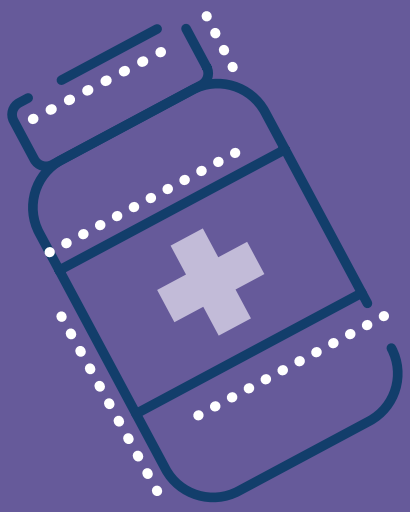
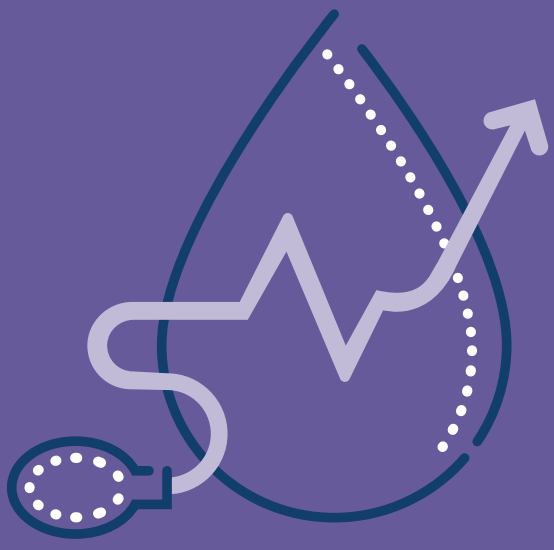


Research Priorities for Non-Communicable Diseases in Humanitarian Crises:

Focus on Cardio-Metabolic Syndrome



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CONTENTS

ACKNOWLEDGEMENTS

The Elrha Non-Communicable Diseases (Cardio-Metabolic Syndrome) Research Priority Setting in Humanitarian Settings Steering Committee and Technical Sub-committee include the following colleagues who volunteered time to offer guidance in the research priority setting process and technical advice:

- Beatrice Vetter, Foundation for Innovative New Diagnostics, Switzerland
- Eimhin Ansbro, London School of Hygiene & Tropical Medicine, UK
- Hala Ghattas, American University of Beirut, Beirut, University of South Carolina, USA
- Iryna Vlasenko, International Diabetes Federation, Ukraine
- Mamsallah Faal-Omisore, Primary Care International, UK/Global
- Marcello Tonelli, University of Calgary, Canada
- Michael Woodman, United Nations Office of the High Commissioner for Refugees, Switzerland/Global
- Mohamed Osman Mohamed, Ministry of Health, Somalia
- Mohammad Sami Karimi, Ministry of Public Health Kabul, Afghanistan
- Philippa Boulle, Médecins Sans Frontières, Switzerland/Global
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- Slim Slama, World Health Organization, Switzerland/Global
- Sonia Walia, Bureau for Humanitarian Assistance, US/Global
- Sylvia Kehlenbrink Oh, Harvard Humanitarian Initiative, International Alliance for Diabetes Action
- Zipporah Ali, NCD Alliance, Kenya

The project team would like to acknowledge and thank the survey respondents, and all observers who provided time and feedback throughout this process, particularly in identifying, developing and refining the research questions.

Special thanks to Tatiana Elghossain for her help in drafting and revising this report.

This work is funded by Elrha's Research for Health in Humanitarian Crises (R2HC) Programme. R2HC is funded by the UK Foreign, Commonwealth and Development Oce (FCDO), Wellcome, and the Department of Health and Social Care (DHSC) through the National Institute for Health Research (NIHR).

ABOUT ELRHA

We are Elrha, a global organisation that finds solutions to complex humanitarian problems through research and innovation.

We are an established actor in the humanitarian community, working in partnership with humanitarian organisations, researchers, innovators and the private sector to tackle some of the most difficult challenges people face all over the world.

We equip humanitarian responders with knowledge of what works, so that people affected by crises get the right help when they need it most. We have supported more than 200 world-class research studies and innovation projects, championing new ideas and different approaches to evidence of what works in humanitarian response. Elrha has two successful humanitarian programmes: Research for Health in Humanitarian Crises (R2HC) and the Humanitarian Innovation Fund (HIF).

The R2HC aims to improve health outcomes for people affected by humanitarian crises by strengthening the evidence base for public health interventions. Our globally recognised research programme focuses on maximising the potential for public health research to bring about positive change and transform the effectiveness of humanitarian response.

The HIF aims to improve outcomes for people affected by humanitarian crises by identifying, nurturing and sharing more effective and scalable solutions. It is our globally recognised programme leading on the development and testing of innovation in the humanitarian system. Established in 2011, the HIF was the first of its kind: an independent, grant-making programme open to the entire humanitarian community.

Suggested Citation: Akik C, Kiapi L, Sibai A, Njagi S, Zaitouny N, Fouad F, Mayoufi M, Tessema M et al. (2024) Research Priorities for Non-Communicable Diseases in Humanitarian Crises: Focus on Cardio-Metabolic Syndrome. Elrha: London.

ISBN Number: 978-1-917009-05-8

Edited by James Middleton. Designed by Blue Stag.

ABBREVIATIONS AND ACRONYMS

AEA	Average expert agreement
AFR	African Region
AMR	Region of the Americas
AUB	American University of Beirut
CHNRI	Child Health and Nutrition Research Initiative
CHW	Community health worker
CMS	Cardio-metabolic syndrome
CVD	Cardiovascular disease
DALY	Disability-adjusted life year
EMR	Eastern Mediterranean Region
EUR	European Region
Govt	Government
HDL	High-density lipoprotein
IADA	International Alliance for Diabetes Action
IIAWG	Informal Inter-agency Working Group
IRB	Institutional Review Board
IRC	International Rescue Committee
LMIC	Low- and middle-income country
NCD	Non-communicable disease
PRQ	Priority research question
QALY	Quality-adjusted life year
R2HC	Research for Health in Humanitarian Crises
Reps	Representatives
RPS	Research priority setting
SEAR	South-East Asian Region
TSC	Technical Sub-committee
UNHCR	United Nations Office of the High Commissioner for Refugees
WHO	World Health Organization
WPR	Western Pacific Region

FOREWORD

In the rapidly evolving landscape of humanitarian emergencies, with acute and protracted crises leading to severe health consequences for hundreds of millions of people, the need for evidence-based solutions is more pressing than ever.

Non-communicable diseases (NCDs) pose a significant threat to the health and well-being of populations affected by humanitarian crises. NCDs cause 74% of global mortality, and in countries experiencing crises, NCDs can make up an even higher proportion of mortality: 92% in Ukraine and 75% in the Syrian Arab Republic. From cardiovascular diseases to diabetes, these conditions exacerbate existing vulnerabilities and increase the burden on already strained healthcare systems. Despite their prevalence, however, NCDs have historically received limited attention in humanitarian response efforts.

The World Health Organization, United Nations Office of the High Commissioner for Refugees (UNHCR), several non-governmental organisations, academic institutions and civil society have been working together with governments to strengthen NCD prevention and care in humanitarian crises. Elrha's 2021 Second Humanitarian Health Evidence Review report in 2021 identified a dearth of evidence on quality NCD interventions for humanitarian crises and resulted in the commissioning of this research priority setting. Cardio-metabolic syndrome is a cluster of NCD conditions that occur together, increasing the risk of mortality in settings where services are unavailable or compromised.

This work, led by a research team from the International Rescue Committee and the American University of Beirut, was guided by a Steering Committee comprising a group of NCD experts from across the world. A robust methodology was used to identify the top research priorities; the resulting report marks a significant milestone in our collective efforts to contribute to solutions to these health challenges in crisis settings.

We thank all contributors and stakeholders for their unwavering commitment to advancing the field of humanitarian health research, and urge researchers, practitioners, policymakers and donors to respond to the priorities identified by investing in research to improve the lives of people living with NCDs in crisis settings.

Together, let us strive to ensure that evidence-based knowledge and solutions guide our efforts to deliver effective, ethical, and equitable healthcare to those affected by humanitarian crises.

Anne Harmer
Head of Research for Health in Humanitarian Crises (R2HC), Elrha

Michael Woodman
Senior Public Health Officer, UNHCR, and Chair of the Inter-agency Working Group on NCDs in Humanitarian Settings

Executive summary

EXECUTIVE SUMMARY

Background

Non-communicable diseases (NCDs) pose a significant burden for public health, and are the leading cause of morbidity and mortality worldwide. In humanitarian settings, NCDs present a unique challenge. The burden of NCDs in such settings is particularly high, and their management is often deprioritised due to limited resources and competing priorities. The ability to respond to chronic disease in both acute and long-term crisis settings is not well established, with access to care inadequate and frequently disrupted.

Cardiovascular diseases, in particular, including cardio-metabolic syndrome (CMS), account for over 20% of the global burden of disability. CMS refers to a cluster of three or more conditions that occur together, increasing the risk of NCDs, notably heart disease, stroke and type 2 diabetes. These conditions include high blood pressure, high blood sugar levels, large waist circumference, low levels of high-density lipoprotein cholesterol and high levels of triglycerides in the blood. In humanitarian settings, deaths due to CMS are expected to continue to rise, and may eventually exceed those due to crises or emergencies, accidental deaths, and war and conflict.

This justifies a global call to action to address the rise of CMS in humanitarian settings to prevent further unnecessary deaths and comorbidities.

Goals and objectives

The objective of this research priority setting (RPS) exercise is to help steer the consensus-based research agenda on CMS and NCDs in humanitarian settings for the next decade. This exercise prioritised CMS to allow for a narrower research focus, while still serving the NCD agenda by including questions applicable to NCD service provision more broadly. Findings from this exercise can be extrapolated to other NCDs, particularly those with similar risk factors and management approaches to CMS.

This exercise also aims to identify gaps and generate findings on CMS that will help guide prioritisation of future research efforts on NCDs, including a more in-depth understanding of context-specific needs regarding the management of NCDs in both acute and long-term humanitarian crises.

Overview of methodology

An adapted approach of the Child Health and Nutrition Research Initiative (CHNRI)[1] was followed for this RPS, using an eight-step process (Table 1).

Overview of the NCD-CMS in humanitarian settings research methodology

Step	Description
1. Selection of process managers	Process managers included members of the American University of Beirut and the International Rescue Committee.
2. Selection of the most relevant criteria for the topic of interest	With input from the Steering Committee and Technical Sub-committee (TSC), the four agreed criteria by which to score the priority research questions (PRQs) included impact, effectiveness, feasibility and deliverability.
3. Specification of context in space, impact of interest and context in time	The process managers agreed on the following scope of research: • **Target populations** – all countries and communities affected by or at risk of humanitarian crises (conflict, displacement, complex emergencies, acute/protracted emergencies) • **Geographic scope** – global, regional, country and local levels • **Time scale** – 2024 to 2034 • **Outcomes of interest** – any outcome of interest.
4. Sourcing of priority research questions by deploying a survey guided by evidence maps	An online survey guided by evidence maps was deployed to source PRQs between April and June 2023.
5. Consolidation of PRQs into one overall list	The 182 survey respondents generated a list of 694 PRQs. Following the review process, a final list of 43 PRQs was generated and each question was assigned to a research theme/sub-theme.
6. Scoring of PRQs according to pre-selected criteria	An online survey was deployed for six weeks between October and November 2023 to score the final list of PRQs against four pre-selected criteria.
7. Calculation of scores and ranking of PRQs	75 respondents took part in the survey. For each PRQ, the average score and average agreement score were calculated.
8. Feedback and revisions	A validation meeting was held with the Steering Committee and TSC, and their feedback was incorporated into the final revisions.

Research priorities

Top ten PRQs

Overall rank	Question	Average score	Average expert agreement (%)
1	Q24. What are the most effective community health worker-driven interventions for cardio-metabolic syndrome management, monitoring and prevention in humanitarian settings, and what work modalities/training of community health workers are needed for this?	92.88	81.67
2	Q13. At primary care level, what are the most effective/ cost-effective interventions that can be effectively implemented to provide quality prevention and management, and improve treatment outcomes for cardio-metabolic syndrome in humanitarian settings?	90.87	81
3	Q12. What are the most effective/cost-effective interventions at the individual and population levels that provide quality diagnosis and management for cardio-metabolic syndrome in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?	89.11	74.00
4	Q33. What self-care interventions are effective among people at risk or living with cardio-metabolic syndrome in humanitarian settings? How do they work, for whom and under what conditions?	88.97	76.00
5	Q3. What are the knowledge, attitudes and practices (KAP) regarding cardio-metabolic syndrome, its risk factors and care-seeking practices in [specific humanitarian context] from the perspective of service providers as well as recipients (eg, refugees, displaced persons and host communities)?	88.92	79.33
6	Q10. What are effective mental health and psychosocial support approaches, and the impact of access to psychosocial support on the management of cardio-metabolic syndrome and treatment outcomes in humanitarian settings?	88.20	73.33

7	Q15. What is the (cost-)effectiveness of adopting an integrated, primary care-centric approach to providing cardio-metabolic syndrome care in humanitarian settings?	88.15	76.33
8	Q22. What are effective models of task shifting for cardio-metabolic syndrome prevention and care for different levels of healthcare providers (at health facility and community levels), communities and families in humanitarian settings?	87.42	73.33
9	Q11. What are the most feasible, effective/cost-effective interventions at the individual and population levels to prevent cardio-metabolic syndrome and its risk factors in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?	87.40	75.00
10	Q18. What interventions are effective at preventing or mitigating disruptions/ensuring continuity of care in cardio-metabolic syndrome care in humanitarian settings, how do they work, for whom and in what emergencies?	87.10	75.00

The top ten questions from the second survey focused on outcomes and processes of care. These higher-ranking questions could be explained by the fact that most survey respondents were healthcare professionals, making this an important thematic area for them to investigate further to obtain more detailed answers and identify solutions. The top-ranking questions also reflect a critical need for a minimum initial service package for NCDs in crisis situations. These findings indicate a leaning towards implementation research over descriptive research, which was the focus of previous research.

Recommendations

The findings from this RPS exercise identify the research priorities to build an adequate evidence base on NCD care and prevention, specific to CMS, in humanitarian settings. It is also of the utmost importance to use patient-centred approaches, including the voices and perspectives of those living with NCDs to help determine and centre their preferences and needs during implementation of NCD research.

Introduction

INTRODUCTION

Humanitarian crises are occurring at increasing rates and burdening a growing number of people globally[2]. Non-communicable diseases (NCDs) account for 41 million (74%) of global annual deaths, with the vast majority of these deaths (77%) occurring in low-and middle-income countries (LMICs)[3].

The global demographic and epidemiological transition, with trends such as population aging, increased life expectancy and changes in lifestyle, have led to shifts in the global burden of disease, including increased prevalence of NCDs[4–6]. NCDs are now the leading cause of morbidity and mortality globally[3, 7–9]; the burden is particularly high in contexts where most humanitarian crises occur[10, 11]. In humanitarian crises, there is a lack of primary-level NCD care structures[12], and chronic disease management is often put on the backburner due to limited resources[13]. Access to healthcare for NCDs in these settings often gets disrupted or overwhelmed[14]. According to Suneja et al:

> "Those experiencing humanitarian crises face significant health challenges as pre-existing medical conditions often worsen and new diseases emerge due to new risks and poor access to healthcare"[15].

NCD-related health needs are increasingly being recognised and addressed in humanitarian settings[16–18]. However, these contexts present a significant challenge with regard to NCD management. They pose an increased demand and pressure on fragile health systems, which are often unable to adapt to and meet the requirements of increased needs for managing both acute and chronic illnesses[7, 11]. The ability to respond to chronic care needs in acute emergency settings has not been well established[12]. This is of concern, especially as people living with chronic conditions are particularly vulnerable when a crisis occurs, as their access to essential care is significantly disrupted[5, 12, 19].

The United Nations Office of the High Commissioner for Refugees (UNHCR) reports that 108.4 million people have been forcibly displaced worldwide, with the majority (76%) of refugees being hosted in LMICs in protracted displacement situations. This calls for improved access to comprehensive healthcare in humanitarian settings[20, 21].

Cardiovascular diseases (CVDs), in particular, are an ever-growing concern. The Global Burden of Disease study has indicated that CVDs and diabetes account for over 20% of the global burden of disability[22]. Cardio-metabolic syndrome (CMS) is characterised by a combination of metabolic disorders or risk factors[22, 23] and poses an increased risk for several co-morbidity factors[24]. CMS refers to a cluster of three or more conditions that occur together, increasing the risk of NCDs, notably heart disease, stroke and type 2 diabetes. These conditions include high blood pressure, high blood sugar levels, large waist circumference, low levels of high-density lipoprotein (HDL) cholesterol and high levels of triglycerides in the blood[23–25].

While there is no widely agreed-upon definition of CMS[23, 24, 26], according to the International Diabetes Federation's new definition, CMS is characterised by central obesity (waist circumference with values specific to ethnicity), in addition to at least two of the following factors: high triglycerides, reduced HDL cholesterol, high blood pressure and high fasting plasma glucose[26]. This definition may create some challenges in contexts where validated definitions are not used, and where operationalised definitions of waist circumference across diverse geographies and population groups vary in defining a threshold for central obesity. The literature on the burden of CMS in humanitarian settings is scarce, but evidence from LMICs, where most humanitarian settings are located, reflects the rise in CVD-related mortality within these contexts[27].

Crisis exposure and forced displacement may lead to an emergence or surge in adverse cardio-metabolic risk factors and outcomes, including hypertension, diabetes, dyslipidemia and ischemic heart disease[4, 28–31]. There is some evidence that armed conflicts also pose increased risks to short- and long- term cardiac morbidity and mortality[32, 33]. This is compounded by the destruction of hospitals and pharmacies, and prioritisation of trauma treatments, all preventing proper access to NCD care[34]. Humanitarian situations involve an increase in stress, lack of access to healthcare, alterations in lifestyle factors and an impact on food security, all of which have a worsening effect on cardio-metabolic outcomes[28]. Given the estimated 18 million annual cardiovascular-related deaths globally, an increased public health focus on CMS is justified[3, 24].

This situation justifies a global call to action, since deaths due to CMS following humanitarian emergencies may eventually exceed those caused by crises or emergencies, accidental deaths, and war and conflict[24]. To prevent further unnecessary deaths and comorbidities, there is a need to prioritise context-specific research to help identify which interventions are most appropriate for people affected by humanitarian crises.

Rationale for this project

The initial project scope was to conduct a research priority setting (RPS) exercise addressing a group of five priority NCDs, but it was narrowed to focus on CMS at Elrha's request and in consultation with experts on the Steering Committee and Technical Sub-committee (TSC). The consensus-based research agenda generated by this RPS exercise will steer research on CMS in humanitarian settings for the next decade. Looking at CMS allows for a narrower research focus, while still serving the broader NCD agenda by including questions applicable to NCD service provision more broadly. Findings from this exercise can be extrapolated to NCDs as a whole, particularly those with similar profiles to CMS. Many research questions from this exercise on CMS could apply to NCDs in general, particularly questions regarding models of care.

However, while NCDs that cause the highest burden of disease in humanitarian settings share similar risk factors and prevention and management aspects with CMS, unique comorbidities with other chronic conditions, such as asthma and chronic respiratory diseases, call for further research on NCDs more broadly[35, 36]. The aim of this exercise is to identify PRQs on CMS to guide further research and interventions that could help develop a more in-depth understanding of context-specific needs related to the management of other NCDs in humanitarian settings. It is hoped that the priorities identified will be useful for bringing together the NCDs community of practice to address this research agenda and attract NCD research funding.

NCD-CMS RPS project overview

The International Rescue Committee (IRC) and the Faculty of Health Sciences at the American University of Beirut (AUB) collaborated on this RPS exercise, funded by Elrha's Research for Health in Humanitarian Crises (R2HC) programme. The methodology (presented in more detail under Study Design and Methodology) followed an adapted approach of the Child Health and Nutrition Research Initiative (CHNRI)[1].

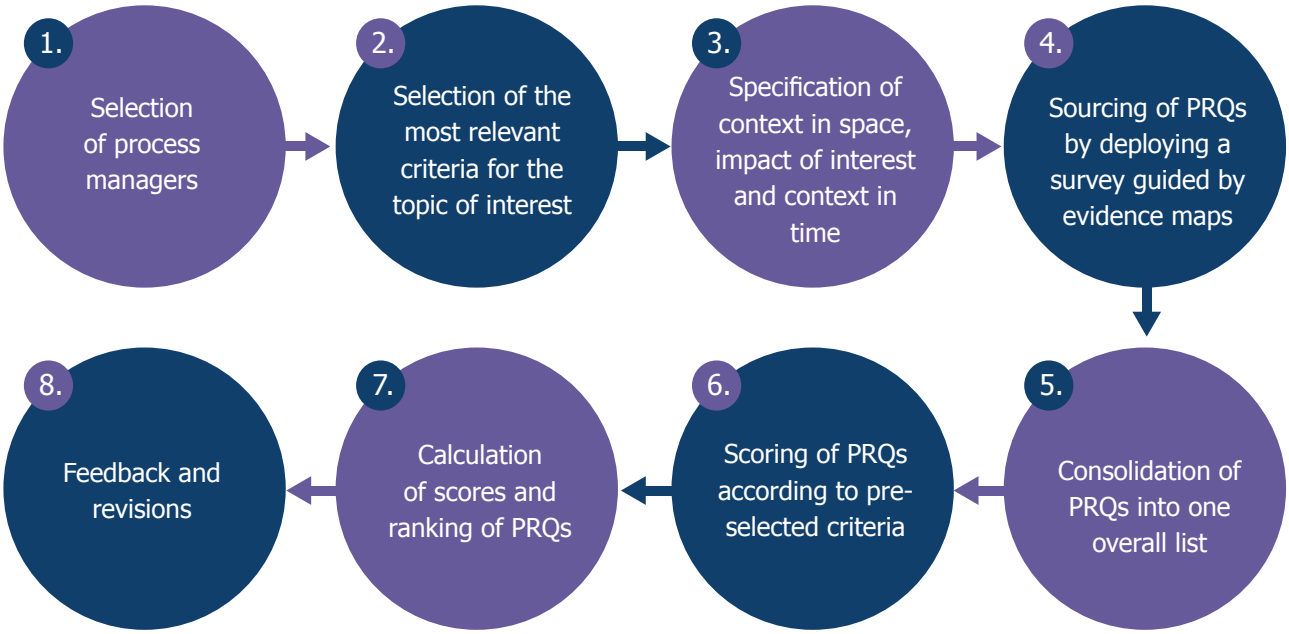
The Steering Committee was established to provide guidance on all steps of the NCD-CMS RPS exercise, and advice on engagement and facilitating access to various groups of stakeholders. The Steering Committee was co-chaired by Mesfin Teklu Tessema, Senior Director of Health at IRC (US/Global), and Fouad Fouad, Associate Professor of Public Health Practice at AUB (Lebanon), and coordinated by Stella Kawira Njagi, NCD Technical Advisor at IRC (Kenya/Global). It was composed of 13 members (Appendix 1) and reflects a broad community of people working on NCDs in humanitarian settings: international non-governmental organisations, academia, the private sector, policymakers, ministry of health representation from LMICs, NCD patient organisations, and bilateral and multilateral organisations. The membership comprised 62% (8/13) females, 70% (9/13) from LMICs, and 70% (9/13) from organisations implementing programmes for people living with NCDs in humanitarian settings. The membership was diverse, but lacked representation from Latin America despite efforts to identify representatives.
The TSC was formed to provide methodological and technical expert guidance on the scope, context and predefined criteria of the NCD-CMS RPS exercise, and on the adapted CHNRI approach. The TSC was chaired by Stella Kawira Njagi and composed of eight members (Appendix 2), including researchers in academic and non-academic settings, technical advisors, programme managers and medical practitioners working on NCDs in humanitarian settings.

Appendix 3 presents a list of the engagements held with the Steering Committee and TSC. This work was undertaken with strong engagement with the members of the Informal Inter-agency Working Group (IIAWG) on NCDs and the World Health Organization (WHO) NCD management unit to ensure uptake and use of RPS findings. The IIAWG members were involved in validating decisions made by the process managers, Steering Committee and TSC at several points: validation of the adopted CHNRI approach, the NCDs to focus on for the RPS, and validation of pre-selected criteria.

Study Design and Methodology

STUDY DESIGN AND METHODOLOGY

An adapted approach of the CHNRI[1] was followed for this RPS. It comprised eight steps:



Step 1: Selection of process managers

The team members of the two institutions co-leading the PRS exercise (AUB and IRC) are the process managers (Appendix 5).

Step 2: Selection of the most relevant criteria for the topic of interest

For the selection of criteria against which to score the list of PRQs, the process managers consolidated a list of the five standard criteria proposed by the CHNRI method (answerability, effectiveness, deliverability, maximum potential for disease burden reduction, effect on equity), as well as other select criteria such as fundability, feasibility of research, magnitude of NCD burden and severity of NCD condition as reported by Rudan et al[1] and in other peer-reviewed priority-setting exercises[37–39].

The process managers solicited TSC inputs on criteria selection and on questions addressing each of these criteria. TSC members were invited to select the top three criteria deemed most relevant and potential questions addressing each of the criteria, and to recommend whether to allocate equal or different weights for selected criteria. The criteria that were identified most frequently were selected and questions were subsequently developed on that basis. The TSC agreed to give equal weight to all criteria. The final list of criteria and respective questions were shared with the IIAWG on NCDs for further validation.

Criteria to score the PRQs

Impact

Would the research lead to interventions and solutions that provide the maximum potential impact on CMS burden and severity in humanitarian settings by 2030 (eg, morbidity, mortality, economic or social impact)?

Effectiveness

Would the research lead to interventions and solutions that are effective for preventing or managing CMS in humanitarian settings?

Feasibility

Would the research lead to interventions and solutions that are feasible in humanitarian settings, reflecting on resources (eg, funding, time, skilled staff) and security considerations?

Deliverability

Would the research lead to interventions and solutions that are deliverable in humanitarian settings, reflecting on (1) the health system environment: the health workforce, the socio-political governance for health in the setting, access to medicine and diagnostics, information systems and health financing; and (2) intervention users (eg, need for change in attitudes or beliefs, supervision, existing demand)?

Step 3: Specification of context in space, impact of interest and context in time

The process managers held an online session with the TSC to specify and agree on contextual factors that would determine the scope of the research agenda. These included target populations, geographic scope, time scale and outcomes of interest.

The process managers agreed on the following scope of research:

- **Target populations** – all countries and communities affected by or at risk of humanitarian crises (conflict, displacement, complex emergencies, acute/protracted emergencies)
- **Geographic scope** – global, regional, country and local levels
- **Time scale** – 2024 to 2034
- **Outcomes of interest** – any outcome of interest.

Step 4: Sourcing of PRQs by deploying a survey guided by evidence maps

We deployed a survey guided by evidence maps to source PRQs between April and June 2023.

The evidence maps were designed to serve as background information to support respondents in identifying relevant questions and research priorities for the next decade. The maps were developed using the results of the WHO-commissioned systematic review of research evidence on NCDs in humanitarian emergency settings[57]. Out of 62 systematic reviews that looked across all NCDs, we extracted eight focusing on CMS. The reviews met the selection criteria by reporting on at least two combined metabolic conditions. We excluded reviews that assessed these conditions separately. This was necessary to align with the international definition of CMS. We placed the eight systematic reviews chosen side by side with the original review of 62 reviews to compare the following three characteristics: type of humanitarian settings, hosting country and types of affected populations. This provided a better understanding of the landscape of CMS systematic reviews across the various humanitarian contexts.

An online survey was created using KoboToolbox software and was deployed in four languages (Arabic, English, French and Spanish) for six weeks to source PRQs guided by the evidence maps. Guidance on how to develop and frame research questions was also added to the survey to facilitate the process for respondents.

The survey targeted various types of stakeholders conducting, supporting or implementing programmes, or conducting research on NCDs in humanitarian settings. These included frontline healthcare workers, researchers in academic and non-academic settings, representatives of health professional bodies, donor/funding organisations, focal persons from ministries of health or other government-related health agencies, NCD patient representatives, health programme managers and technical experts.

The research team worked closely with the members of the IIAWG, Steering Committee and TSC, to amplify key RPS messaging, reaching various stakeholders through their networks' email listservs and newsletters. The RPS exercise was presented in October 2022 during the third symposium of the International Alliance for Diabetes Action (IADA) in Krakow, Poland, to socialise the work among its membership who are stakeholders in the humanitarian sector. The research team conducted webinars on the first survey in four languages (Arabic, English, French and Spanish) for frontline health workers, researchers, donors and agencies. Furthermore, the team produced a flyer on the study, containing a link to the survey. The flyer was disseminated via the IRC and AUB accounts on official social media platforms (LinkedIn and Twitter (now X)) and researchers' own social media accounts.

Step 5: Consolidation of PRQs into one overall list

The process managers held an online session with the TSC to specify and agree on contextual factornitarian contexts.

An online survey was created using KoboToolbox software and was deployed in four languages (Arabic, English, Fred non-academic settings, representatives of health professional bodies, donor/funding organisations, focal persons from ministries of health or other government-related health agencies, NCD patient representatives, health programme managers and technical experts.

The process managers reviewed the generated list of PRQs and excluded questions that were either not relevant to CMS or to humanitarian settings, or were not actual questions. The remaining questions were categorised according to a preliminary theme and the '4Ds framework' (description, delivery, development and discovery) specified in the CHNRI approach[1]. Under the framework, 'description' research includes research questions that assess the burden of CMS and understand its determinants; 'delivery' research includes research questions that allow evaluation of already available interventions to optimise health status; 'development' research focuses on research questions aimed at improving existing interventions to make them more feasible, sustainable, effective, etc; and 'discovery' research includes research questions that may lead to innovation and thus the development of entirely new interventions.

The sourced research questions were further consolidated in an iterative process of thematic analysis, where they were grouped according to recurrent research themes and sub-themes (Table 1).

Table 1: Research themes/sub-themes and their definitions/descriptions

Themes	Definition/Description
1. Burden and risk factors	The impact of a health problem on a given population, which can be measured using a variety of indicators such as mortality, morbidity or financial costs[40]. Risk factors are any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease[41].
2. Outcomes of care 2.1. Prevention and control 2.2. Treatment	The results (effectiveness and quality) of healthcare interventions on patient and population health outcomes, including clinical outcomes, patient-centred outcomes (such as patient satisfaction) and economic outcomes (such as cost-effectiveness)[42].
3. Processes of care 3.1. Integrated care 3.2. Continuity of care 3.3. Task shifting/sharing 3.4. Patient-centred approaches/Client responsiveness 3.5. Access to care	The series of actions taken by healthcare professionals in delivering services, including prevention, diagnosis, treatment and management of health conditions. Steps could include patient education, clinical assessments and diagnostic tests, and medical treatments[43].
4. Monitoring and evaluation/ Digital health	Involves systematic data collection, analysis and use of information to improve the delivery and effectiveness of health programmes and services[44]. Digital health refers to the use of information and communications technologies in medicine and other health professions to manage illnesses and health risks, and promote wellness. Digital health has a broad scope and includes the use of wearable devices, mobile health, telehealth, health information technology and telemedicine[45].
5. Financing	Health financing is a core function of health systems that can enable progress towards universal health coverage by improving effective service coverage and financial protection[46]. Health financing describes more than just the money available for health; it includes all of the mechanisms, from raising funds to paying for health services[47].

6. Diagnostic/Tools	A medical device can be any instrument, apparatus, implement, machine, appliance, implant, reagent for in vitro use, software, material or other similar or related article, intended by the manufacturer to be used, alone or in combination, for a medical purpose. Medical devices include medical tools and diagnostic devices[48].
7. Innovations	New or improved solutions with the transformative ability to accelerate positive health impact[49].
8. Health system structure	A health system structure comprises several interlocking components, including healthcare providers, healthcare facilities, health insurance companies and government regulatory agencies, all aimed towards promoting, restoring and maintaining population health[50]. Health systems can be understood "as comprising all the organisations, institutions and resources that are devoted to producing health actions"[51].

The consolidation process led to a narrower list of PRQs, which were further shared with the TSC for specific input on the formulation of questions and whether questions could be further consolidated, and to ensure none of the questions had already been answered before in humanitarian settings.

Step 6: Scoring of PRQs according to pre-selected criteria

An online survey was deployed in four languages (Arabic, English, French and Spanish) for six weeks between October and November 2023 to score the final list of research questions against the four pre-selected criteria. The same types of stakeholders conducting, supporting or implementing programmes, or doing research on NCDs in a humanitarian setting were targeted. These included healthcare workers, researchers in academic and non-academic settings, representatives of health professional bodies, donor/funding organisations, focal persons from ministries of health or other government-related health agencies, NCD patient representatives, health programme managers and technical experts. A strong dissemination strategy was designed for the deployment of the survey to facilitate a high response rate by sending personalised emails to respondents to the first survey who had consented to be contacted for the second survey, as well as direct emails to various professional colleagues in the networks of the research team working on NCDs in humanitarian settings. Two webinars were conducted in English with simultaneous translation into Arabic, French and Spanish, along with wide dissemination of the survey through listservs of various NCD networks (eg, NCD Alliance, IADA, Public Health in the Arab World, UN agencies, and the social media accounts of IRC and AUB, which were tagged or shared with other NCD social media platforms).

Data on the country and region of work, job categories, area of work focus and gender were collected from each respondent. This exercise did not involve any personal or otherwise sensitive data. All findings were anonymised and individual responses to the questions are not presented.

Step 7: Calculation of scores and ranking of PRQs

As part of survey 2, each respondent was invited to score all 43 short-listed PRQs (consolidated from 694 initial responses – more on this in the results) against the four pre-selected criteria by answering Yes" (1 point), "No" (0 points), "Undecided" (0.5 points) and "Don't know/Insufficiently informed" (no input). Table 2 shows an example of how the survey was presented to respondents for each research question. Specific questions were provided to help assess the likelihood that the proposed research options would satisfy each of the selected criteria. Respondents had to provide an answer for each criterion to ensure they scored all the questions.

Table 2: Example PRQs from survey 2

What are the most effective, acceptable and feasible non-pharmacological lifestyle interventions (including dietary modifications, physical activity and behavioural changes) for preventing and managing cardio-metabolic syndrome in humanitarian settings?	Yes	No	Un-decided	Don't know/ Insufficiently informed
Impact Would the research lead to interventions and solutions that provide the maximum potential impact on CMS burden and severity in humanitarian settings by 2030 (eg, morbidity, mortality, economic or social impact)?	☐	☐	☐	☐
Effectiveness Would the research lead to interventions and solutions that provide the maximum potential impact on CMS burden and severity in humanitarian settings by 2030 (eg, morbidity, mortality, economic or social impact)?	☐	☐	☐	☐
Feasibility Would the research lead to interventions and solutions that are feasible in humanitarian settings, reflecting on resources (eg, funding, time, skilled staff) and security considerations?	☐	☐	☐	☐
Deliverability Would the research lead to interventions and solutions that are deliverable in humanitarian settings, reflecting on (1) the health system environment: the health workforce, the socio-political governance for health in the setting, access to medicine and diagnostics, information systems and health financing; and (2) intervention users (eg, need for change in attitudes or beliefs, supervision, existing demand)?	☐	☐	☐	☐

The results of the survey were exported into Excel for data cleaning. They were analysed using SPSS software and a research priority score was computed for each criterion – impact, effectiveness, deliverability and feasibility – for every research priority question, ranging from 0% to 100%. From this, an overall research priority score was computed for each PRQ, calculated as the average of the scores of the four criteria. The research priority score was calculated for all respondents, then stratified by region of work, job categories, area of work focus and gender. All criteria were equally weighted when calculating the overall score per question.

Calculation of average expert agreement

The level of agreement or disagreement between participants' answers for each PRQ was assessed by calculating the average expert agreement (AEA). The AEA is the proportion of scorers who gave the most common score (mode) for a question, divided by the total number of scorers who scored that question.

This is computed as follows:

$$\text{AEA} = \frac{1}{4} \times \sum_{q=1}^{4} \frac{\text{N(scorers who provided most frequent response)}}{\text{N(scorers who provided any response)}} \times 100$$

where q is a criterion question that experts are being asked to evaluate each PRQ area against. The AEA is unaffected by 'undecided' responses and variances in the number of scorers for each survey question. In AEA computation, all four possible responses are treated as valid, including 'Don't know/Insufficiently informed', to reflect all responses in the level of overall agreement.

Step 8: Feedback and revisions

As the scores were calculated and process managers reflected on the results, a validation meeting was held with the Steering Committee and TSC. The meeting aimed to disseminate the results of the RPS, as well as get the members' feedback on the interpretation of the results in relation to their knowledge and experience of implementing NCD programmes and research in humanitarian settings. The Steering Committee and TSC members' interpretation and discussion of the results are included in the report with acknowledgement of their contributions.

Ethical approval

This research was approved by the AUB Institutional Review Board (SBS-2022-0245). Ethical approval was sought for both online surveys. When potential participants clicked on the survey link, they were referred to an information sheet, followed by an informed consent form, before they could access the survey. Survey responses were anonymous as no personal identifiers were required from respondents. However, respondents were asked at the end of survey 1 whether they were interested in taking part in the next survey and if so, they provided their email addresses, which were used to contact them during the second survey. Answers were de-linked from their email addresses.

Results

RESULTS

1. Generating the PRQs

1.1. Characteristics of the respondents to survey 1

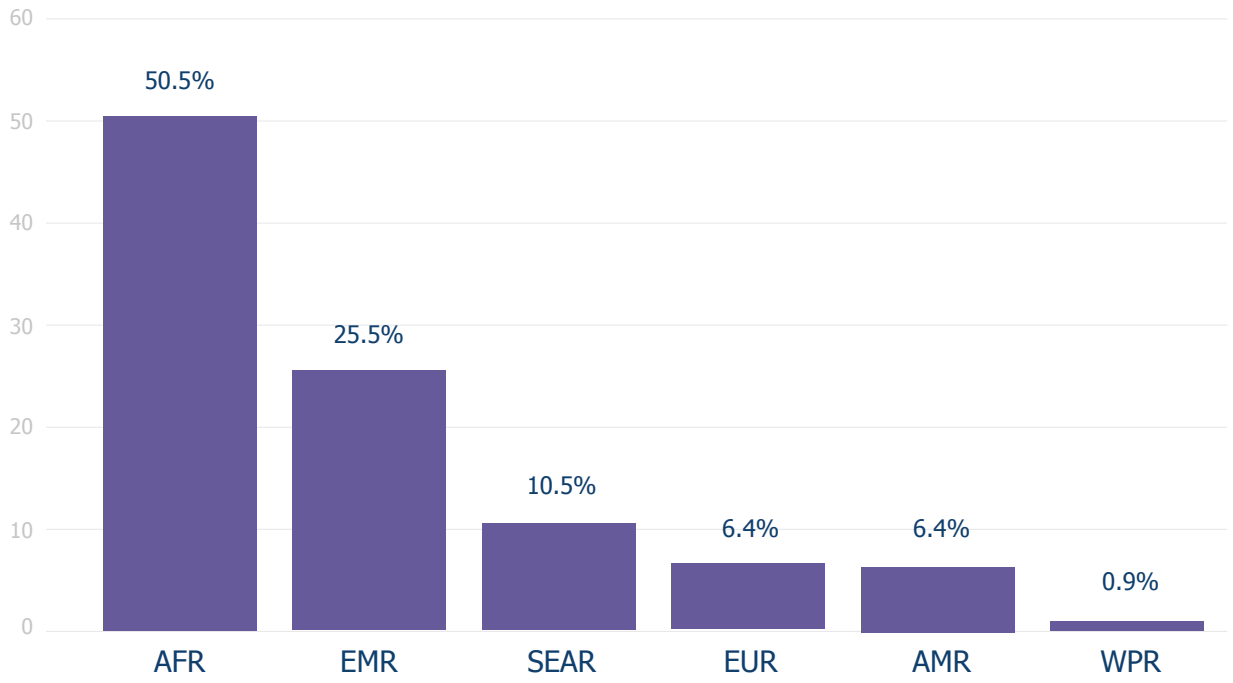
A total of 186 survey responses were received. Four responses were removed as the respondents declined to participate in the survey; thus, 182 respondents contributed data. Responses represented 58 different countries, with a broad geographic representation. Table 3 outlines the characteristics of survey respondents by region of work, using WHO regional classifications and job categories. Respondents were able to select more than one answer per category.

Table 3: Characteristics of survey 1 respondents

Characteristic	N	%
Region of work		
African Region	111	50.5
Eastern Mediterranean Region	56	25.5
South-East Asian Region	23	10.5
European Region	14	6.4
Region of the Americas	14	6.4
Western Pacific Region	2	0.9
Job categories	**N**	**%**
Region of work		
Healthcare workers	87	47.8
Health programme managers	59	32.4
NCDs researchers	47	25.8
NCDs technical experts	17	8.3
NCDs reps (professional/donor/govt/patient)	27	21.3
Others	15	8.2

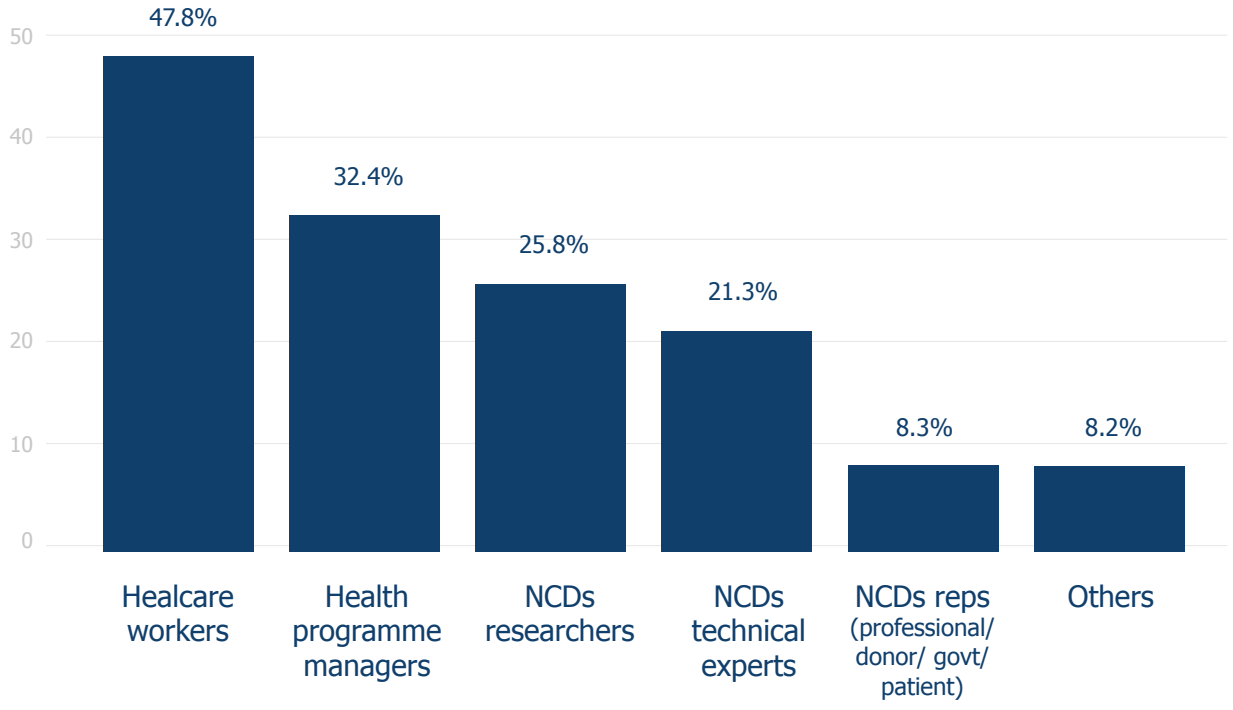
Note: reps = representatives; govt – government.

Figure 1: Region of work of survey 1 respondents (by WHO regions)



Note: AFR – African Region; AMR – Region of the Americas; EMR – Eastern Mediterranean Region; EUR – European Region; SEAR – South-East Asian Region; WPR – Western Pacific Region

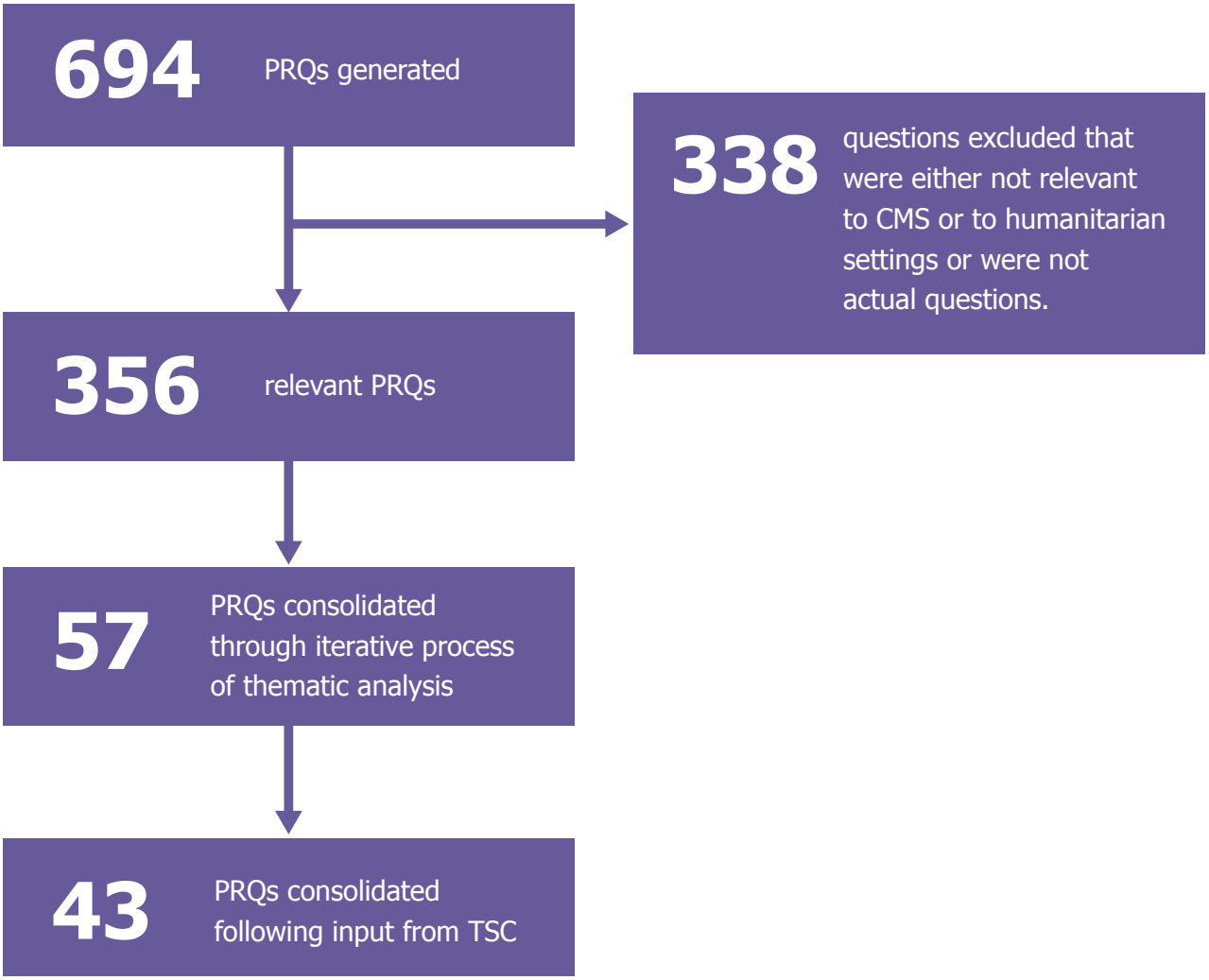
Figure 2: Job categories of survey 1 respondents



1.2. Consolidating the list of PRQs

The 182 survey respondents generated a list of 694 PRQs. Following the review process, a final list of 43 PRQs was created (Figure 3).

Figure 3: Consolidation of PRQs



1.3. PRQs per research theme and per the 4Ds framework

The list of the 43 PRQs is shown in Table 4. These are also presented by research theme/sub-theme in Appendix 6. The most common research themes are processes of care followed by outcomes of care, and burden and risk factors.

Table 4: List of 43 PRQs

Question	4Ds framework				Research themes/sub-themes
	Des	Del	Dev	Dis	
Q1. What is the burden of cardio-metabolic syndrome in [specific humanitarian context]? Are there any notable disparities by age, urban/rural settings, genders, ethnicities, and physical abilities?	X				Burden and risk factors
Q2. What are the underlying individual, community and environmental factors that contribute to the development and progression of cardio-metabolic syndrome, and how do these vary across axes of vulnerability/disadvantage in humanitarian crises (food insecurity/income/wealth/educational attainment, etc)?	X				Burden and risk factors
Q3. What are the knowledge, attitudes and practices (KAP) regarding cardio-metabolic syndrome, its risk factors and care-seeking practices in [specific humanitarian context] from the perspective of service providers as well as recipients (eg, refugees, displaced persons and host communities)?	X				Burden and risk factors
Q4. What is the impact of crises (armed conflicts, displacement, disasters, disease outbreaks, etc) on the epidemiology, detection and management of cardio-metabolic syndrome?		X			Burden and risk factors
Q5. What is the impact of interventions aimed at prevention and management of cardio-metabolic syndrome on quality of life and burden of disease (QALYs/ DALYs) in humanitarian settings?		X			Outcomes of care:Treatment

Q6. What are behavioural modifications tools/models that can reduce incidence of cardio-metabolic diseases among children in humanitarian settings?	X				Diagnostics/Tools
Q7. What are the most effective, acceptable and feasible pharmacological therapeutic strategies for effectively controlling cardio-metabolic syndrome and its complications in specific humanitarian contexts?		X			Outcomes of care: Treatment
Q8. What are the most effective, acceptable and feasible non-pharmacological lifestyle interventions (including dietary modifications, physical activity and behavioural changes) for preventing and managing cardio-metabolic syndrome in humanitarian settings?		X			Outcomes of care: Prevention and control
Q9. What strategies/approaches (including human rights-based approaches) can humanitarian actors (including donors) use to design and negotiate a healthy food environment, and provide and promote a healthy diet to prevent and manage cardio-metabolic diseases in humanitarian settings?		x			Outcomes of care: Treatment
Q10. What are effective mental health and psychosocial support approaches, and the impact of access to psychosocial support on the management of cardio-metabolic syndrome and treatment outcomes in humanitarian settings?		X			Outcomes of care: Treatment
Q11. What are the most feasible, effective/cost-effective interventions at the individual and population levels to prevent cardio-metabolic syndrome and its risk factors in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		X			Outcomes of care: Prevention and control
Q12. What are the most effective/cost-effective interventions at the individual and population levels that provide quality diagnosis and management for cardio-metabolic syndrome in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		X			Outcomes of care: Treatment

Q13. At primary care level, what are the most effective/cost-effective interventions that can be effectively implemented to provide quality prevention and management, and improve treatment outcomes for cardio-metabolic syndrome in humanitarian settings?		X			Processes of care: Integrated care
Q14. How can people living with cardio-metabolic syndrome related conditions be effectively enrolled into care and followed up on in humanitarian settings?		x			Processes of care: Continuity of care
Q15. What is the (cost-)effectiveness of adopting an integrated, primary care-centric approach to providing cardio-metabolic syndrome care in humanitarian settings?		X			Processes of care: Integrated care
Q16. What are the best approaches to provide holistic care and improve treatment outcomes for persons with cardio-metabolic syndrome in humanitarian settings? (Holistic care is defined as the provision of care to patients based on a mutual understanding of their physical, psychological, emotional and spiritual dimensions. In addition, holistic care emphasises the partnership between nurse and patient, and the negotiation of healthcare needs that lead to recovery.)		x			Processes of care: Integrated care
Q17. What are the mechanisms behind effective integrated care for long-term care of cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Integrated care
Q18. What interventions are effective at preventing or mitigating disruptions/ ensuring continuity of care in cardio-metabolic syndrome care in humanitarian settings, how do they work, for whom and in what emergencies?		X			Processes of care: Continuity of care
Q19. What are the key factors (enabling/impeding factors) that influence prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?	X				Burden and risk factors
Q20. What are the key factors (enabling/impeding factors) that influence access to care and support for cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Access to care

Q21. How can operationalisation of guidance and interventions for cardio-metabolic syndrome in humanitarian settings be effected, particularly when funding is limited? What are the operational and capacity barriers, and how can these be overcome?		X			Health system structure
Q22. What are effective models of task shifting for cardio-metabolic syndrome prevention and care for different levels of healthcare providers (at health facility and community levels), communities and families in humanitarian settings?		X			Processes of care: Task shifting/sharing
Q23. Which approaches are effective in encouraging humanitarian healthcare workers/service providers to focus on cardio-metabolic syndrome among communities affected by conflict?		X			Health system structure
Q24. What are the most effective community health worker-driven interventions for cardio-metabolic syndrome management, monitoring and prevention in humanitarian settings, and what work modalities/training of community health workers are needed for this?		X			Processes of care: Task shifting/sharing
Q25. How can interventions aiming at improving the acceptability and accessibility of community-based care for cardio-metabolic syndrome effectively be delivered at scale and in a sustainable manner in humanitarian settings?			X		Processes of care: Task shifting/sharing
Q26. How can we enhance prognostic models and individualised management techniques for healthier lives for people living with cardio-metabolic syndrome in humanitarian settings?			X		Processes of care: Integrated care
Q27. What new biomarkers, simple diagnostic techniques and tools can properly identify people who are at risk of developing cardio-metabolic syndrome in humanitarian settings in a timely manner?			X		Diagnostics/Tools
Q28. How can early detection and risk prediction models for cardio-metabolic syndrome be improved to enhance prevention efforts in high-risk, vulnerable populations and for those with co-morbidities in humanitarian settings?			X		Diagnostics/Tools

Q29. What are the most effective interventions (eg, simple electronic medical record systems/patient-held records)/best practices to improve the monitoring and surveillance of cardio-metabolic syndrome care in humanitarian settings (eg, monitoring indicators, medication control and prescription)?			X		Monitoring and evaluation/ Digital health
Q30. Which NCD indicators at the community, health facility and health system levels are the most useful for monitoring cardio-metabolic syndrome in humanitarian settings?		X			Monitoring and evaluation/ Digital health
Q31. How can technology and digital health interventions be leveraged to prevent and improve treatment outcomes, and reduce healthcare costs for individuals with cardio-metabolic syndrome in humanitarian settings?			X		Monitoring and evaluation/ Digital health
Q32. Among people with cardio-metabolic syndrome, what are the implications of current models of care employed in humanitarian settings on long-term health outcomes (eg, disease control, prevalence of complications, progression towards NCD, etc)?	x				Outcomes of care: Treatment
Q33. What self-care interventions are effective among people at risk or living with cardio-metabolic syndrome in humanitarian settings? How do they work, for whom and under what conditions?		X			Processes of care: Patient-centred approaches/Client responsiveness
Q34. What are the research priorities from the perspective of people living with cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Patient-centred approaches/Client responsiveness
Q35. What are effective mechanisms for including perspectives of people with lived experience of cardio-metabolic syndrome when it comes to programme design and planning in humanitarian settings?		X			Processes of care: Patient-centred approaches/Client responsiveness
Q36. To what extent are cardio-metabolic syndrome-focused services inclusive of people living with disabilities in humanitarian settings?		X			Processes of care: Patient-centred approaches/Client responsiveness

Q37. What are effective/cost-effective innovations to improve prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?				X	Innovations
Q38. How do we sustainably implement proven effective interventions for prevention and control of cardio-metabolic syndrome in crisis-affected settings?		X			Outcomes of care: Prevention and Control
Q39. How can healthcare systems and policies be optimised to effectively prevent, detect and manage cardio-metabolic syndrome at both the individual and population levels at all levels of crises (preparedness, response, recovery)?			X		Health system structure
Q40. To what extent do relevant entities (eg, donors, funding agencies, government agencies) prioritise the financing, programming and resource allocation for cardio-metabolic syndrome prevention and control in humanitarian settings? What are effective strategies to prioritise these activities?	X				Financing
Q41. What is the economic benefit/return on investment of ensuring prevention and access to care for cardio-metabolic syndrome in humanitarian settings (acute and protracted)?	X				Financing
Q42. What are the socioeconomic costs (including healthcare costs, loss of productivity, etc) associated with cardio-metabolic syndrome on individuals and families in humanitarian settings, and how can they be mitigated?	X				Financing
Q43. What are the roles of the informal sector (drug stores, traditional healers) in addressing cardio-metabolic syndrome in humanitarian settings?	X				Health system structure

Note: Des = description; Del = delivery; Dev = development; Dis = discovery; QALY = quality-adjusted life year; DALY = disability-adjusted life year.

Table 5: Frequency distribution of PRQs per research theme/sub-theme

Research themes and sub-themes	N
Burden and risk factors	**5**
Outcomes of care	**9**
Prevention and control	3
Treatment	6
Processes of care	**15**
Integrated care	5
Continuity of care	2
Task shifting/sharing	3
Patient-centred approaches/Client responsiveness	4
Access to care	1
Monitoring and evaluation/Digital health	**3**
Financing	**3**
Diagnostics/Tools	**3**
Innovations	**1**
Health system structure	**4**

Table 6 also presents the number and percentage of PRQs under each element of the 4Ds framework. While PRQs categorised under 'description' represent around 35% of questions, almost half the PRQs came under 'delivery' and 16% under 'development'. Only one question was categorised under 'discovery'.

Table 6: Number and percentage of PRQs by the 4Ds framework

Category	N	%
Description	15	34.9
Delivery	20	46.5
Development	7	16.3
Discovery	1	2.3

2. Scoring of the consolidated list of PRQs

2.1. Characteristics of survey 2 respondents

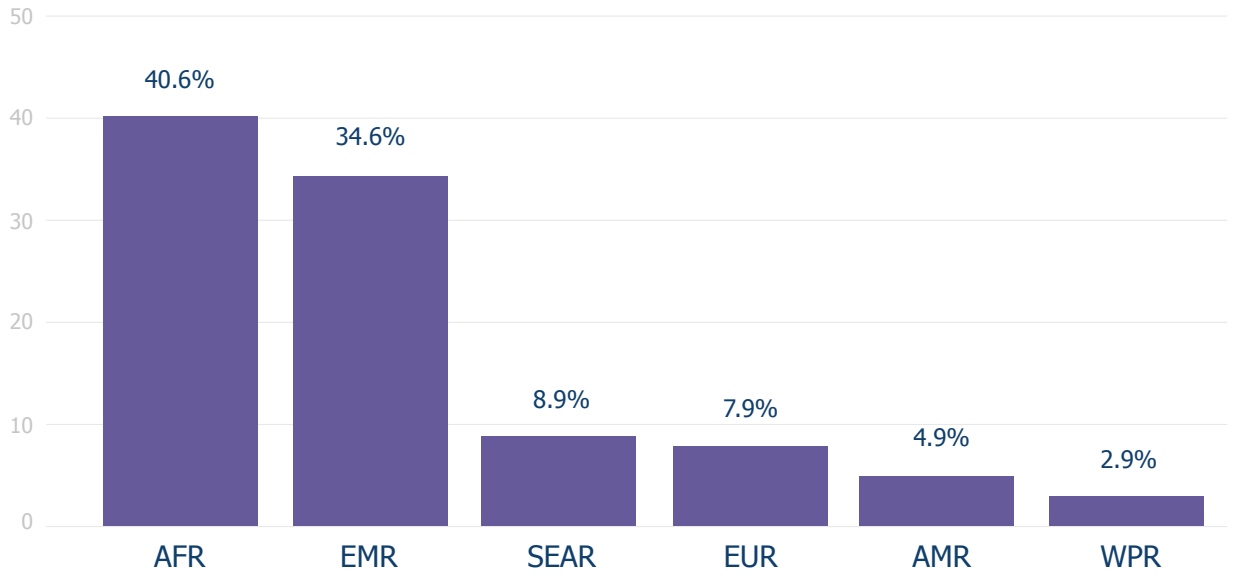
A total of 75 survey responses were received, all completed in full as questions could not be skipped. Responses were received from individuals from 33 different countries with broad geographic representation. Table 7 shows the characteristics of the survey 2 respondents in full.

Table 7: Characteristics of survey 2 respondents

Characteristic	N	%
Region of work		
African Region	41	40.6
Eastern Mediterranean Region	35	34.6
Region of the Americas	9	8.9
South-East Asian Region	8	7.9
European Region	5	4.9
Western Pacific Region	3	2.9
Job categories	**N**	**%**
Region of work		
Healthcare workers	29	38.6
Health programme managers	25	33.3
NCDs researchers	19	25.3
NCDs technical experts	12	16

NCDs reps (professional/donor/govt/patient)	11	14.6
Others	8	10.6
Area of work focus	**N**	**%**
Region of work		
Health	63	46.0
Nutrition and food security	29	21.2
Education, Water, sanitation and hygiene (WASH) Protection, Disability, Shelter, Early recovery, Other	24	17.5
Mental health and psychosocial support	14	10.2
Governance leadership	7	5.1
Gender	**N**	**%**
Region of work		
Male	38	50.7
Female	25	33.3
I would rather not say	11	14.7
Other	1	1.3

Figure 4: Region of work of survey 2 respondents (by WHO regions)



Note: AFR – African Region; AMR – Region of the Americas; EMR – Eastern Mediterranean Region; EUR – European Region; SEAR – South-East Asian Region; WPR – Western Pacific Region

Figure 5: Job categories of survey 2 respondents

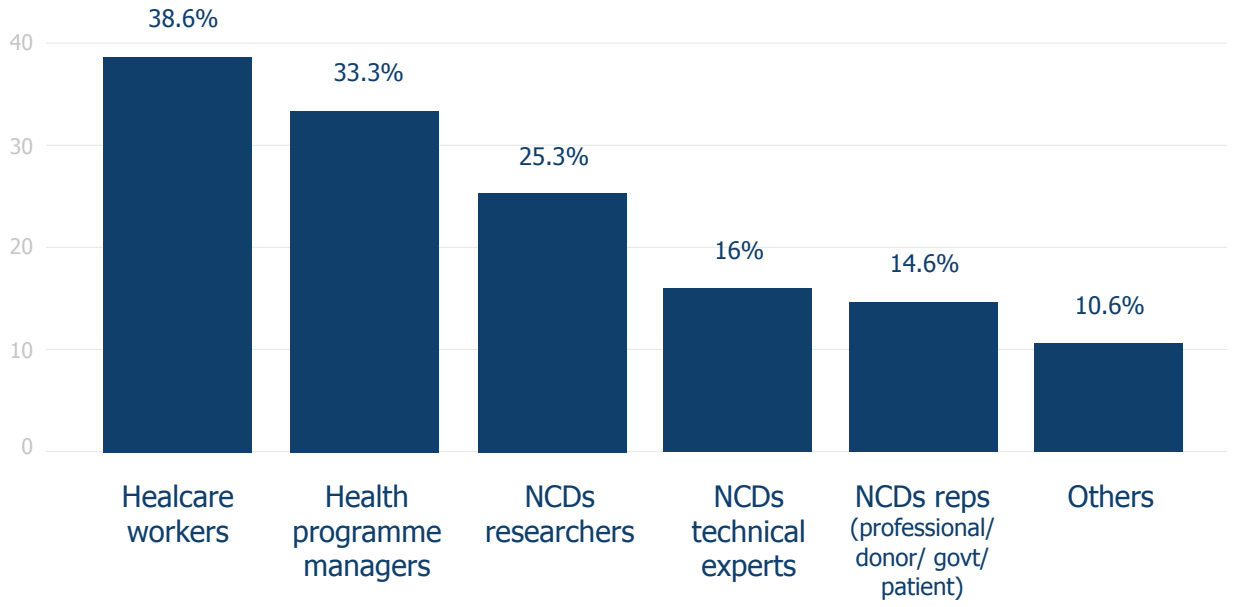


Figure 6: Area of work focus of survey 2 respondents

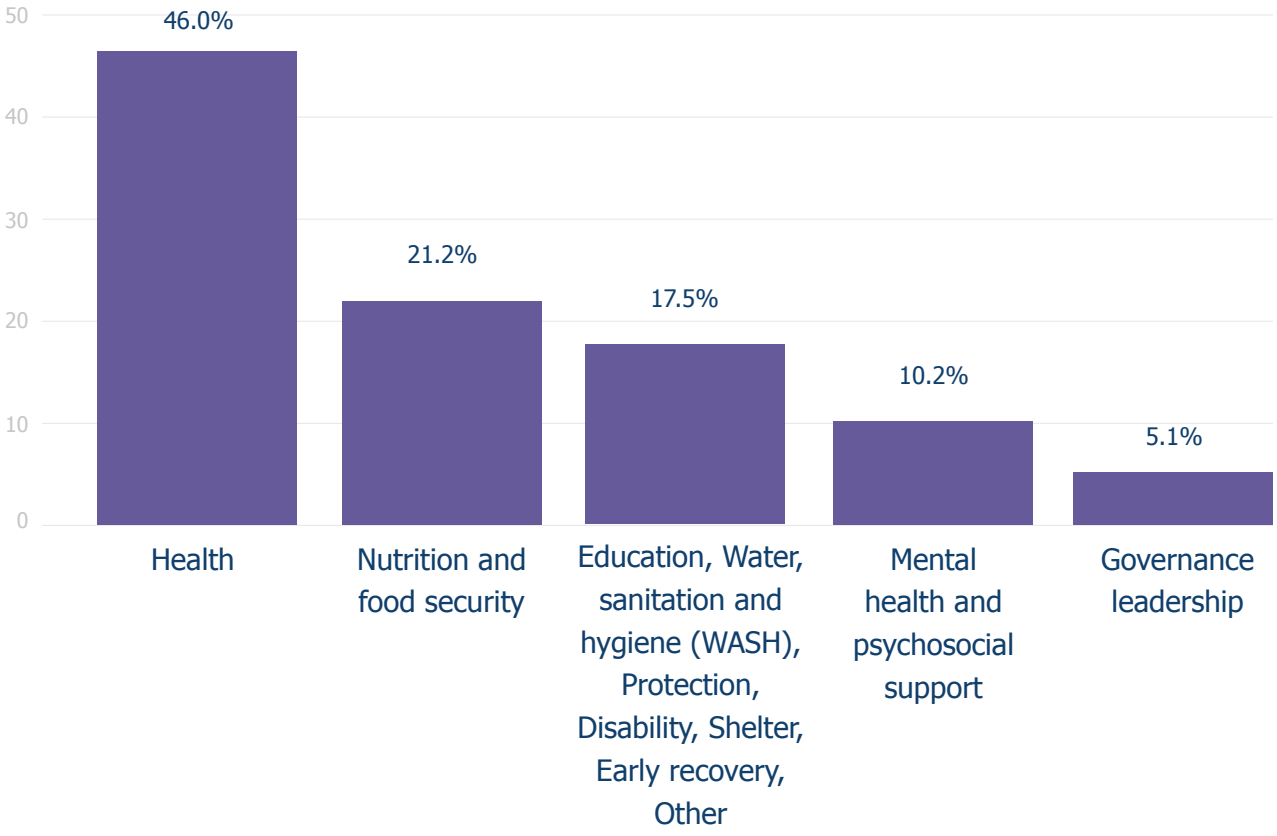
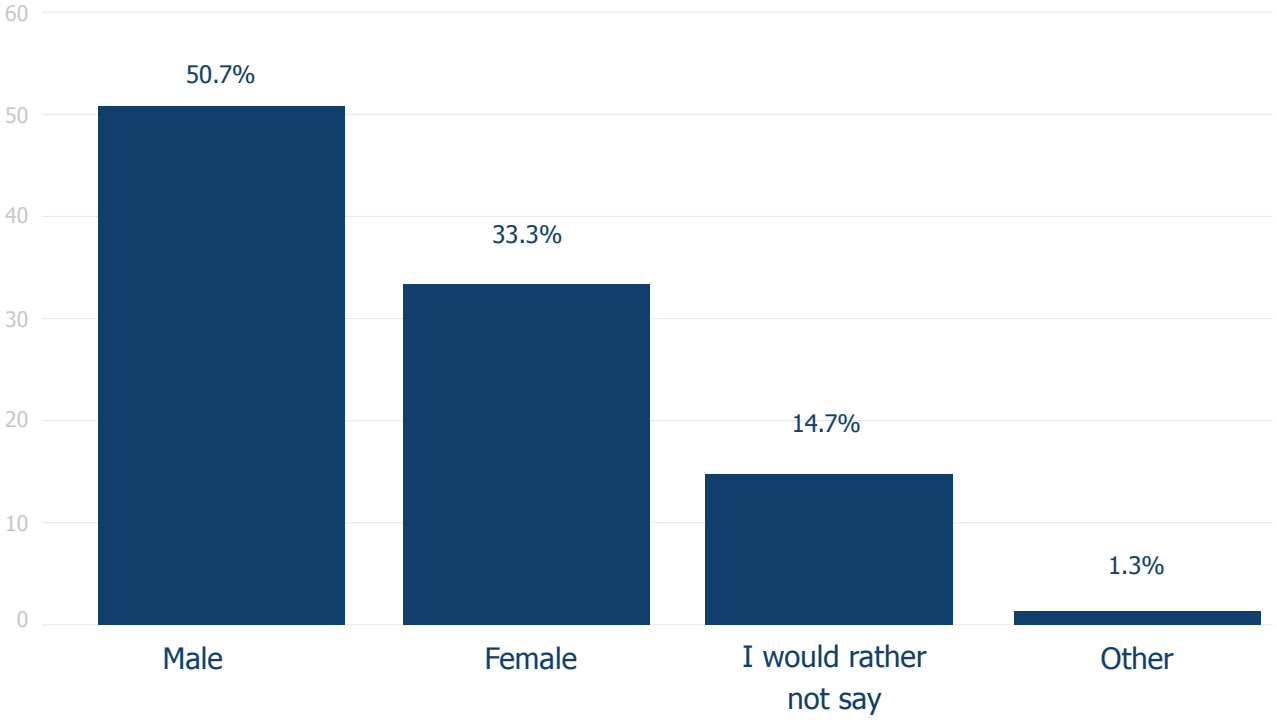


Figure 7: Gender of survey 2 respondents



2.2. Scores of the consolidated list of PRQs

Table 8 presents the list of 43 PRQs for the proposed CMS research agenda for 2024–2034, ranked according to average criteria scores. The average score ranged from 92.88% to 73.13%. The AEA ranged from 81.67% to 53.33%; for the ten highest-ranking questions, the range was from 75% to 81.67%, indicating a high-level of agreement between experts on the top priorities. The list of the top ten PRQs is shown in Appendix 7.

Table 8: List of 43 PRQs by overall ranking

Overall rank	Question	4Ds framework				Research theme/sub-theme	Average score	AEA
		Des	Del	Dev	Dis			
1	Q24. What are the most effective community health worker-driven interventions for cardio-metabolic syndrome management, monitoring and prevention in humanitarian settings, and what work modalities/training of community health workers are needed for this?		X			Processes of care: Task shifting/sharing	92.88	81.67%
2	Q13. At primary care level, what are the most effective/cost-effective interventions that can be effectively implemented to provide quality prevention and management, and improve treatment outcomes for cardio-metabolic syndrome in humanitarian settings?		X			Processes of care: Integrated care	90.87	81%
3	Q12. What are the most effective/cost-effective interventions at the individual and population levels that provide quality diagnosis and management for cardio-metabolic syndrome in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		X			Outcomes of care: Treatment	89.11	74.00%

4	Q33. What self-care interventions are effective among people at risk or living with cardio-metabolic syndrome in humanitarian settings? How do they work, for whom and under what conditions?		X			Processes of care: Patient-centred approaches/Client responsiveness	88.97	76.00%
5	Q3. What are the knowledge, attitudes and practices (KAP) regarding cardio-metabolic syndrome, its risk factors and care-seeking practices in [specific humanitarian context] from the perspective of service providers as well as recipients (eg, refugees, displaced persons and host communities)?	X				Burden and risk factors	88.92	79.33%
6	Q10. What are effective mental health and psychosocial support approaches, and the impact of access to psychosocial support on the management of cardio-metabolic syndrome and treatment outcomes in humanitarian settings?		X			Outcomes of care: Treatment	88.20	73.33%
7	Q15. What is the (cost-)effectiveness of adopting an integrated, primary care-centric approach to providing cardio-metabolic syndrome care in humanitarian settings?		X			Processes of care: Integrated care	88.15	76.33%
8	Q22. What are effective models of task shifting for cardio-metabolic syndrome prevention and care for different levels of healthcare providers (at health facility and community levels), communities and families in humanitarian settings?		X			Processes of care: Task shifting/sharing	87.42	73.33%
9	Q11. What are the most feasible, effective/cost-effective interventions at the individual and population levels to prevent cardio-metabolic syndrome and its risk factors in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		X			Outcomes of care: Prevention and control	87.40	75.00%

10	Q18. What interventions are effective at preventing or mitigating disruptions/ensuring continuity of care in cardio-metabolic syndrome care in humanitarian settings, how do they work, for whom and in what emergencies?		X			Processes of care: Continuity of care	87.10	75.00%
11	Q19. What are the key factors (enabling/impeding factors) that influence prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?	X				Burden and risk factors	86.88	76.67%
12	Q14. How can people living with cardio-metabolic syndrome related conditions be effectively enrolled into care and followed up on in humanitarian settings?		X			Processes of care: Continuity of care	86.84	75.67%
13	Q30. Which NCD indicators at the community, health facility and health system levels are the most useful for monitoring cardio-metabolic syndrome in humanitarian settings?		X			Monitoring and evaluation/Digital Health	86.66	75.00%
14	Q1. What is the burden of cardio-metabolic syndrome in [specific humanitarian context]? Are there any notable disparities by age, urban/rural settings, genders, ethnicities, and physical abilities?	X				Burden and risk factors	86.45	73.67%
15	Q20. What are the key factors (enabling/impeding factors) that influence access to care and support for cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Access to care	86.33	78%
16	Q38. How do we sustainably implement proven effective interventions for prevention and control of cardio-metabolic syndrome in crisis-affected settings?		X			Outcomes of care: Prevention and control	85.65	70.33%

17	Q34. What are the research priorities from the perspective of people living with cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Patient-centred approaches/Client responsiveness	85.29	68.00%
18	Q29. What are the most effective interventions (eg, simple electronic medical record systems/patient-held records)/ best practices to improve the monitoring and surveillance of cardio-metabolic syndrome care in humanitarian settings (eg, monitoring indicators, medication control and prescription)?			X		Monitoring and evaluation/Digital Health	85.12	76.67%
19	Q16. What are the best approaches to provide holistic care and improve treatment outcomes for persons with cardio-metabolic syndrome in humanitarian settings? (Holistic care is defined as the provision of care to patients based on a mutual understanding of their physical, psychological, emotional and spiritual dimensions. In addition, holistic care emphasises the partnership between nurse and patient, and the negotiation of healthcare needs that lead to recovery.)		x			Processes of care: Integrated care	84.89	70.00%
20	Q7. What are the most effective, acceptable and feasible pharmacological therapeutic strategies for effectively controlling cardio-metabolic syndrome and its complications in specific humanitarian contexts?		X			Outcomes of care: Treatment	84.41	73.00%
21	Q35. What are effective mechanisms for including perspectives of people with lived experience of cardio-metabolic syndrome when it comes to programme design and planning in humanitarian settings?		X			Processes of care: Patient-centred approaches/Client responsiveness	84.21	68.00%

22	Q2. What are the underlying individual, community and environmental factors that contribute to the development and progression of cardio-metabolic syndrome, and how do these vary across axes of vulnerability/disadvantage in humanitarian crises (food insecurity/income/wealth/ educational attainment, etc)?	x				Burden and risk factors	83.82	72.00%
23	Q37. What are effective/cost-effective innovations to improve prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?				X	Innovations	83.70	72.00%
24	Q9. What strategies/approaches (including human rights-based approaches) can humanitarian actors (including donors) use to design and negotiate a healthy food environment, and provide and promote a healthy diet to prevent and manage cardio-metabolic diseases in humanitarian settings?		X			Outcomes of care: Treatment	83.20	68.33%
25	Q28. How can early detection and risk prediction models for cardio-metabolic syndrome be improved to enhance prevention efforts in high-risk, vulnerable populations and for those with co-morbidities in humanitarian settings?			X		Diagnostics/Tools	83.15	69.67%
26	Q31. How can technology and digital health interventions be leveraged to prevent and improve treatment outcomes, and reduce healthcare costs for individuals with cardio-metabolic syndrome in humanitarian settings?			X		Monitoring and evaluation/Digital Health	83.10	65.67%
27	Q25. How can interventions aiming at improving the acceptability and accessibility of community-based care for cardio-metabolic syndrome effectively be delivered at scale and in a sustainable manner in humanitarian settings?			X		Processes of care: Task shifting/sharing	83.05	68.00%

28	Q39. How can healthcare systems and policies be optimised to effectively prevent, detect and manage cardio-metabolic syndrome at both the individual and population levels at all levels of crises (preparedness, response, recovery)?			X		Health system structure	82.77	68.33%
29	Q8. What are the most effective, acceptable and feasible non-pharmacological lifestyle interventions (including dietary modifications, physical activity and behavioural changes) for preventing and managing cardio-metabolic syndrome in humanitarian settings?		X			Outcomes of care: Prevention and control	82.30	71.67%
30	Q4. What is the impact of crises (armed conflicts, displacement, disasters, disease outbreaks, etc) on the epidemiology, detection and management of cardio-metabolic syndrome?	X				Burden and risk factors	82.30	71.33%
31	Q41. What is the economic benefit/return on investment of ensuring prevention and access to care for cardio-metabolic syndrome in humanitarian settings (acute and protracted)?	X				Financing	81.85	66.00%
32	Q17. What are the mechanisms behind effective integrated care for long-term care of cardio-metabolic syndrome in humanitarian settings?	X				Processes of care: Integrated care	81.52	64.33%
33	Q5. What is the impact of interventions aimed at prevention and management of cardio-metabolic syndrome on quality of life and burden of disease (QALYs/DALYs) in humanitarian settings?	X				Outcomes of care: Treatment	81.08	67.00%
34	Q6. What are behavioural modifications tools/models that can reduce incidence of cardio-metabolic diseases among children in humanitarian settings?	X				Diagnostics/Tools	81.03	67.67%

35	Q23. Which approaches are effective in encouraging humanitarian healthcare workers/service providers to focus on cardio-metabolic syndrome among communities affected by conflict?		X			Health system structure	80.96	67.00%
36	Q21. How can operationalisation of guidance and interventions for cardio-metabolic syndrome in humanitarian settings be affected, particularly when funding is limited? What are the operational and capacity barriers, and how can these be overcome?		X			Health system structure	80.92	69.33%
37	Q43. What are the roles of the informal sector (drug stores, traditional healers) in addressing cardio-metabolic syndrome in humanitarian settings?	X				Health system structure	78.65	65.00%
38	Q42. What are the socioeconomic costs (including healthcare costs, loss of productivity, etc) associated with cardio-metabolic syndrome on individuals and families in humanitarian settings, and how can they be mitigated?	X				Financing	78.59	62.33%
39	Q36. To what extent are cardio-metabolic syndrome-focused services inclusive of people living with disabilities in humanitarian settings?		X			Processes of care: Patient-centred approaches/Client responsiveness	78.03	58.67%
40	Q32. Among people with cardio-metabolic syndrome, what are the implications of current models of care employed in humanitarian settings on long-term health outcomes (eg, disease control, prevalence of complications, progression towards NCD, etc)?	x				Outcomes of care: Treatment	77.49	57.67%

41	Q40. To what extent do relevant entities (eg, donors, funding agencies, government agencies) prioritise the financing, programming and resource allocation for cardio-metabolic syndrome prevention and control in humanitarian settings? What are effective strategies to prioritise these activities?	X				Financing	76.68	64.67%
42	Q26. How can we enhance prognostic models and individualised management techniques for healthier lives for people living with cardio-metabolic syndrome in humanitarian settings?			X		Processes of care: Integrated care	73.40	53.33%
43	Q27. What new biomarkers, simple diagnostic techniques and tools can properly identify people who are at risk of developing cardio-metabolic syndrome in humanitarian settings in a timely manner?			X		Diagnostics/Tools	73.13	59.00%

Note: Des = description; Del = delivery; Dev = development; Dis = discovery.

2.3 Further analysis by region of work, job categories, area of work focus and gender

The results of this RPS exercise are available in an online interactive data visualisation tool hosted on Elrha's website. This tool enables users to interact with the data by average score and criterion, as well as by region of work (according to WHO regions), job categories, area of work and gender. These stratifications might help interested stakeholders in identifying the highest priorities identified based on variables of interest.

Discussion

DISCUSSION

Summary of findings and key messages

The growing burden of CMS with compounding chronic disease justifies a global call to action. Nearly 70% of mortality worldwide is caused by NCDs, with the largest burden due to CVDs[8, 52, 53]. The burden of NCDs is particularly marked in LMICs[7, 16, 29, 53–55], where most humanitarian crises occur[10, 11].

With deaths due to CMS following humanitarian emergencies predicted to exceed those caused by crises or emergencies, accidental deaths, and war and conflict21, CMS poses an enormous health and financial burden at individual and collective levels. The global public health community can no longer afford to under-prioritise efforts to address this.

To our knowledge, this RPS exercise is the first of its kind, and sheds light on CMS needs in crisis settings – an area of public health that has previously been under-recognised in global research and intervention. Given the lack of prioritisation of NCDs, particularly CMS, within humanitarian contexts, this exercise makes the case for positioning them as a central public health concern, especially given the long-term implications of NCDs on global health. By identifying research gaps and collating stakeholder opinions on research priorities in chronic disease healthcare management in humanitarian settings, this exercise has strong potential to influence research for future interventions in these contexts.

This exercise also serves as a model for prioritising and addressing research gaps for other NCDs among vulnerable populations in both short-term/acute and protracted crises. While this study provides a wealth of information, it should ideally serve as a call to action for the implementation and funding of priority areas in addressing and managing CMS.

> To prevent further unnecessary deaths and comorbidities, context-specific research and interventions must be prioritised in the global humanitarian agenda.

Higher-ranking research questions

The top ten ranked PRQs (Appendix 7) focused on outcomes and processes of care. These higher-ranking questions could be explained by the high response rate to the survey by healthcare professionals, making this an important thematic area for them due to their proximity to patient care. Previous research has focused on the epidemiological evidence for the burden and risk factors of disease[56, 57], while the results of this study have called for prioritisation of implementation and intervention research, or identifying what works for patient care within humanitarian contexts. The top-ranking questions also reflect the critical need for a minimum initial service package for NCDs in crisis settings. These findings indicate the need for implementation research that would be additive to the adoption of WHO's best buys, which outline evidence-based, cost-effective public health interventions to guide policy decisions on prevention and control of NCDs[58].

Understanding community health worker (CHW) interventions, their modalities of work and training in addressing CMS in humanitarian settings was the top question prioritised. The value of CHWs cannot be understated in settings with disrupted or recovering health systems addressing CMS. Their role in supporting continuity of care, access to services, prevention and management of NCDs, vulnerability reduction, and health education and counselling on NCDs is well documented in non-crisis settings, and general guidance is provided for crisis settings[55, 59]. However, this guidance is not contextualised to varied humanitarian settings for ease of uptake at policy and implementation levels.

Further understanding on effective (and efficient) approaches to integrating CMS into primary healthcare[60], individual and population interventions, as well as self-care interventions[61] for patient-centred prevention, diagnosis and management efforts for CMS in crisis settings, also ranked high in this exercise. Although humanitarian actors are increasingly integrating NCD care into their activities, there is limited literature on the delivery of these interventions in crisis settings. Furthermore, more research is needed on how delivery of interventions varies in different settings, influenced by limited resources, governance structures, social norms, culture and gender disparity.

Specific interventions for preventing or mitigating disruptions to ensure continuity of care were also prioritised, particularly crisis-resilient service delivery models adopted for complex emergencies where multiple concurrent factors lead to disruption of services, compounded by context-specific constraints on management and high mobility of affected populations[11]. Furthermore, with the realisation that these settings have frequent/chronic healthcare worker shortages, research on context-specific task-shifting/-sharing models for prevention and care for CMS in crisis settings was also prioritised.

People living with CMS are at risk of mental health challenges, coupled with the challenges of living in crisis settings. Respondents prioritised the determination of effective mental health and psychosocial support approaches, and the impact of access to psychosocial support for people living with CMS.

In line with these findings and within the 4Ds framework, 35% of PRQs were classified in the 'description' category, while almost half came under 'delivery' and 16% under 'development'. Only one question was categorised under 'discovery'. With 77% of studies included in a WHO review of current research evidence on NCDs in humanitarian emergencies focused on burden and risk factors[57], this RPS suggests a shift in research interests and priorities from burden and risk factors to the delivery and improvement of interventions – including feasibility, scalability, accessibility and other aspects that aim to optimise delivery of care within humanitarian settings. They further highlight the need for context-specific evidence on what interventions have the most potential in humanitarian settings, and how they can be adapted most effectively.

Lower-ranking research questions

Questions related to financing were among those that ranked the lowest. This may be explained by multiple factors. NCD financing is a neglected area of interest that is not typically part of the day-to-day engagement of most health workers, who made up the majority of survey respondents in this exercise. Humanitarian funding also does not break down specific sub-areas of health, meaning that there is not typically a pot of funding for NCDs within health sector funding. Rather, funding for NCDs is lumped within overall health funding, which is only able to sustain NCD services if overall health funding is sufficient[62–64].

There is a discrepancy between the burden of NCDs and the allocation of funding for their management. Although NCDs cause more global death and disability than any other disease group, only 1–2% of the total share of development assistance for health has been dedicated to NCDs since 2000[65]. Insufficient NCD financing continues to pose an enormous challenge more broadly, particularly in humanitarian settings, with NCDs often deprioritised from receiving the limited financing available amid other health priorities[66]. These findings are in line with studies that found a limited understanding of the complexity of NCDs; weak advocacy efforts; other health services being considered more cost-effective; and a focus on more immediate health needs in humanitarian settings[67]. Evidence has also pointed to a lack of coordinated national strategies to tackle NCDs[67] and a conception among provider organisations of NCD care as costly, inhibiting their engagement in this field[12,68].

Furthermore, the fundamental questions around implementation for NCDs in humanitarian settings have not yet been answered. To answer these priority questions, funding is needed for research and implementation as there is a direct relationship between the two. The lack of existing evidence-based answers to the identified questions could, in turn, explain why financing ranked lower on the scale of prioritisation relative to other questions. Insufficient funding, with challenges in its prioritisation, is compounded by the limited evidence-based research on where to best allocate available resources, especially in fragile contexts[66].

Although research on NCD financing seems to have been de-prioritised, questions related to cost efficiency of treatment, care and prevention of CMS scored highly. Cost-effectiveness analysis is critical to support decision-making on the prioritisation of scarce resources to ensure vital access to CMS services at primary care level[69, 70]. Evidence has shown that NCD care at the primary care level can be affordable[71] and that 80% of NCDs can be prevented in older age through actions that are affordable in most countries[72]. However, more research on cost-effectiveness is still needed[18].

> This calls for global, regional and national prioritisation of funding for the prevention and management of NCDs, in line with global development goals[73].

This need is particularly evident given global population aging, coupled with protracted crises and the continually growing burden of NCDs[65, 74], which place a significant strain on the health of individuals and collective healthcare systems. Prioritisation of interventions that have the potential to be effective will require country-specific information to assess both cost-effectiveness and the added value within existing health systems[69].

A key reason for undertaking this RPS was to influence funding flows to CMS research in humanitarian settings. Understanding a baseline measure of current funding levels would have been beneficial for the evidence maps but was beyond the scope of the RPS. This represents a beneficial future implementation research area, with the aim of reshaping the funding landscape of NCD-CMS in humanitarian settings.

Another set of lower-ranking questions related to the development of new biomarkers, simple diagnostic techniques and tools to identify people who are at risk of developing CMS. Identifying accurate biomarkers for CMS is crucial for its prevention, diagnosis and management. However, many biomarkers are still under study, such as HDL cholesterol, low-density lipoprotein cholesterol, triglycerides, fasting plasma glucose and lipoprotein-A; these may currently be unknown to frontline healthcare providers. Innovative simple diagnostic tools for CMS and NCDs are critical to enhance health system resilience by enabling early detection, accurate diagnosis, timely management and efficient allocation of scarce resources. Many providers in humanitarian settings focus on using existing basic tools or use syndromic approaches for diagnosis; innovative tools are perceived as costly and unsustainable, which may explain their low scores in this exercise despite their importance[75].

The results of the survey were likely influenced by respondents' professions and locations of work, with the majority being health professionals working in the humanitarian settings in the AFR and EMR. This could potentially explain the resulting high and low scores of certain research questions. It is to be noted that most NCD work in humanitarian settings currently takes place in the AFR and EMR[7], with work increasing in the SEAR. This indicates that the skewing of these results may not be a limitation, but probably illustrates the interest and involvement of those working on the ground in crisis contexts.

Strengths

- **First RPS on NCD-CMS in humanitarian situations**: This RPS exercise identifies critical evidence gaps in the research on CMS. It serves to advocate for changes in the priorities of funders, policymakers, implementers and researchers in this field, with potential extension of the findings to other NCDs. These research priorities, when undertaken, would help address the critical evidence gaps for NCD-CMS in these settings, and inform decision-making to improve population health and outcomes.
- **Involvement of technical experts**: A team of experts on NCDs in humanitarian settings – including researchers, implementers and programme managers, as well as patient organisations – formed our Steering Committee and TSC, contributing valuable, relevant and diverse perspectives that helped strengthen our research approach and the interpretation of our findings.
- **Strong survey dissemination strategy**: The dissemination strategy of the surveys was persistent and broad enough to ensure the participation of a diverse group of experts. Both structured and unstructured dissemination methods were used, including participation in webinars and international online fora, as well as a snowball sampling. A list of potential participants was gathered and they were sent regular reminders to participate. The scoring of the survey was open to a large pool of experts and not only limited to those who had submitted research questions previously. This allowed those who did not have the chance to participate previously another opportunity to take part in this exercise. Both surveys were conducted in four different languages (Arabic, English, French and Spanish). The online survey strategy we employed was designed to make answering the survey easy for respondents from as many contexts as possible, maximising inclusion and representation.
- **Adapting the CHNRI approach**: An adapted CHNRI approach was used, overseen by the Steering Committee and TSC, which were both independent of the final ranking process. The CHNRI approach is a powerful tool that can help identify new research questions and maximise input on prioritisation of these questions from a variety of different stakeholders. Since the CHNRI process is easily adaptable, it allowed for implementation in a web-based survey, as well as a wider scope, further enhancing representativeness.
- **No partially completed surveys**: It was mandatory for participants to complete the survey in full, which prevented partially completed responses.

Limitations

Several limitations in how the surveys were carried out may present bias in the representativeness of some of the results. These limitations include:

- **Representation by region of work and job categories**: The majority of survey respondents were health professionals working in the field in the AFR and EMR, where most humanitarian programmes providing NCD care are located. In our view, this may have skewed the results due to the higher survey engagement from humanitarian actors in these regions. These two regions have among the highest workload for humanitarian work, including NCD programmes. The AFR in particular has had poor representation in the literature on NCDs in humanitarian crises, which may have contributed to the higher response rates, indicating a need for more research in the region[56]. The higher rates of frontline health professionals responding to the survey may have also contributed to the higher ranking of questions related to improving models of care, as they are more likely to be involved in day-to-day NCD programming on the ground.
- **Bias in self-selection for the surveys**: While efforts were made to mitigate selection bias, there is still a possibility for selection bias due to the online nature of the survey and respondents' self-selection. Scoring might have been influenced by ongoing research or projects in which self-selected participants have relevant interests. While the CHNRI approach is limited to those who are reachable and able to respond, efforts were made to limit any selection and response biases, such as having a robust dissemination strategy for both surveys.
- **Length and structure of the survey**: It was mandatory for participants to fully complete the survey to prevent partially completed responses. While this enhanced the quality of the exercise, the time-consuming nature of the survey and the requirement for it to be fully completed may have impacted the response rate. The non-randomised structure of the survey questions may have also resulted in scorer fatigue.
- **Sample size bias**: Additional areas of research may have emerged if a larger sample had participated in the first survey. A sample size of 75 for the second survey may have led to an over- or under-estimation of some of the results, and could explain the variability in some of the question rankings. However, the CHNRI methodology attempts to mitigate this based on the wisdom of crowds theory "that suggests that approximately 24 scorers are needed in order to cancel out personal biases and judgements and to arrive at the collective wisdom of the group"[31]. As our survey had 75 respondents, this potential bias was likely mitigated, though a larger sample size in future studies would help provide more robust findings.
- **Framing of research questions:** Many of the research questions were not based on a specific type of context, and may not reflect only humanitarian settings, making them potentially applicable to broader contexts. Among the 356 research questions that addressed CMS, only 19 reported specific contexts such as emergency/stable/unstable settings. As the PRQs were consolidated through an iterative process of thematic analysis, these few

occurrences were merged with similar questions. While context-specific questions that apply to only acute or protracted crises settings may be more nuanced, this research project defined a humanitarian setting as "one in which an event (eg, armed conflict, crisis, emergency, epidemic, famine) or series of events has resulted in a critical threat to the health, safety, security and well-being of a community or other large group of people"[42]. The objective was to capture all potential humanitarian contexts and obtain a broad perspective that could apply to various situations globally.

- **Political crises**: The impact of the ongoing crises in Gaza and in Ukraine may have limited or skewed the response rate from the EMR and EUR.

Conclusion

CONCLUSION

Our findings highlight the need to prioritise research on models of care for people with NCDs in humanitarian settings, including looking at processes and outcomes of care.

They also highlight a clear need to focus research on delivering quality, effective, integrated primary care for NCDs in humanitarian settings. Health workers are keen to understand how best to prevent and manage NCDs in these settings, using patient-centred approaches, and maintaining the continuity and sustainability of care. The need to generate evidence on task-shifting care to CHWs in humanitarian settings was also underscored in this exercise.

This RPS exercise shows the importance of adopting integrated, multidisciplinary approaches that address research, interventions, and policies involving local and international stakeholders. Research on models of care must focus on sustainable approaches that facilitate continuity of care and ensure integration within existing healthcare systems. These integrated efforts are needed for a holistic and sustainable approach to addressing the growing burden of CMS and NCDs globally.

While there is a better understanding of the global, regional and national burden of NCDs, there are gaps in financing and analyses of the cost-effectiveness of research and interventions in humanitarian settings. Further research efforts are needed to understand more effective ways of systematically addressing this burden. Hopefully, this list of ranked research priorities will be useful to funding organisations, and will stimulate the deployment of funds to CMS research, interventions and policies.

Call to action

1. Fund research based on the results of the CMS RPS to build evidence on NCD care and prevention in humanitarian settings.
2. Research cost-effective models focusing on implementation outcomes, such as acceptability and feasibility.
3. Research which interventions have the strongest potential impact within humanitarian settings and obtain a contextual understanding of need by priority area before implementation.
4. Use patient-centred approaches, and include voices of people living with NCDs to help determine and centre their preferences and needs.
5. Develop and test a set of core monitoring and evaluation indicators to measure NCD outcomes in humanitarian settings.

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Appendices

APPENDICES

Appendix 1: Members of the Steering Committee

Role	Individual	Title, Organisation
Co-Chair	Mesfin Teklu Tessema	Senior Director Health, IRC (US/ Global)
Co-Chair	Prof. Fouad Fouad	Associate Professor of Public Health Practice, AUB (Lebanon)
Steering Committee Coordinator	Dr Stella Kawira Njagi	NCD Technical Advisor, IRC (Kenya/ Global)
Member	Michael Woodman	Senior Public Health Officer, UNHCR (Switzerland/Global)
Member	Dr Mamsallah Faal-Omisore	Clinical Director, Primary Care International (UK/Global)
Member	Dr Zipporah Ali	Chair, NCD Alliance Kenya
Member	Beatrice Vetter	Project Manager – NCDs, Foundation for Innovative New Diagnostics
Member	Iryna Vlasenko	Vice President, International Diabetes Federation, Ukraine (Ukraine response)
Member	Mohamed Osman Mohamed (Nasiim)	NCD National Professional Officer, WHO Country Office (Somalia) – formerly NCD Program Manager, Ministry of Health (Somalia)
Member	Dr Philippa Boulle	NCD Advisor and Working Group Leader, MSF (Switzerland/Global)
Member	Sonia Walia	Senior Health Advisor, Bureau for Humanitarian Assistance (US/Global)
Member	Deisy Arrubla	Professor of Public Health, Pontificia Universidad Javeriana, Colombia
Member	Mohammad Sami Karimi	Director NCDs, Ministry of Public Health Kabul, Afghanistan
Observer	Anne Harmer	Head of Research in Humanitarian Crises (R2HC) programme, Elrha (UK)

Appendix 2: Members of the TSC

Role	Individual	Title, Organisation
Chair/Coordinator	Dr Stella Kawira Njagi	NCD Technical Advisor, IRC (Kenya/ Global)
Member	Dr Philippa Boulle	NCD Advisor and Working Group Leader, MSF (Switzerland/Global)
Member	Dr Sylvia Kehlenbrink Oh	Director NCDs, Harvard Humanitarian Initiative/Chair, IADA
Member	Dr Zipporah Ali	Chair, NCD Alliance Kenya
Member	Dr Eimhin Ansbro	Research Fellow – NCDs in Humanitarian Settings, London School of Hygiene & Tropical Medicine
Member	Dr PhuongThao Le	Assistant Professor/Faculty Fellow, College of Global Public Health, Johns Hopkins University
Member	Dr Aebischer Perone Sigiriya	NCD Advisor ICRC/Geneva University Teaching Hospital
Member	Dr Mamsallah Faal-Omisore	Clinical Director, Primary Care International (UK/Global)
Member	Dr Marcello Tonelli	Associate Vice President (Health Research)/Nephrologist, University of Calgary

Appendix 3: Steering Committee and TSC Engagements

Date	Group	Topics discussed	Outcomes
13 July 2022	Steering Committee	• Introduction to NCDs RPS project (methodology) • Creation of TSC to provide expert technical guidance on RPS steps • No. of NCDs for RPS process (consideration of inclusion of epilepsy, chronic kidney disease and sickle cell disease not in original proposal)	• Commissioned the creation of the TSC to discuss/decide the no. of NCDs to be included in the RPS process
2 August 2022	TSC	• Terms of Reference for TSC • Methodology of NCDs RPS process • Consideration of 3 other NCDs not in original proposal • Inclusion of patient representatives as study respondents	• Created a scoring system with justification for inclusion of additional NCDs; consensus on inclusion of epilepsy • Suggested connecting with NCD Alliance to reach NCD patients through TSC member from NCD Alliance
16 August 2022	TSC	• Brainstorming on inclusion of patient representatives • Connection with NCD Alliance	• Developed pathways for inclusion of patient representatives in the RPS exercise
3 October 2022	Steering Committee and TSC	• Update on inclusion of epilepsy in RPS process • Review of AUB Institutional Review Board (IRB) documents (consent and survey forms) • Review of evidence maps • Piloting draft of survey 1 on RPS for 6 NCDs on Kobo Collect	• Finalised survey 1 documents with feedback from Steering Committee/ TSC members

10 November 2022	Steering Committee – Co-Chairs and Research Team	• Discussing feedback from Elrha on direction to change study scope to cover 1–2 NCDs instead of 6 NCDs	• Call for a meeting with both Steering Committee and TSC members to communicate and deliberate on this change
23 November 2022	Steering Committee and TSC	• Change of scope of NCDs for RPS as suggested by Elrha from 6 NCDs to 1–2 NCDs	• Consensus to focus on CMS
1 December 2022	Steering Committee and TSC	• Communicating to Steering Committee/TSC approval from Elrha to conduct RPS exercise on CMS • Communicating project extension to September 2023 due to change in study scope	• Approval and study extension noted
21 February 2023	Steering Committee and TSC	• Feedback on updated survey 1 containing invitation email, consent form, evidence maps and guidance on developing research questions	• Received feedback on survey 1 forms
2 February 2023	TSC	• Setting criteria for scoring research questions • Suggesting potential questions to address each of the criteria • Allocation of equal or different weights for selected criteria	• Consensus on top 3 most relevant criteria (impact, feasibility, effectiveness) then later added the 4 one – Deliverability; equal weights for all criteria
18 April 2023	Steering Committee and TSC	• Notification on IRB approval for survey 1 • Survey 1 pre-deployment testing	• Survey 1 deployment approved by Steering Committee/TSC after testing
19 May 2023	Steering Committee and TSC	• Poor response rates for survey 1	• Disseminated and conducted follow-up reminders for survey 1 to professional networks that members belong to.

6 June 2023	Steering Committee and TSC	• Extension of survey 1 deadline • Invitation to participate in NCDs RPS webinar targeting various stakeholders	• Deadline extended to 9 June 2023 • Webinar conducted on 6 June 2023
27 July 2023	Steering Committee and TSC	• Update on survey 1 response rate (694 research questions; final inclusion of 356 questions relevant to CMS in humanitarian settings; final consolidation to 57 questions) • Update on collation and categorisation using the 4Ds criteria and thematic categorisation	• Received feedback on formulation of questions; further consolidation of questions; deletion of questions already answered
21–28 September 2023	Steering Committee and TSC	• Update on finalised survey 2 PRQs; 43 questions with scoring by criteria • Testing of survey 2 on KoboToolbox	• Minor edits proposed on the presentation of questions on KoboToolbox • Research team given go-ahead to release the survey 2 on 13 October 2023
17 October 2024	Steering Committee and TSC	• Participation in launch webinar for survey 2	• Attended launch webinar for survey 2 to support dissemination of the RPS exercise
15 January 2024	Steering Committee and TSC	• Sharing results and analysis of survey 2 on scoring of 43 RPS questions • Discussion on consensus on interpretation of results/ analysis	• Feedback provided to present ranking of questions by thematic bands and not just numerical ranking from highest to lowest • Need to think through the reasons for the highest- and lowest-ranked questions
15 February 2024	Steering Committee and TSC	• Sharing the draft of final CMS RPS report for input and feedback	• Received feedback and incorporated it

Appendix 4: Informal Interagency Working Group on NCDs Engagements

Date	Group	Discussion	Outcomes
23 September 2022	IIAWG on NCDs	• Methodology and selection of stakeholders for RPS • Update/validation on addition of epilepsy to RPS based on TSC recommendation as it had not been included in mental health and psychosocial support RPS	• Gave green light on use of the CHNRI approach • Validation given on inclusion of epilepsy in RPS process
24 March 2023	IIAWG on NCDs	• Presented evidence maps, with inclusion of 8 systematic reviews relevant for the RPS • Consensus on selection criteria to be agreed upon	• Reached consensus on criteria to include: impact, effectiveness, feasibility and deliverability. • There would be no weighting of criteria.
16 October 2023	IIAWG on NCDs	• Presented final 43 priority questions and scoring criteria • Disseminated survey 2	• IIAWG members supported dissemination of survey 2 to various networks

Appendix 5: Research/Process Management Team

International Rescue Committee (IRC)

- Dr Lilian Kiapi – Co-Principal Investigator
- Dr Stella Njagi – Project Coordinator/Advisor

American University of Beirut (AUB)

- Prof. Abla Mehio Sibai – Principal Investigator
- Dr Chaza Akik – Consultant Investigator
- Prof. Fouad Fouad – Co-Investigator
- Dr Hala Ghattas – Project Advisor
- Ms Nancy Zaitouny – Research Assistant

Appendix 6: PRQs by research theme/sub-theme

1. Burden and risk factors

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
5	Q3. What are the knowledge, attitudes and practices (KAP) regarding cardio-metabolic syndrome, its risk factors and care-seeking practices in [specific humanitarian context] from the perspective of service providers as well as recipients (eg, refugees, displaced persons and host communities)?	x				88.89	87.32	88.89	90.58	88.92	79.33%
11	Q19. What are the key factors (enabling/impeding factors) that influence prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?	x				88.03	86.23	86.11	87.14	86.88	76.67%
14	Q1. What is the burden of cardio-metabolic syndrome in [specific humanitarian context]? Are there any notable disparities by age, urban/rural settings, genders, ethnicities, and physical abilities?	x				88.41	87.86	83.10	86.43	86.45	73.67%
22	Q2. What are the underlying individual, community and environmental factors that contribute to the development and progression of cardio-metabolic syndrome, and how do these vary across axes of vulnerability/disadvantage in humanitarian crises (food insecurity/income/wealth/educational attainment, etc)?	x				89.58	86.43	82.14	77.14	83.82	72.00%
30	Q4. What is the impact of crises (armed conflicts, displacement, disasters, disease outbreaks, etc) on the epidemiology, detection and management of cardio-metabolic syndrome?	x				83.11	89.33	78.57	78.17	82.30	71.33%

2. Outcomes of care

2.1. Prevention and control

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
9	Q11. What are the most feasible, effective/cost-effective interventions at the individual and population levels to prevent cardio-metabolic syndrome and its risk factors in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		x			85.62	90.97	88.73	84.29	87.40	75.00%
16	Q38. How do we sustainably implement proven effective interventions for prevention and control of cardio-metabolic syndrome in crisis-affected settings?		x			89.44	87.68	82.86	82.61	85.65	70.33%
29	Q8. What are the most effective, acceptable and feasible non-pharmacological lifestyle interventions (including dietary modifications, physical activity and behavioural changes) for preventing and managing cardio-metabolic syndrome in humanitarian settings?		x			84.72	84.03	79.29	81.16	82.30	71.67%

2.2.Treatment

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
3	Q12. What are the most effective/cost-effective interventions at the individual and population levels that provide quality diagnosis and management for cardio-metabolic syndrome in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		x			93.57	92.65	85.61	84.62	89.11	74.00%
6	Q10. What are effective mental health and psychosocial support approaches, and the impact of access to psychosocial support on the management of cardio-metabolic syndrome and treatment outcomes in humanitarian settings?		x			88.57	90.71	87.50	86.03	88.20	73.33%
20	Q7.What are the most effective, acceptable and feasible pharmacological therapeutic strategies for effectively controlling cardio-metabolic syndrome and its complications in specific humanitarian contexts?		X			88.89	87.32	78.57	82.86	84.41	73.00%
24	Q9. What strategies/approaches (including human rights-based approaches) can humanitarian actors (including donors) use to design and negotiate a healthy food environment, and provide and promote a healthy diet to prevent and manage cardio-metabolic diseases in humanitarian settings?		x			87.32	89.29	78.99	77.21	83.20	68.33%
33	Q5. What is the impact of interventions aimed at prevention and management of cardio-metabolic syndrome on quality of life and burden of disease (QALYs/DALYs) in humanitarian settings?	x				89.58	81.51	77.86	75.36	81.08	67.00%

40	Q32. Among people with cardio-metabolic syndrome, what are the implications of current models of care employed in humanitarian settings on long-term health outcomes (eg, disease control, prevalence of complications, progression towards NCD, etc)?	x				77.94	77.54	76.87	77.61	77.49	57.67%

3. Processes of care

3.1. Integrated care

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
2	Q13. At primary care level, what are the most effective/cost-effective interventions that can be effectively implemented to provide quality prevention and management, and improve treatment outcomes for cardio-metabolic syndrome in humanitarian settings?		x			93.06	91.67	90.71	88.03	90.87	81.00%
7	Q15. What is the (cost-)effectiveness of adopting an integrated, primary care-centric approach to providing cardio-metabolic syndrome care in humanitarian settings?		x			90.14	89.44	87.50	85.51	88.15	76.33%
19	Q16. What are the best approaches to provide holistic care and improve treatment outcomes for persons with cardio-metabolic syndrome in humanitarian settings? (Holistic care is defined as the provision of care to patients based on a mutual understanding of their physical, psychological, emotional and spiritual dimensions. In addition, holistic care emphasises the partnership between nurse and patient, and the negotiation of healthcare needs that lead to recovery.)		x			89.29	90.71	80.88	78.68	84.89	70.00%

32	Q17. What are the mechanisms behind effective integrated care for long-term care of cardio-metabolic syndrome in humanitarian settings?	x				86.96	84.06	78.26	76.81	81.52	64.33%
42	Q26. How can we enhance prognostic models and individualised management techniques for healthier lives for people living with cardio-metabolic syndrome in humanitarian settings?			x		76.52	77.69	69.70	69.70	73.40	53.33%

3.2. Continuity of care

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
10	Q18. What interventions are effective at preventing or mitigating disruptions/ensuring continuity of care in cardio-metabolic syndrome care in humanitarian settings, how do they work, for whom and in what emergencies?		x			91.43	90.28	82.39	84.29	87.10	75.00%
12	Q14. How can people living with cardio-metabolic syndrome related conditions be effectively enrolled into care and followed up on in humanitarian settings?		x			85.92	85.71	90.00	85.71	86.84	75.67%

3.3. Task shifting/sharing

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
1	Q24. What are the most effective community health worker-driven interventions for cardio-metabolic syndrome management, monitoring and prevention in humanitarian settings, and what work modalities/training of community health workers are needed for this?		x			93.66	95.71	91.30	90.85	92.88	81.67%
8	Q22. What are effective models of task shifting for cardio-metabolic syndrome prevention and care for different levels of healthcare providers (at health facility and community levels), communities and families in humanitarian settings?		x			86.62	90.14	88.41	84.51	87.42	73.33%
27	Q25. How can interventions aiming at improving the acceptability and accessibility of community-based care for cardio-metabolic syndrome effectively be delivered at scale and in a sustainable manner in humanitarian settings?			x		86.11	84.03	82.88	79.17	83.05	68.00%

3.4 Patient-centred approaches/Client responsiveness

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
4	Q33. What self-care interventions are effective among people at risk or living with cardio-metabolic syndrome in humanitarian settings? How do they work, for whom and under what conditions?		x			90.00	90.14	89.13	86.62	88.97	76.00%
17	Q34. What are the research priorities from the perspective of people living with cardio-metabolic syndrome in humanitarian settings?	x				87.31	85.61	84.38	83.87	85.29	68.00%
21	Q35. What are effective mechanisms for including perspectives of people with lived experience of cardio-metabolic syndrome when it comes to programme design and planning in humanitarian settings?		x			85.51	87.86	84.78	78.68	84.21	68.00%
39	Q36. To what extent are cardio-metabolic syndrome-focused services inclusive of people living with disabilities in humanitarian settings?		x			80.30	79.23	72.73	79.85	78.03	58.67%

3.5. Access to care

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
15	Q20. What are the key factors (enabling/impeding factors) that influence access to care and support for cardio-metabolic syndrome in humanitarian settings?	X				86.99	81.25	89.04	88.03	86.33	78.00%

4. Monitoring and evaluation

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
13	Q30. Which NCD indicators at the community, health facility and health system levels are the most useful for monitoring cardio-metabolic syndrome in humanitarian settings?		x			88.03	85.71	87.68	85.21	86.66	75.00%
18	Q29. What are the most effective interventions (eg, simple electronic medical record systems/patient-held records)/ best practices to improve the monitoring and surveillance of cardio-metabolic syndrome care in humanitarian settings (eg, monitoring indicators, medication control and prescription)?			x		84.93	85.62	84.93	85.00	85.12	76.67%
26	Q31. How can technology and digital health interventions be leveraged to prevent and improve treatment outcomes, and reduce healthcare costs for individuals with cardio-metabolic syndrome in humanitarian settings?			x		88.57	87.68	81.16	75.00	83.10	65.67%

5. Financing

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
31	Q41. What is the economic benefit/return on investment of ensuring prevention and access to care for cardio-metabolic syndrome in humanitarian settings (acute and protracted)?	x				83.33	81.82	80.15	82.09	81.85	66.00%
38	Q42. What are the socioeconomic costs (including healthcare costs, loss of productivity, etc) associated with cardio-metabolic syndrome on individuals and families in humanitarian settings, and how can they be mitigated?	x				80.56	78.87	76.76	78.17	78.59	62.33%
41	Q40. To what extent do relevant entities (eg, donors, funding agencies, government agencies) prioritise the financing, programming and resource allocation for cardio-metabolic syndrome prevention and control in humanitarian settings? What are effective strategies to prioritise these activities?	x				76.03	76.39	77.14	77.14	76.68	64.67%

6. Diagnostics/Tools

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
25	Q28. How can early detection and risk prediction models for cardio-metabolic syndrome be improved to enhance prevention efforts in high-risk, vulnerable populations and for those with co-morbidities in humanitarian settings?			x		85.42	87.32	78.17	81.69	83.15	69.67%
34	Q6. What are behavioural modifications tools/models that can reduce incidence of cardio-metabolic diseases among children in humanitarian settings?	x				85.71	79.71	79.71	78.99	81.03	67.67%
43	Q27. What new biomarkers, simple diagnostic techniques and tools can properly identify people who are at risk of developing cardio-metabolic syndrome in humanitarian settings in a timely manner?			x		76.81	77.21	70.59	67.91	73.13	59.00%

7. Innovations

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
23	Q37. What are effective/cost-effective innovations to improve prevention, diagnosis and management of cardio-metabolic syndrome in humanitarian settings?				x	87.50	84.03	83.57	79.71	83.70	72%

8. Health system structure

Overall rank	Question	4Ds framework				I	E	F	D	Average score	Agreement score
		Des	Del	Dev	Dis						
28	Q39. How can healthcare systems and policies be optimised to effectively prevent, detect and manage cardio-metabolic syndrome at both the individual and population levels at all levels of crises (preparedness, response, recovery)?			x		88.73	85.00	78.99	78.36	82.77	68.33%
35	Q23. Which approaches are effective in encouraging humanitarian healthcare workers/service providers to focus on cardio-metabolic syndrome among communities affected by conflict?		x			80.82	79.45	82.86	80.71	80.96	67.00%
36	Q21. How can operationalisation of guidance and interventions for cardio-metabolic syndrome in humanitarian settings be effected, particularly when funding is limited? What are the operational and capacity barriers, and how can these be overcome?		x			78.38	80.56	84.03	80.71	80.92	69.33%
37	Q43. What are the roles of the informal sector (drug stores, traditional healers) in addressing cardio-metabolic syndrome in humanitarian settings?	x				76.81	80.43	80.88	76.47	78.65	65%

Note: Des = description; Del = delivery; Dev = development; Dis = discovery; I = impact; E = effectiveness; F = feasibility; D = deliverability.

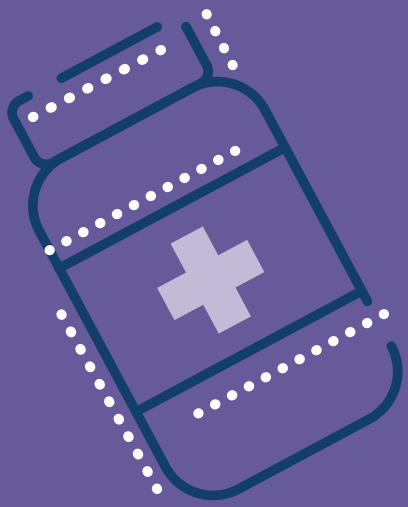
Appendix 7: Top ten PRQs

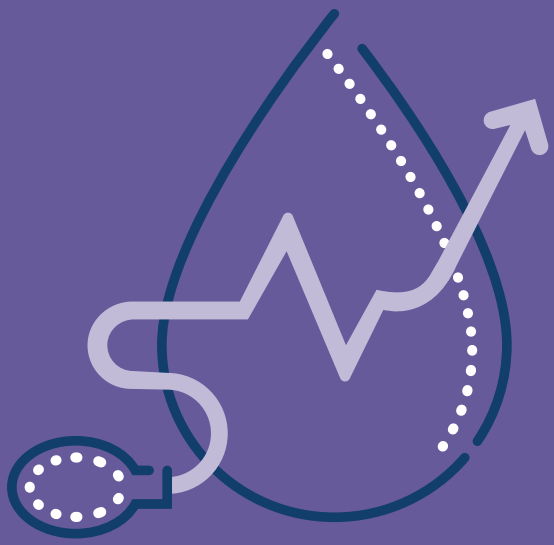
Overall rank	Question	4Ds framework				Research theme/sub-theme	Average score	AEA
		Des	Del	Dev	Dis			
1	Q24. What are the most effective community health worker-driven interventions for cardio-metabolic syndrome management, monitoring and prevention in humanitarian settings, and what work modalities/training of community health workers are needed for this?		x			Processes of care: Task shifting/sharing	92.88	81.67%
2	Q13. At primary care level, what are the most effective/cost-effective interventions that can be effectively implemented to provide quality prevention and management, and improve treatment outcomes for cardio-metabolic syndrome in humanitarian settings?		x			Processes of care: Integrated care	90.87	81%
3	Q12. What are the most effective/cost-effective interventions at the individual and population levels that provide quality diagnosis and management for cardio-metabolic syndrome in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		x			Outcomes of care: Treatment	89.11	74.00%
4	Q33. What self-care interventions are effective among people at risk or living with cardio-metabolic syndrome in humanitarian settings? How do they work, for whom and under what conditions?		x			Processes of care: Patient-centred approaches/Client responsiveness	88.97	76.00%

5	Q3. What are the knowledge, attitudes and practices (KAP) regarding cardio-metabolic syndrome, its risk factors and care-seeking practices in [specific humanitarian context] from the perspective of service providers as well as recipients (eg, refugees, displaced persons and host communities)?	x				Burden and risk factors	88.92	79.33%
6	Q10. What are effective mental health and psychosocial support approaches, and the impact of access to psychosocial support on the management of cardio-metabolic syndrome and treatment outcomes in humanitarian settings?		x			Outcomes of care: Treatment	88.20	73.33%
7	Q15. What is the (cost-)effectiveness of adopting an integrated, primary care-centric approach to providing cardio-metabolic syndrome care in humanitarian settings?		x			Processes of care: Integrated care	88.15	76.33%
8	Q22. What are effective models of task shifting for cardio-metabolic syndrome prevention and care for different levels of healthcare providers (at health facility and community levels), communities and families in humanitarian settings?		x			Processes of care: Task shifting/sharing	87.42	73.33%
9	Q11. What are the most feasible, effective/cost-effective interventions at the individual and population levels to prevent cardio-metabolic syndrome and its risk factors in humanitarian and low-resource settings? How can they be adapted to meet the needs of varied populations?		x			Outcomes of care: Prevention and control	87.40	75.00%

10	Q18. What interventions are effective at preventing or mitigating disruptions/ensuring continuity of care in cardio-metabolic syndrome care in humanitarian settings, how do they work, for whom and in what emergencies?		x			Processes of care: Continuity of care	87.10	75.00%

Note: Des = description; Del = delivery; Dev = development; Dis = discovery.





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