of the TAG-NCD R&I subgroup, with specific activities to include:

- Systematic review of the literature on implementation research on WHO technical packages relating to NCD management to identify common approaches and best practices.
- Map the key stakeholders and resources available to support implementation research in African and South-East Asia Regions and in Norway-supported countries, including information from the relevant Regional Offices, published literature, WHO Collaborating Centres, global research networks, and Institutes of Public Health.
- Work together with the successful applicants from the WHO-AHPSR implementation research call to establish a network of implementation research teams, to create opportunities for shared learning and peer support, and facilitate technical assistance depending on identified needs.

3. **WHO research agenda for NCD-related implementation research**
   - WHO has the ability to leverage its position and convening power to influence the NCD research agenda globally.
   - It is critical to support Member States in developing an agenda for NCD-related implementation research at the national level which is contextually relevant and locally driven.
   - A WHO-promoted implementation research agenda for NCDs could help to stimulate political will and funding.
The TAG-NCD R&I called for an updated WHO NCD research agenda with a specific focus on implementation research to guide countries in setting their national research agendas. The revised agenda will not attempt to prioritize questions for specific diseases or risk factors, which are the purview of clinicians and academics working in the relevant areas. Instead, this contemporary and relevant WHO guidance would provide high-level endorsement of the importance of implementation research, targeting policy makers, health systems planners and funders.

**Advocacy for NCD-Related Implementation Research**

The TAG-NCD R&I suggested advocating for implementation research in NCDs through various fora, mentioning the World Health Summit and Health Systems Global Conference as two specific opportunities. Additionally, a commentary co-authored by the TAG-NCD R&I members will be published in 2023, advocating for NCD-related implementation research activities specifically in LMICs.
Annex 4: TAG-NCD R&I sub-group report

Background

The Technical Advisory Group on NCD-related Research and Innovation (TAG-NCD R&I) was established in July 2021 and held its first meeting in February 2022. At this first TAG-NCD R&I meeting, several recommendations were made, including that WHO should prioritize implementation research to improve NCD programme delivery and strengthening the capacity for research in countries.

Report of the first meeting of the Technical Advisory Group on NCD-related Research and Innovation (who.int)

The TAG-NCD R&I subgroup was formed as a means to action some of the recommendations, focusing on providing coordinated country support for NCD-related implementation research, including capacity strengthening.

Professor Tiina Laatikainen provided a report on behalf of the subgroup to the 2nd TAG-NCD R&I meeting in November 2022, and the TAG-NCD R&I members were invited to contribute suggestions to the proposed workplan. Reports from TAG-NCD R&I subgroup meetings (in June and August 2022) were shared as pre-reading.

There was agreement that WHO should support national implementation research capacity building in LMICs through the work of the TAG subgroup, with specific activities to include:

- Systematic review of the literature on implementation research on WHO technical packages relating to NCD management, to identify common approaches and best practice.
- Map the key stakeholders and resources available to support implementation research in African and South-East Asia Regions and in Norway-supported countries, including information from the relevant Regional Office, published literature, WHO collaborating centres, global research networks, Institutes of Public Health.
- Work together with the successful applicants to the WHO-AHPSR implementation research call to establish a network of implementation research teams, to create opportunities for shared learning and peer support, and facilitate technical assistance depending on identified needs.

Summary of activities in 2023

TAG-NCD R&I subgroup meetings

To date in 2023, the subgroup has met in March, June and September. The subgroup members are: Tiina Laatikainen (Chair), Yodi Mahendradhata, Jaime Miranda

Sarah Rylander (NCD Department, WHO headquarters) and Robert Marten (Alliance for Health Policy and Systems Research (AHPSR)) have provided support.
Technical support has been provided by Ishu Kataria and Rachel Nugent (RTI International) through an Agreed Performance of Work.

Kjersti Blom-Bakke (Norwegian Institute of Public Health, Norway) has contributed as an observer to the subgroup discussions, sharing experiences from the Building stronger public health institutions and systems (BIS) program.

The focus of the meetings has been to review and guide the activities detailed above, recommended by the 2nd TAG-NCD R&I meeting.

**Outputs supported by the TAG-NCD R&I subgroup**

The following specific outputs have been supported by the TAG NCD-R&I subgroup – a progress update on these will be provided to the 3rd meeting of the TAG-NCD R&I:

- Systematic review of the literature on implementation research on WHO technical packages relating to NCD management, to identify common approaches and best practice.
- Mapping of the key stakeholders and resources available to support implementation research in African and South-East Asia Regions and in Norway-supported countries.
- Implementation research projects relating to NCD integration in primary health care in Ethiopia, Ghana, India and Nepal – supported by WHO Norway Flagship Initiative on NCDs, in collaboration with AHPSR. The projects include designing, implementing and assessing:
  - In Ethiopia, the delivery of comprehensive diabetes, hypertension, and cervical cancer services through an adapted HEARTS package. Principal investigator: Dr Netsanet Worku, University of Gondar.
  - In Ghana, the integration of hypertension and diabetes care with HIV services. Principal investigator: Prof Phyllis Dako-Gyeke, University of Ghana School of Public Health.
  - In India, the utilization of m-health technology and community health workers to enhance drug adherence for coronary artery disease. Principal investigator: Dr Aswathy S Reedevi, Amrita Institute of Medical Sciences.
  - In Nepal, the role of female community health volunteers in reducing systolic blood pressure. Principal investigator: Dr Archana Shrestha, Institute for Implementation Science and Health, Nepal Health Research Council.

Link to AHPSR news release [here](#).

**Key messages to bring to the TAG-NCD R&I**

The outputs listed above, and the discussions around their development have facilitated a deeper understanding of some of the issues raised in the previous two TAG-NCD R&I meetings.

The subgroup recognizes key messages:

- Implementation science could be used more effectively to inform the adoption and scale-up of NCD interventions and packages.
- The systematic review identified a gap in appropriate use of implementation research methodology.
- From the mapping exercise, funding comes from a relatively small pool of donors.
• There are some excellent academic institutions and research teams in the four countries.
• Supported through the WHO Norway Flagship Initiative on NCDs (Ethiopia, Ghana, India, Nepal).
• Funding tends to go to relatively few key institutions.
• Lack of awareness of global training opportunities (e.g., TDR and GACD).
• Engagement of implementers and policy makers is critical for impact.

• Coordination at national or sub-national level can strengthen institutional links and capacity

There is a need to explore these challenges and opportunities, sharing experiences and learning, in order to develop specific suggestions for action.

The subgroup would like to raise the following issues for further discussion in the TAG-NCD R&I meeting:

1. How to facilitate the use of implementation science and research to inform the adoption and scale-up of recommended NCD interventions e.g., best buy interventions and WHO NCD technical packages.
2. What strategies can be employed to embed implementation research into the delivery of technical packages and interventions from the outset – how can WHO support this?
3. How can we encourage funding for this important area, and stimulate longer term projects.
4. How to use existing research networks and raise awareness of potential resources (funding calls, training opportunities).
5. When does networking work well – examples of good practice (between individuals, institutions, within countries, across countries).
6. Other research networks to tap into – avoiding silos, considering academic institutions work on a broad portfolio of research areas.
7. How to build the capacity of implementation research teams and nurture links between implementers, researchers, health system planners and policy makers.
8. What are the incentives for each stakeholder group to fully engage – can funders support this institutional capacity strengthening and networking.
9. How to mitigate turnover of staff, changing priorities, brain drain.
Annex 5: Systematic review—methods and findings brief

Abstract

**Background:** Implementation science research plays a critical role in supporting countries’ efforts to adapt and effectively implement WHO technical packages for noncommunicable diseases (NCDs). This multidisciplinary research method supports successful adoption and adaptation of health interventions by disseminating best practices, identifying barriers and facilitators, and evaluating the effectiveness of technical package implementation. **Objectives:** This paper seeks 1) to review implementation science methods that are used to evaluate the application of WHO technical packages for NCDs; and 2) to review findings from the body of literature on the subject, with a focus on barriers and facilitators to the implementation of technical packages in LMICs. **Methods:** A literature search was conducted of 8 databases, targeting peer-reviewed implementation science research that was conducted in LMICs and discussed the implementation of one or more WHO technical package for NCDs. **Results:** The review included 56 studies originating from 27 countries representing all WHO regions. Over half of all articles (n=31) discussed WHO PEN or WHO PEN Plus technical packages. Twelve articles focused on the WHO HEARTS technical package, while ten included the WHO MPOWER technical package. Of the remaining articles, 2 discussed an integrated WHO PEN and HEARTS technical package program and 1 the WHO SHAKE technical package. **Conclusion:** This study summarizes the findings of previous implementation science research for NCDs, highlighting identified best practices and areas of need for further research in this field. This research produces insights for the effective implementation of WHO technical packages for NCDs in low- and middle-income countries.

Introduction

As the leading international organization responsible for coordinating global health policies and standards, the World Health Organization (WHO) disseminates evidence-based guidance to help countries respond to health trends and emerging threats. Recognizing the growing burden of noncommunicable diseases (NCDs) in low- and middle-income countries (LMICs), WHO has developed technical packages that provide guidance and tools for resource-limited health systems to reduce the morbidity and mortality associated with these diseases. The most widely adopted of these technical packages is the WHO package of essential noncommunicable (PEN) disease interventions (henceforth, the WHO PEN package; 2010), which provides a comprehensive set of cost-effective interventions for the prevention and management of various NCDs in primary care settings. Other WHO technical packages for NCDs include MPOWER (2008), HEARTS (2016), SHAKE (2016), SAFER (2018), and REPLACE (2018), which, respectively, provide guidance for addressing tobacco use; cardiovascular diseases; excessive intake of salt, sugar, and fat; alcohol consumption; and reducing consumption of trans fats.

The flexibility and adaptability of WHO technical packages for NCDs allow countries to use them as guiding frameworks, rather than rigid mandates. Countries’ ministries of health adapt and implement these packages at national or subnational levels, a process which involves assessment of local needs and capabilities, contextualization of WHO guidelines within the local health environment, policy development and dissemination, training, and capacity building to ensure that health care providers are practicing the most up-to-date standards of care for NCDs. While adapting WHO guidelines, countries also learn from best practices in other nations facing similar challenges. By harnessing global expertise and local knowledge, countries can develop and implement evidence-based NCD strategies suited for their unique circumstances and health systems.
Implementation research plays a critical role in supporting countries’ efforts to adapt and effectively implement WHO technical packages for NCDs. This multidisciplinary field of study supports successful adoption and adaptation by disseminating best practices, identifying barriers and facilitators, and evaluating the effectiveness of technical package implementation across contexts. Research on the implementation of WHO technical packages for NCDs has been published in dozens of countries. Much of this research is performed in collaboration with government officials, health care providers, or representatives of multilateral and civil society organizations who personally oversaw the implementation of technical packages within their own national or subnational health system.

For ministries of health that are developing policies to address NCDs, the utility of this global knowledge exchange cannot be overstated. With a robust body of implementation research, health authorities can plan effective and sustainable integration of WHO guidelines into their existing policies. They can also target barriers and facilitators identified in scientific literature during the adaptation, and match guidance to existing health system capabilities to ensure smooth implementation. Furthermore, global evidence demonstrating effectiveness and cost-effectiveness of technical package implementation can be used to advocate for the prioritization and funding of these efforts.

This paper offers a stocktaking of the scope, results, and methods of implementation research concerning WHO technical packages for NCDs. It was undertaken at the request of the WHO Technical Advisory Group on NCD Research and Innovation and is intended to guide the Technical Advisory Group’s development of a research agenda.

**Objectives**

The objectives of this systematic review are (1) to review the methods that are used in implementation research to evaluate the application of WHO technical packages for NCDs; and (2) to review findings from the body of implementation science literature on the subject, with a focus on barriers and facilitators to the implementation of technical packages in LMICs. This paper summarizes the findings of previous research, highlighting best practices in implementation science and areas of need for further research in this field. We conducted this review so that the existing body of implementation science literature can be more effectively considered in informing the introduction and scale-up of WHO technical packages for NCDs in LMICs.

This paper will first describe the systematic review process we employed to identify relevant implementation science literature. Next, we summarize evidence from peer-reviewed literature on the barriers and facilitators of successful technical package implementation in LMICs. Finally, we detail key outcomes reported by researchers of WHO technical package implementation, including to patient engagement, patient health improvements, cost-effectiveness, and health system capacity.

**Methods**

We conducted a literature search for articles describing WHO technical package implementation in LMICs. Studies considered for inclusion in this review (1) were related to implementation science, (2) had research conducted in a low- or middle-income country, (3) discussed at least one WHO NCD technical package, and (4) were peer-reviewed. We defined implementation science as the study of methods used to support the integration of evidence-based treatment into health care settings. We excluded non-English language papers, systematic reviews, protocols, and articles that were not readily accessible. WHO NCD technical packages comprised PEN, MPOWER, HEARTS, SHAKE, SAFER, and REPLACE.
Search Strategy and Data Extraction

We conducted a literature search of the following databases for studies published on or after January 1, 2009: PubMed, PsycINFO, Cochrane Library, CINAHL, Web of Science, Embase, Global Health Database, and OpenDOAR. Our search terms included terms related to LMICs and “PEN OR PEN-Plus package OR HEARTS OR MPOWER OR ACTIVE OR SHAKE OR REPLACE OR SAFER” OR “implementation science OR policy analysis OR monitoring OR evaluation.” One reviewer performed the electronic search strategy and two reviewers (G. Allman and L. Morrell) independently screened the titles, abstracts, and full texts to determine whether they met the inclusion criteria using a combination of the Rayyan intelligent review web-tool and Microsoft Excel. Differences were resolved by two additional reviewers (I. Kataria and R. Nugent).

Two reviewers (G. Allman and L. Morrell) independently extracted data using an Excel-based matrix. The data extraction matrix gathered three levels of information:

1. **Level 1** coded descriptive information of each study: author names, author affiliations, full study title, year of publication, abstract, years that the study took place, scope of the studies, name of the relevant WHO package, and the funding statement.
2. **Level 2** comprised information on the type of implementation framework used in the study, the impact of implementation, barriers to implementation status, health systems capacity and feasibility information, specific package component evaluations, and capacity-building components.
3. **Level 3** retrieved information on the strategies and structures that the studies used. Strategies consisted of any training, tools, technical assistance, incentives, and assessment or feedback components.

Structures included the orientation of studies; the duration, frequency, and amount of capacity-building support provided in the study; the delivery mode of capacity building in the intervention; and an indicator as to whether the study included technical assistance.

Results

The search strategy (see Prisma diagram, Figure A5.1) identified 93 studies, of which 1 was a duplicate and therefore excluded. Of the remaining 92 studies, 29 failed to meet inclusion criteria and were excluded from the analysis, leaving 63 studies to evaluate for full-text eligibility. We excluded 7 of these studies because they were either a conference abstract or a protocol, leaving 56 articles for inclusion in the review. This review included studies from 27 countries from all WHO regions. Studies from South Asia were the most common, with the plurality in the region coming from India ($n = 3$) and Bhutan ($n = 3$) (Figure A5.2). Two articles were from low-income countries, 22 from lower-middle income countries, and 12 from upper-middle-income countries. We identified 20 multi-country studies from lower-and middle-income countries.
Over half of the reviewed articles ($n = 31$) discussed the WHO PEN or WHO PEN-Plus technical packages. Twelve articles focused on the WHO HEARTS technical package,$^9, 11^{–}21$ and 10 included the WHO MPOWER technical package.$^{22^{–}31}$ Of the remaining articles, 2 discussed an integrated WHO PEN and HEARTS technical package.
Only one of the studies used an implementation science framework, specifically the Consolidated Framework for Implementation Research (CFIR). In the eight studies that included any framework, the following kinds were used: health system dynamics framework ($n = 3$), Cabana framework ($n = 1$), consolidated criteria for reporting qualitative research ($n = 1$), CFIR ($n = 1$), primary health care performance initiative conceptual framework ($n = 1$), and WHO-reassured criteria ($n = 1$).

**Outcomes**

Nineteen articles reported on patient-related outcomes (17 on patient health, 2 on patient engagement). Of the 19, 12 included the PEN package, $^{35–46}$ 4 the MPOWER package, $^{25, 27, 30, 31}$ 2 the HEARTS package, $^{15, 20}$ and 1 both the PEN and HEARTS packages. $^{33}$ Figure A5.3 displays the number of each main outcome grouped by WHO technical package.

**Fig. A5.3: Main patient-related outcomes reported in included studies grouped by WHO technical package**

The patient-related health outcomes connected to the PEN package included improved cardiovascular disease symptoms, reductions in alcohol use levels, reductions in smoking consumption levels, decreases in the incidence rate of myocardial infarction and stroke, increases in NCD screening levels, and reductions of mortality. Studies that included the MPOWER package showed outcomes relating to decreases in cigarette use and reductions in smoking-attributable deaths. The two studies that included the HEARTS package found that patients experienced an increase in blood pressure control after program implementation. Lastly, the one study that implemented both the PEN and HEARTS packages discovered that implementation of the programs led to higher overall disease control.

Of the two studies that focused on outcomes related to patient engagement, both reported increased NCD screening levels. Bollars et al. (2018) evaluated screening levels after four protocols of the WHO PEN package were implemented in Samoa. $^{38}$ This study reported that 6.7% of participants older than 40 years were identified as being at a high-risk level for at least one NCD and were referred to further treatment. Tripathy and Mishra
(2021) found that more than 90% of the target population were screened for NCDs after PEN implementation in Samoa.35

Table A5.1: Descriptive characteristics of included studies

<table>
<thead>
<tr>
<th>Author(s) (Publication Year), Country/Region</th>
<th>WHO Technical Package</th>
<th>Framework Used</th>
<th>Capacity Building (yes/no)</th>
<th>Main Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albelbeisi et al. (2021), West Bank and Gaza Strip</td>
<td>PEN</td>
<td>Cabana Framework</td>
<td>Yes</td>
<td>Health system capacity</td>
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<tr>
<td>AlHelo and Elessi (2019), West Bank and Gaza Strip</td>
<td>PEN</td>
<td>Not specified (N.S.)</td>
<td>Yes</td>
<td>Patient health</td>
</tr>
<tr>
<td>Aryal et al. (2018), Nepal</td>
<td>PEN</td>
<td>N.S.</td>
<td>No</td>
<td>Health system capacity</td>
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<tr>
<td>Ayat et al. (2022), the Islamic Republic of Iran</td>
<td>PEN</td>
<td>N.S.</td>
<td>No</td>
<td>Patient health</td>
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<td>Aye et al. (2020), Myanmar</td>
<td>PEN</td>
<td>Consolidated criteria for reporting qualitative research</td>
<td>Yes</td>
<td>Program evaluation</td>
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<tr>
<td>Basu et al. (2019), South Africa</td>
<td>PEN</td>
<td>N.S.</td>
<td>No</td>
<td>Patient health</td>
</tr>
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<td>Bernabé-Ortiz et al. (2021), Global</td>
<td>PEN</td>
<td>WHO-reassured criteria</td>
<td>No</td>
<td>No outcomes stated</td>
</tr>
<tr>
<td>Bollars et al. (2018), Samoa</td>
<td>PEN</td>
<td>N.S.</td>
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<td>Khan et al. (2018), Colombia, Malaysia, and Canada</td>
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<td>Okoli et al. (2021), Nigeria</td>
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<td>Philbert et al. (2022), Saint Lucia</td>
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</table>

28| Report of the third meeting of the TAG on NCD-related research and innovation
Capacity Building

Of the studies, 47 included at least one of the five types of capacity-building strategies: training, tools, technical assistance, incentives, and assessment or feedback components. Seventeen articles included training of health care workers (n = 14), of trainers (n = 5), or a combination of health care workers and trainers (n = 2). [8–11,13–15,18,20,35,40,46,47,49,52,63] Sixteen of the studies reported on various tools, comprising clinical decision support tools (n = 7), clinical and diagnostic tools (n = 5), the HEARTS costing tool (n = 2), scorecards (n = 1), and WHO/ISH (International Society of Hypertension) charts (n = 1). (8,9,11–13,15,38,40,42,44,52–56,64)

Of the 11 articles that reported on the use of technical assistance, 4 were connected to partnerships between multilateral and local organization, 3 between local partners, 2 between unknown partners, 1 between the government and a local partner, and 1 between a non-governmental organization and a local partner. [9,12–14,33,38,40,42,46,52,63] Nine studies included tools describing assessment and feedback strategy. The most common assessment and feedback strategies were patient feedback (n = 2), assessments of a health facilities’ readiness to implement an intervention (n = 2), feedback on barriers to patient adherence (n = 1), feedback on curriculum uptake (n = 1), patient and provider feedback (n = 1), performance assessments (n = 1), and quality care feedback (n = 1). [16,17,33,40,42,47–49,55]

None of the publications reported on the use of incentives for capacity building.

Barriers and Facilitators to Implementation of WHO Packages

Many of the included studies analyzed health system capacity to implement WHO packages and other NCD programs; however, no included studies analyzed barriers and facilitators to conducting implementation research on the technical packages. This lack of published information indicates a large knowledge gap in implementation research. Barriers to implementation of WHO packages commonly included a general lack of essential medicines in health care facilities, a lack of medical supplies such as testing devices and strips, inadequate training of health care workers (particularly for diabetes care), a lack of digitized health systems, poor or absent screening programs, and patient distrust in services. Reported facilitators included support from senior leadership at health care facilities, standardized treatment protocols, continuity of care and follow-up in health care systems, and team-based care and task-shifting roles at primary health care facilities.

Implementation Timing

Figure A5.4 represents the timing of when the reviewed studies reported results. Because all studies included WHO technical package implementation, timing of results reporting aligned with the phase of technical package implementation. We classified studies as being reported pre-implementation, during implementation, post-implementation, or a mixture of the categories. We classified three articles as mixed: multi-country studies that evaluated the level of package implementation across the included countries.
Discussion

Our systematic review shows that implementation research referencing the WHO technical packages is limited and is usually not carried out using an implementation science framework. Only 1 study of the 56 included used an implementation science framework. Most of the included studies also did not evaluate the standard implementation science outcomes of acceptability, reach, adoption, fidelity, implementation cost, and sustainability (65). Their reporting predominantly emphasizes outcomes over the processes of implementation research, with sole focuses on package implementation and its associated outcomes. However, these studies lack components that are a part of standard implementation research, such as stakeholder engagement and formative analysis. This highlights a disconnect between conventional outcomes observed in implementation research and the outcomes reported in the included studies concerning WHO packages.

Few implementation science studies have evaluated the facilitators and barriers to WHO technical package implementation in LMICs. When it is done, this used various methods: policy analysis, quantitative techniques such as pre-post testing, qualitative techniques such as workshops with providers, secondary analysis, and predictive economic modeling.

Common barriers to WHO package implementation include a general lack of essential medicines in health care facilities, a lack of medical supplies such as testing devices and strips, inadequate training of health care workers (particularly for diabetes care), a lack of digitized health systems, poor or absent screening programs, and patient distrust in services. Of the few studies that reported on facilitators to WHO package implementation, commonalities were strong support from senior leadership at health care facilities, standardized treatment protocols, continuity of care and follow-up in health care systems, and team-based care and task-shifting roles at primary health care facilities.

However, none of the studies specifically analyzed barriers and facilitators to conducting implementation research on the technical packages. This lack of published information indicates a large knowledge gap in implementation research regarding WHO NCD technical packages, thus making a strong case for (1) building capacity on implementation research at the national level throughout the world and (2) using standard
implementation research outcomes to determine how best to implement WHO NCD technical packages in LMICs. Additionally, implementation research needs to be action-oriented and have recommendations that can be used by national governments to accelerate the development and actions on policy and programme.

Our review also had a few limitations. The search criteria were in English, which omitted articles published in other languages. Also, we limited our search to LMICs, which may have reduced learnings from WHO technical package implementation in high-income contexts.

References

34. Shahrir, S.N, Abdul Manaf, M.R., Mustapha, F.I., Md. Isä, Z. Critical review on dietary sodium reduction policies in Malaysia. *Int Food Research J.* 2019:26(1);33–40. Available from:


57. Primary healthcare system readiness to prevent and manage non-communicable diseases in Bangladesh: a mixed-method study protocol | *BMJ Open.* 2021;11:e051961. Available from: [https://bmjopen.bmj.com/content/11/9/e051961](https://bmjopen.bmj.com/content/11/9/e051961)


Annex 6: Mapping of research institutions with capacity for NCD implementation science research: summary of methods and results

Background
Implementation science is an emerging practice in global public health, particularly in the area of NCDs. To enable research capacity building, facilitate researcher connections, and strengthen future research within this field, RTI mapped funders, researchers, and research institutions that have supported and conducted implementation science research for NCDs in the last 5 years. Beyond facilitating connections for the purposes of funding and conducting research, this mapping of research institutions can provide the foundation for a knowledge sharing and capacity building hub.

Data Collection
Excel data was downloaded from NIH [National Institutes of Health] World Report for all research funded in 5 key NORAD [Norwegian Agency for Development Cooperation]-supported countries: Ethiopia, Ghana, India, Myanmar, and Nepal. The NIH World Report is an interactive, open-access online database of global research investments from top biomedical research funders. Data was extracted on May 31, 2023, after which details on each of the included implementation science research projects were verified by visiting online project pages maintained by the various funding organizations.

Additional research activities have been identified through searches of the websites of the Global Alliance for Chronic Diseases, the National Institute for Health and Care Research, the Australian National Health and Medical Research Council, and relevant WHO Collaborating Centres on NCDs which are listed on the final tab of the Institution Mapping Spreadsheet. Finally, we included relevant implementation science research projects from our systematic literature review, and from a web search of organizations which funded research featured in another literature review by Hategeka et al.

Funding data across years was aggregated, and other information such as participating research organizations and investigators was compiled in a single row per project. Funding has been listed in the donor currency, in addition to having been converted to U.S. dollars (USD) using historical exchange rates for the first date of each funding year from Oanda Currency Converter.

Aside from funding, key information collected for each implementation science research project includes the project timeline, research partners (principal investigators and research institutions), targeted population groups, NCDs, and risk factors.

Results
- The institutional mapping exercise has shown the range and distribution of implementation science research across institutions in Ethiopia, Ghana, India, Myanmar, and Nepal. We have identified a diverse range Indian and Ghanaian academic and research institutions conducting implementation science, in addition to a number of medical facilities and civil society organizations contributing as research partners. In contrast Ethiopia (and Myanmar and Nepal to a lesser extent) demonstrates a concentration of implementation science research being performed by a limited number of institutions. While Addis Ababa University is the only institution to have conducted multiple identified projects in Ethiopia, 18 institutions in India have participated in two or more research projects.
- From the available data on research grants in the 5 NORAD-supported countries, we have seen funding for implementation science research grow over the last 5 years. In particular, India and Ghana have seen...
significant positive trends in the disbursement of funding for implementation science research for NCDs. The most consistent funders of this research are the U.S. National Institutes of Health, UK Medical Research Council, the Global Alliance for Chronic Diseases, and the European Commission. Additionally, the British government’s National Institute for Health and Care Research disbursed a large amount of relevant funding across research projects in Ghana, India, and Nepal in 2022.

**Limitations**

This search process focuses on the largest funders of implementation science for noncommunicable diseases, and results represent the majority of relevant project funding being disbursed in the target countries. Smaller projects, particularly those funded through private foundations and other philanthropic channels, are liable to be overlooked by this search process. However, we believe these projects are likely to be smaller, shorter-term, and less research-oriented than the projects that have been uncovered by the institution mapping process. Another limitation is that the uneven timing of funding flows by different donors prevents showing a clear trend of funds disbursed over time. Funding information for ongoing projects is comprehensive for the majority of funders, but only representative of NIH funding disbursed to date. Because NIH is the largest cumulative funder of implementation science for NCDs across the study period, the totals appear lumpy across a multi-year period whereas they are likely to be disbursed more evenly across year.