Journal of Cancer Policy 20 (2019) 100190

Contents lists available at ScienceDirect

Journal of Cancer Policy

journal homepage: www.elsevier.com/locate/jcpo

# Integration of Research Priorities in Low and Middle-Income Countries: A Qualitative Analysis of National Cancer Control Plans

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ARTICLE INFO

*Keywords:*
Cancer control plan
Low and middle-income countries
Research priorities
Policy

ABSTRACT

Incorporating research objectives into national cancer control plans informs effective implementation, and ultimately, health outcomes. We sought to explore the inclusion and description of research priorities in select low- and middle-income countries' (LMIC) cancer control plans to elucidate gaps and collaborative opportunities. LMIC plans published in English, in 2016 or later, and met World Bank and Human Development Index criteria, comprised the eligible sample. A systematic, inductive approach was used to characterize the research priorities. Two overarching categories of research priorities were identified: Establishing Research Agendas (ERA) and Building Research Capacity (BRC). Codes were subsequently assigned to distinguish between types of research and strategies for developing research capacity. Twelve LMIC cancer control plans were included in the analysis. Six of the 12 plans articulated ERA priorities involving five types of research; the most frequently planned being Health Services Research (31%), followed by Epidemiologic (27%) and Clinical (27%). Five strategies were proposed to build research capacity; the most frequently proposed were "Enhance Cancer Surveillance" (44%) and "Establish Research Infrastructure" (24%). Country-specific variation in ERA and BRC priorities were observed across research type and cancer continuum phase. This is the first systematic examination of research priorities in a subset of LMIC national cancer control plans. Findings suggest that some LMICs intend to focus their research efforts in specific areas and others plan to integrate research across the continuum to enhance cancer control efforts. The extent and overlap of research priorities between countries demonstrates promise for trans-national research collaborations.

## 1. Introduction

Low and middle-income countries (LMIC) bear a major proportion of the world's cancer burden. With two-thirds of cancer deaths occurring in LMICs, cancer has emerged as the leading cause of death in these countries, with cancer incidence projected to rise 70% by 2030 [1–3]. Internationally respected organizations such as the World Health Organization (WHO), International Agency for Research on Cancer (IARC), National Cancer Institute (NCI), and Union for International Cancer Control (UICC), have coordinated their efforts to recommend cancer control planning as a first step for countries to address cancer control [4,5]. A national cancer control planning process facilitates consensus-building across multi-sectoral stakeholders in a country to develop a strategic plan to reduce the cancer incidence and mortality, enhance prevention, and improve cancer patients' quality of life [4,6]. The resulting national cancer control plan (NCCP) ideally outlines context-specific goals and objectives that are data-driven, evidence-based, and may include a funding plan for established priorities [7,8].

The Seventieth World Health Assembly in 2017 passed a resolution on cancer prevention and control, calling on Member States to act on 22 outlined priorities [9,10]. One of the priorities called for the enhancement of the evidence base for cancer prevention and control through research in health outcomes, quality of life and cost-effectiveness. Research in such key areas can inform appropriate interventions, assess

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https://doi.org/10.1016/j.jcpo.2019.100190
Received 29 April 2019; Accepted 12 May 2019
Available online 15 May 2019
2213-5383/ Published by Elsevier Ltd.

**Table 1**
Building Research Capacity (BRC) - Planned Strategies.

| Strategies | Description |
|---|---|
| Enhance cancer surveillance | Cancer registry development or enhancement (national, regional, and/or local), including mandated reporting, case registration, abstraction, surveillance, technology use |
| Establish/Enhance Monitoring and Evaluation (M&E) | Data collection, monitoring, measurement, and evaluation system (e.g., indicators, quality improvement personnel); standardization, &/or processes for data acquisition to facilitate M&E of cancer control programs and services (NOTE: excludes cancer registry systems) |
| Establish Research Infrastructure | Governance and coordination structure development to ensure ethical research conduct; partnerships, consortia, collaborative research network development; creation of comprehensive, integrated data resources; developing research training |
| Develop Research Agenda | Activity to convene and identify research topics or questions |
| Enable Research Conduct | Supportive and facilitative research efforts (e.g. advocacy for research funding, fostering publications) |

program effectiveness, and strengthen registry systems for cancer surveillance [11,12] to improve cancer outcomes [13,14]. Integrating research into national cancer plans can support such enhancements in the evidence base. Additionally, knowledge of research priorities can help partners and funders identify potential areas of collaboration. Understanding the content and scope of research priorities articulated in LMICs' cancer control plans can help elucidate LMICs' research priorities and identify workforce and capacity building needs to accelerate local cancer control efforts.

There is a critical need for contextually-relevant research in LMIC contexts to inform policy and care delivery [15,16]. The Bamako Call to Action prioritized local research activities to transform social and environmental conditions that improve health outcomes while engaging politicians and scientists[17]. Yet country-specific research priorities have not been systematically examined for LMICs, to date. We sought to identify and systematically characterize the research priorities in a subset of LMIC cancer control plans. Such information could potentially help determine where countries' priorities might overlap with international partner interests and illuminate areas for cancer research collaborations.

## 2. Methods

### 2.1. Inclusion criteria

For the purposes of this analysis, a cancer control plan was defined as a policy document endorsed by a country's ministry of health that described goals, objectives, strategies, and activities, and was informed by the country's disease burden and context. A plan was eligible for inclusion in the analysis if it was published online in English [18] or was recently approved or close to being approved by the ministry of health and available to the authors. In addition, plans eligible for inclusion had an end date of 2017 or later. Plans were excluded if they provided only an executive summary or framework or if the country was classified as either "high-income" as defined by the World Bank [19] or "very high" in the United Nations Human Development Index [20]. Twelve cancer control plans, i.e., nine published and three recently completed, unpublished plans, comprised the final subset of LMIC plans for the analysis.

### 2.2. Data abstraction and analysis

Type of text and placement in cancer control plans informed which data were abstracted. Activities and approaches were largely used as the "analytic data". Text was abstracted from sections of plans that outlined implementation priorities with one of the following headings: implementation matrix, action plan/grid, or an implementation table. In some plans, where only the general objective or strategy was provided, and no activities and approaches were indicated, the objective or strategy text was abstracted and reviewed as a plan priority. Key terms were applied to the text to identify relevant content: "research", "explore", "understand", "test", "assess", "investigate", "survey", "study/studies", "conduct". Subsequently, we conducted a qualitative content analysis, adhering to scientific principles of rigor and consistency [21,22].

Two overarching categories of research priorities were identified. After iterative review, codes were subsequently assigned to the different descriptive elements within each category. These codes characterized the type of research as interpreted by the researchers (IP, BK):

1) **Establishing Research Agendas (ERA)** was an assigned overarching category if a country **explicitly** stated topics for research or funding support for any of the following: research on a particular cancer site (e.g. lung cancer, cervical cancer); research on phases of the cancer control continuum (e.g., diagnosis, rehabilitation); specific research approaches (e.g. surveys, cost analysis, clinical research). Within the ERA category, research activities proposed were subsequently coded to describe five **types** of research: Basic/Biological; Clinical; Epidemiologic/Descriptive; Health Services Research; and Non-specific/Other. ERA activities were also classified into four **phases** of the cancer continuum: Prevention/Risk Factors; Screening/Early Detection; Treatment/Management; and Not Phase-Specific (i.e., addressed more than one phase or phase not indicated).

2) **Building Research Capacity (BRC)** was assigned if the country described **intention** to facilitate research or equip the research workforce. This includes: performing baseline assessments to develop research questions; surveillance and monitoring; setting up research infrastructure; developing the research workforce through new hires or training existing staff; establishing research oversight and administration (e.g. scientific review or advisory groups); building partnerships with research institutions; and assessing research challenges. Subsequent coding of BRC-related actions revealed five strategies planned to strengthen research capacity (Table 1).

## 3. Findings

Twelve plans from different regions met the inclusion criteria (Fig. 1). The plans varied in duration, with different start and end dates. Data are presented in tables by plan periods/years in descending order, beginning with the plan that has the greatest number of years remaining for implementation.

### 3.1. Research Priority: Establishing Research Agendas (ERA)

Six of the 12 countries (Jamaica, Kenya, Malaysia, Mongolia, Morocco, Tanzania) identified a total of 67 ERA priorities characterized by **type** of research and cancer continuum **phase** (Table 2). The most frequent **type** of research proposed was Health Services Research (N = 21) and the most common **phase** in which research topics were articulated was Treatment/Management (N = 20). Epidemiologic/Descriptive studies comprised the predominant **type** of research in the Prevention/Risk Factor **phase** whereas Clinical Research was largely in the Screening/Early Detection **phase**.

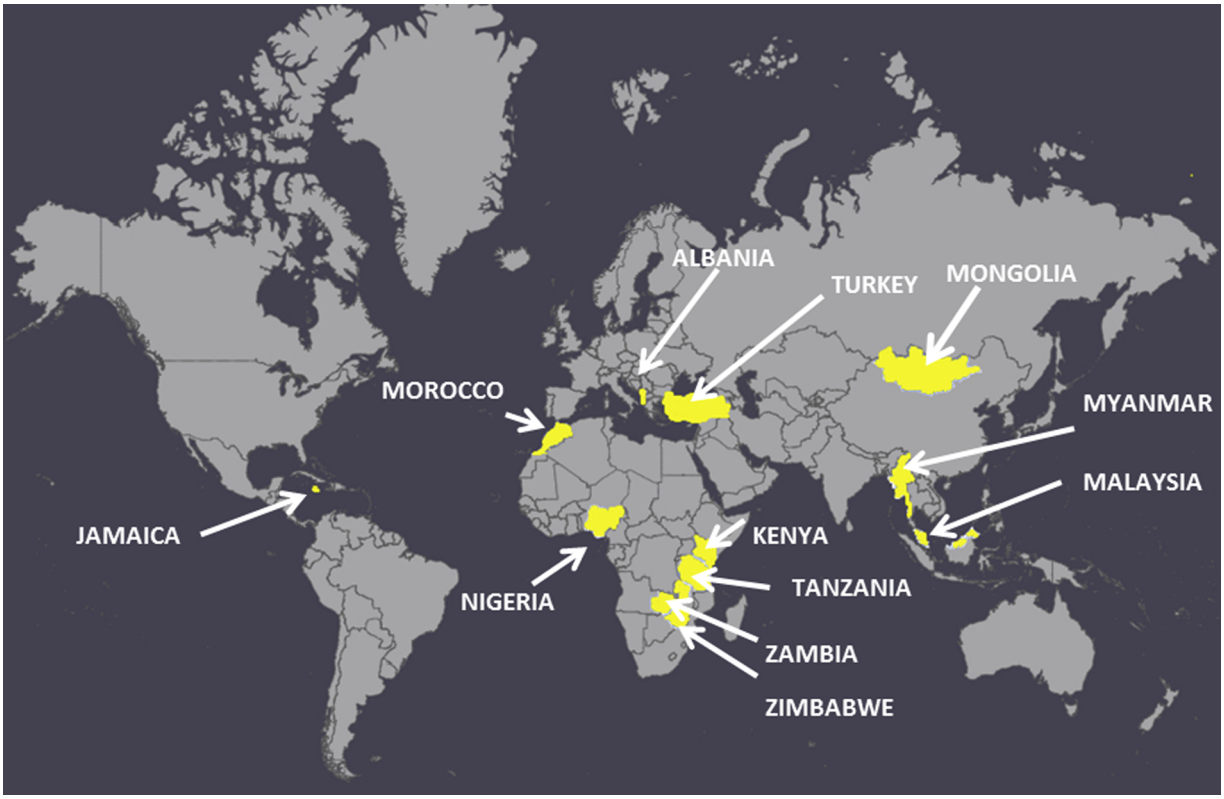


**Fig. 1.** Geographical Distribution of Included LMIC Plans].

Substantial country-specific differences were observed (Table 2). Morocco's plan proposed the largest number of ERA priorities (N = 26) followed by Kenya (N = 20) and Malaysia (N = 19). For Morocco, the predominant **type** of research proposed was Epidemiologic/Descriptive (38%). Kenya's plan identified 11 (55%) of its research priorities as Health Services Research while Clinical Research comprised about 53% of Malaysia's priorities. Countries' research priorities along the **phases** also differed (Table 2). Morocco's priorities were largely focused on Prevention (46%) and Treatment/Management (42%) while half of Malaysia's 18 research priorities were concentrated in Screening/Early Detection. In contrast, Kenya's priorities were mostly Not Phase-Specific (55%), and it was the only country of the six that reported research not specific to a phase in the continuum.

### 3.2. Building Research Capacity (BRC)

A total of 140 BRC activities were articulated and involved five types of strategies. (Supplemental Information). The most frequently mentioned BRC strategy was *Enhance Cancer Surveillance* (N = 66; 47%), followed by *Establish Research Infrastructure* (N = 31; 22%). Far fewer priorities were seen in the other three strategies: *Establish/Enhance M&E Capability* (N = 20; 14%), *Enable Research Conduct* (N = 16; 11%), and *Develop Research Agenda* (N = 7; 5%). Kenya and Malaysia had the largest number of BRC priorities overall (N = 28; 20% and N = 23; 16% respectively), followed by Nigeria (N = 17; 12%), Myanmar (N = 16; 11%), and Tanzania (N = 15; 11%). Countries varied in their primary strategy to build research capacity. *Establish Research Infrastructure* (N = 19; 83%) was Malaysia's primary strategy while *Enhance Cancer Surveillance* was the primary strategy for Myanmar (N = 10; 63%), Nigeria (N = 10; 59%), Tanzania (N = 8; 53%), Kenya (N = 10; 36%). Mongolia (N = 5; 100%) and Zambia (N = 4; 100%).

We examined *Enhance Cancer Surveillance* (47%) and *Establish Research Infrastructure* (22%) more closely because they were most frequently mentioned as primary BRC strategies. These two BRC strategies create an environment that provides quality data resources for enabling research, establishes operational systems to assure ethical, peer-reviewed research, and provides collaborative research opportunities. Specific focal areas for each BRC strategy were also identified (Fig. 2).

### 3.3. Enhance Cancer Surveillance (ECS)

Five distinct focal areas of ECS were identified: Registry Operations, Registry Training, Registry Development, Registry Policy, and Registry Linkages (See Supplemental Information). Sixty-two percent of the 66 ECS strategies concentrated on enhancing registry operations (N = 41). These included developing protocols and processes for quality data collection systems and integrating registry data into existing health management information systems. There were markedly fewer priorities focused on adding registries, and policy efforts to mandate cancer reporting (N = 11; 17% and N = 6; 9% respectively). Myanmar focused on both registry development and registry operations whereas Albania and Mongolia focused only on registry operations. Five countries reported no efforts to develop registries.

### 3.4. Establish Research Infrastructure (ERI)

Research Environment and Research Collaborations were two focal areas of ERI (see Supplemental Information). Of the 31 ERI activities identified, over two-thirds focused on creating robust and comprehensive research environments to facilitate the conduct of ethical research (N = 21). Malaysia had the highest number of ERI activities (N = 19), 13 of which addressed Research Environment. One-third of the ERI strategies emphasized Research Collaborations (N = 10).

**Table 2**
: Distribution of Research by Type, Country and Cancer Control Continuum Phases.

| Phase of Continuum | RESEARCH TYPE Basic/Biological | Clinical | Epidemiologic/ Descriptive | Health Services Research | Non-Specific / Other | **Total** |
|---|---|---|---|---|---|---|
| Prevention/Risk Factors | 2 | 0 | 14 | 1 | 2 | **19** |
| Screening / Early Detection | 1 | 10 | 0 | 5 | 1 | **17** |
| Treatment / Management | 1 | 8 | 4 | 7 | 0 | **20** |
| Not Phase-Specific | 0 | 0 | 0 | 8 | 3 | **11** |
| Total | **4** | **18** | **18** | **21** | **6** | **67** |

| Country | RESEARCH TYPE Basic/ Biological | Clinical | Epidemiologic/ Descriptive | Health Services Research | Non-Specific / Other | **Total** |
|---|---|---|---|---|---|---|
| Tanzania (2013-2022) | 0 | 0 | 0 | 1 | 0 | **1** |
| Kenya (2017–2022) | 1 | 2 | 3 | 11 | 3 | **20** |
| Malaysia (2016-2020) | 1 | 10 | 4 | 2 | 1 | **18** |
| Morocco (2010-2019) | 2 | 5 | 10 | 7 | 2 | **26** |
| Jamaica (2013-2018) | 0 | 0 | 1 | 0 | 0 | **1** |
| Mongolia (2007-2017) | 0 | 1 | 0 | 0 | 0 | **1** |
| Total | **4** | **18** | **18** | **21** | **6** | **67** |

| Country | PHASE OF CANCER CONTROL CONTINUUM Prevention | Screening / Early Detection | Treatment/ Management | Not Phase-Specific | **Total** |
|---|---|---|---|---|---|
| Tanzania (2013-2022) | 0 | 1 | 0 | 0 | **1** |
| Kenya (2017–2022) | 3 | 4 | 2 | 11 | **20** |
| Malaysia (2016-2020) | 3 | 9 | 6 | 0 | **18** |
| Morocco (2010-2019) | 12 | 3 | 11 | 0 | **26** |
| Jamaica (2013-2018) | 1 | 0 | 0 | 0 | **1** |
| Mongolia (2007-2017) | 0 | 0 | 1 | 0 | **1** |
| Total | **19** | **17** | **20** | **11** | **67** |

## 4. Discussion

Inclusion of research priorities in NCCPs can facilitate improved cancer control by strengthening the evidence-base for decision-making [23,24]. Moreover, cancer research performed or guided directly by LMICs strengthens a country's capacity to produce the contextually-applicable evidence needed to accomplish plan objectives, assess program impact, and sustain progress in reducing the cancer burden for its people [15,25]. A recent global review assessed whether national plans incorporated components essential for implementing effective cancer control, including research, and learned that 53% of LMIC plans and 89% of NCCPs addressed cancer research [26]. Key differences distinguish their findings from ours. Romero et al. included both NCCPs and non-communicable disease plans (NCD); included more high and middle-income countries; and used a limited set of keywords for identifying research objectives. In contrast, our analysis specifically examined and characterized research priorities using a wide-ranging list of keywords to capture the breadth and type of activities in a purposive sample of 12 LMIC cancer control plans. Our findings revealed two distinct categories of research priorities (N = 207): **Establishing Research Agendas** (32%) and **Building Research Capacity** (68%). Fig. 2 illustrates the breadth and description of these research priorities.

We observed substantial alignment of LMICs' research priorities with internationally recommended priorities. Our sample included 66 surveillance priorities, and many detailed action plans and articulated actions in multiple focal areas. International entities recommend improving cancer surveillance and population based-cancer registries [17]. Encouragingly, in our sample, we found that priorities were tailored to country context with a wide variety of specific focal areas articulated. Of concern, however, is that only 17% of cancer surveillance activities addressed Registry Development whereas 62% were focused on Registry Operations (Supplemental Information). While the findings suggest that improvement in data systems for existing registries seems to have a large emphasis, there is also a need for more focused efforts to expand new registry development (Fig. 2).

International research collaboration has the potential to have significant positive impact if they are mutually beneficial to all parties [15,16,27]. Several opportunities for international research collaborations that build on existing structures became apparent through this analysis. The National Cancer Institute's (NCI) Regional Centers for Research Excellence (RCRE) coordinated by NCI's Center for Global Health, for example, facilitates partnership between countries and resource sharing to generate research that will ultimately provide contextual evidence necessary for cancer policy in LMICs [28]. The RCRE program and other twinning programs could benefit from understanding local research priorities through countries' NCCPs. In addition, individual researchers can use NCCPs to help identify potential research collaborators in countries where research interests align. More LMICs should be encouraged to participate in international collaborations like the International Cancer Research Partnership (ICRP) that shares

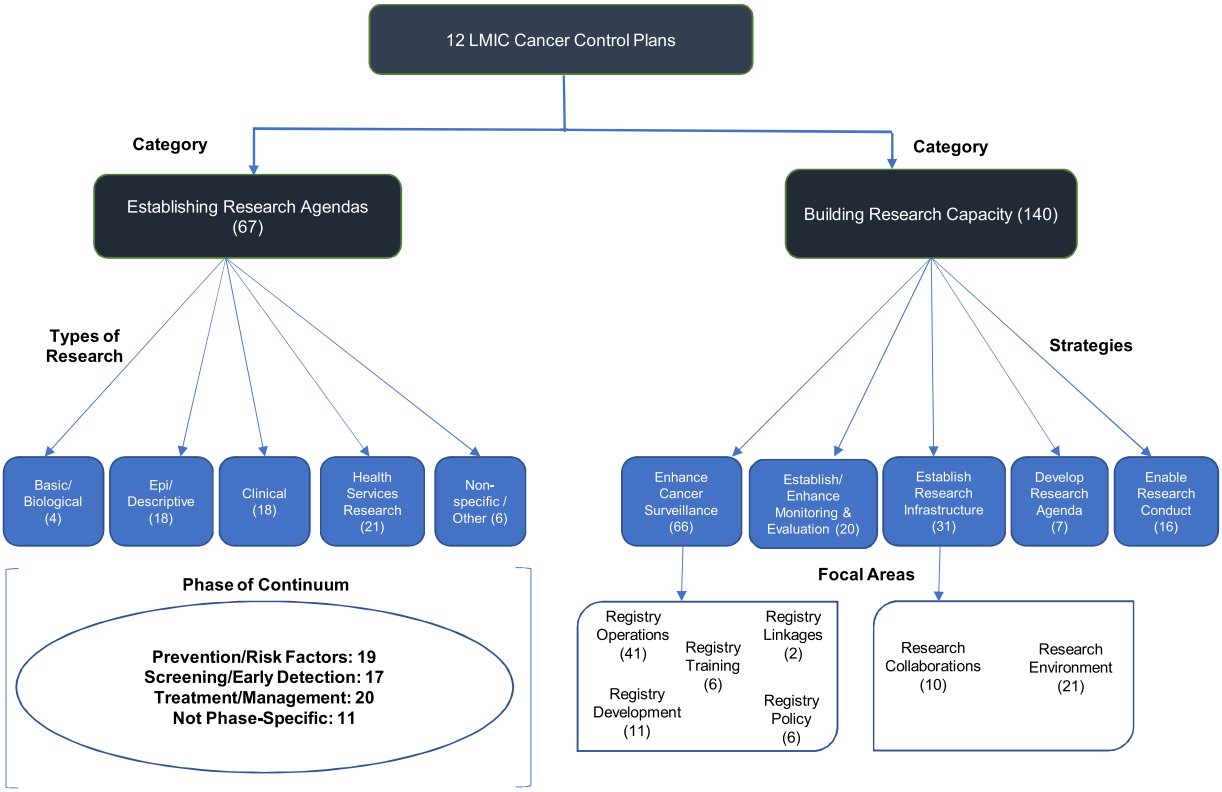


**Fig. 2.** Diagrammatic Presentation of Cancer Control Research Priorities.

funding information to facilitate collaboration and identify cancer research funding trends and gaps [29].

Our analysis revealed a potential framework to integrate a research paradigm into cancer control planning. This framework incorporates five components: surveillance, strategy, studies, synthesis, and spread (Supplemental Information) that may be useful for LMICs in employing a research-oriented approach to cancer control planning and implementation (Supplemental Information).

There are several limitations to be considered. We focused on a subset of LMIC plans meeting specific inclusion criteria. Consequently, this subset does not reflect the priorities for all LMICs engaged in cancer control planning. Due to the limited dataset and the fact that NCCPs reflect local activities and local culture, the analysis is not generalizable. The intent of this analysis was to understand how research had been incorporated into NCCPs and to gain insights about opportunities for enhancing global cancer research. It is also important to consider the limitations of NCCPs themselves as policy documents outlining priorities since they do not provide information regarding funding and/or implementation. Despite this limitation, the NCCPs included in this analysis had (or were nearing) ministry of health approval, indicating a base level of government support for implementation. Additional challenges arose due to inconsistency in terminology used to describe research priorities, different plan formats used, and varying levels of detail across plans. Since our analysis relied on NCCP text as the primary source of data and did not include a second level of analysis to validate findings, these findings are limited to a subjective interpretation of the text. Nevertheless, the codes and categories assigned generally adhered to accepted labels in the field and yielded valuable insights into research priorities. Furthermore, while we assessed research activities that countries were planning, very little information exists on the research currently being done.

## 5. Conclusion

This is the first analysis to systematically examine research priorities within LMIC cancer control plans. Research is vital to addressing the cancer burden, and it can inform evidence-based strategies for cancer prevention and control across the continuum. More importantly, with the support of ministries of health and collaborations with academic and other organizations, more contextual research may be generated. Our analysis has revealed how some countries are approaching research prioritization through cancer control planning and how countries are tailoring their plans to prioritize research pertinent to their own setting. Additionally, we offer a potential framework for integrating research into cancer control planning. The analysis has also provided insight into whether country priorities are aligned with broad global recommendations. Finally, the information gleaned highlights areas where collaborative opportunities exist and where joint efforts might advance impactful cancer control research globally.

## 6. Declarations of interest

None

## Acknowledgment

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.jcpo.2019.100190.

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