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# BMJ Open

## Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping Review Protocol

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Manuscripts

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3 1 **Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping**  
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6 2 **Review Protocol**  
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3 25 **Abstract**  
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8 27 **Introduction**  
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10 28 An ambitious strategy has been set for 2030, aiming for malaria elimination in at least 35 countries as one  
11  
12 29 of its goals. Challenges in malaria cross borders require greater attention to achieve the elimination target.  
13

14 30 This scoping review aims to identify successful forms of interventions to control malaria transmission  
15  
16 31 across national borders in the Asia-Pacific area.  
17

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19 32 **Methods and Analysis**  
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21 33 This scoping review will apply a methodology from Arksey and O'Malley (2005). The literatures will be  
22  
23 34 searched from electronic databases (PubMed, ScienceDirect, EBSCOhost, and ProQuest) using the time  
24  
25 35 limit of 1 January 2010 to 30 June 2021. Two independent reviewers will screen all titles and abstracts  
26  
27 36 during the second stage. Study characteristics will be recorded; qualitative data will be extracted and  
28  
29 37 evaluated, while quantitative data will be extracted and summarized.  
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32 38 **Ethics and Dissemination**  
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34 39 The results will be disseminated through peer-reviewed publications and conference presentations. The  
35  
36 40 data used will be from publicly available secondary sources. This data does not require ethical review  
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38 41 because no data collection on primary data and human samples will be carried out.  
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## 49 **Strengths and limitations of this study**

- 50 • This review is a novel scoping review to understand what types of malaria intervention and how  
51 this intervention exists within cross border settings in the Asia-Pacific.
- 52 • Stakeholders will be engaged throughout the review process.
- 53 • A significant limitation concerns the time filter (data collection in the last ten years). However,  
54 this enables updates to strategic planning on malaria elimination in 2030.

## 56 **Introduction**

58 Malaria is a fatal disease caused by the *Plasmodium* parasite, transmitted from person to person by the  
59 *Anopheles* mosquito as a vector. This disease creates a significant health and socio-economic burden, with  
60 3.7 billion people at risk of being infected with malaria (1). Globally, there are an estimated 229 million  
61 malaria cases and over 400 thousand deaths across 87 malaria-endemic countries in 2019, with the African  
62 region accounting for 94% of the global case burden (1). However, some of the “leftover countries” are  
63 still malaria-endemic (1,2). In Asia-Pacific countries, the malaria burden is highly under-diagnosed due to  
64 the high proportion of submicroscopic malaria which lead to ongoing undetectable transmission (3–5).

66 The global plan aims to eliminate malaria in at least 35 countries in 2030, including malaria-endemic  
67 countries in Asia-Pacific (Figure 1) (1,6). By 2015, three countries were at the pre-elimination stage and  
68 four countries at the control stage (7). With massive control to eliminate malaria in 2030, the malaria  
69 burden in the Asia-Pacific region shows impressive progress. The malaria burden declined by 68%, from  
70 23 million cases in 2000 to 7.3 million in 2019 (1). This region has specific characteristics, for instance, low-  
71 intensity transmission and the dominance of *P. vivax* (8). Moreover, several unique challenges appear,  
72 such as resistance to artemisinin treatment and insecticides used, diversity of malaria vectors, and hard-

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3 73 to-reach population as people at risk (8–10). Another problem in this region is the movement of  
4  
5 74 individuals or mosquitoes across countries, which is usually called cross border malaria (11).  
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10 76 [Insert Figure 1 here]  
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12 77

13  
14 78 Cross border intervention is critical to accelerating the malaria elimination effort because no country can  
15  
16 79 achieve and maintain an exclusive malaria elimination status (12). As emphasized by WHO in their  
17  
18 80 strategic plan, there is an urgency to collaborate in accelerating elimination efforts by paying attention to  
19  
20 81 prevention and treatment management and the importance of surveillance (6). Also, adaptation to the  
21  
22 82 local context to support this strategic planning (13). In the Asia-Pacific region, attention to malaria  
23  
24 83 elimination efforts is given by a joined networking of the Asia-Pacific Malaria Elimination Network  
25  
26 84 (APMEN), the Asia Pacific Leaders Malaria Alliance (APLMA), and the Global Fund to Fight AIDS,  
27  
28 85 Tuberculosis and Malaria (the Global Fund) (14–16). APMEN started in 2009 to support capacity building,  
29  
30 86 advocacy, and research in member countries, hence aims to solve problems of malaria control in the area  
31  
32 87 (10,12). In line with APMEN, since 2013, ALPMA provides political commitment through a high-level  
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34 88 advocacy platform to eliminate malaria from the Asia Pacific by 2030 (8,15). Meanwhile, the Global Fund  
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36 89 provides and leveraging funding to support malaria elimination efforts (16,17).  
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43 91 However, the effectiveness of cross border malaria control activities remains unclear. Existing reviews  
44  
45 92 mainly discuss the characteristics and challenges of malaria in Asia-Pacific and its relation to the technical  
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47 93 strategy of malaria elimination (8,9,12). Other review-related malaria and cross borders talk about mobile  
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49 94 populations, cross border characteristics, and multidrug resistance (11,18,19).  
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3 96 In conclusion, there has been no scoping review related to cross border control efforts in the Asia-Pacific.  
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5 97 The result of this study would reveal the most effective and efficient intervention in the Asia-Pacific cross  
6  
7 border setting.  
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## 11 12 100 **Purpose and objectives**

13  
14 101 The purpose of the proposed scoping review is to identify and summarize existing evidence on any  
15  
16 102 intervention related to malaria elimination effort in cross border settings. Our primary research question  
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18 is “What are the most successful interventions or innovations in accelerating malaria elimination goals in  
19 103 a cross border setting?”  
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## 24 25 106 **Methods and analysis**

### 26 27 107 **Protocol design**

28  
29 108 To address the purpose and objectives of the proposed study, we will use the scoping review method  
30  
31 109 described by Arksey and O’Malley and further refined Levac *et al.* (20). There are six stages: (i) identify  
32  
33 research questions, (ii) search for relevant studies, (iii) select studies, (iv) mapping data, (v) collate,  
34  
35 110 summarize and report results, and (vi) consultation. The study will cover all malaria borders; a malaria  
36  
37 111 potential transmission between countries sharing land border, in the Asia-Pacific (Figure 2) (21). We will  
38  
39 112 include all original articles and case studies in this scoping review. Quality appraisal of studies will not be  
40  
41 113 conducted as this review only explores the general scope of research conducted in this field.  
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48 116 [Insert Figure 2 here]49  
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3 121 Stage one: Identifying research questions  
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5 122 Our research questions will be developed and refined through an iterative process and consultations held  
6  
7 123 by the research team. Within this stage, the team will also decide Population, Concept, and Context (PCC)  
8  
9 124 on the study (Table 1). Our team will decide to use the PCC approach as a second screening after all  
10  
11 125 literature search is combined.  
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16 127 [Insert Table 1 here]  
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21 129 Stage two: Search for relevant studies  
22

23 130 At this stage, the team will deliberate and decide upon criteria for eligibility, databases to search, and  
24  
25 131 formulate a search strategy and key terms. We agreed to use four electronic databases, namely  
26  
27 132 EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles.  
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32 134 The search strategy uses malaria-related and cross border keywords as our primary filtering methods, and  
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34 135 all researchers have agreed with this. The secondary research terms will include broader keywords on  
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36 136 intervention and migration or movement. The filtering methods of ranged date, English, and non-review  
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38 137 articles are used in all databases.  
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43 139 The following eligibility criteria will be used to guide the search and reviewing articles: (i) study location  
44  
45 140 in Asia-Pacific, (ii) countries with malaria nationwide elimination program (iii) data collection in the last  
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47 141 ten years (from January 1st 2010 – June 30st 2021), (iv) articles written in English. The explicit exclusion  
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49 142 criteria identified are:

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52 143 - Transnational malaria; an importation of malaria parasites from airport and seaport international  
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54 144 border  
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3 145 - review articles including systematic reviews, meta-analysis, meta-synthesis, scoping reviews,  
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5 146 narrative reviews, rapid reviews, critical reviews, and integrative reviews  
6  
7 147 - journal articles that are not rigorous reviews, such as opinion articles, commentaries, or editorial  
8  
9 reviews  
10 148  
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14 150 Stage three: Study selection  
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16 151 All retrieved papers will be uploaded to a reference management software (Mendeley). We will design a  
17  
18 152 two-level screening. First, an independent reviewer will review titles and abstracts to determine eligibility  
19  
20 153 based on inclusion and exclusion criteria. The second part of the selection process will include two  
21  
22 154 reviewers about the PCC suitability. When differences arise or any uncertainty appears, the citation will  
23  
24 155 not be eliminated for consideration in the next stage. For studies that have multiple publications of the  
25  
26 156 same outcomes reported, we will use the one with the newest publication.  
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32 158 The next stage of the study selection process is a full-text review. In this stage, each reviewer will assess  
33  
34 159 whether the articles meet the eligibility criteria. Any lack of agreement will be discussed until consensus  
35  
36 160 is received or by involving a third reviewer if disagreement still arises. Those fulfilling criteria will be  
37  
38 161 retrieved in this study.  
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43 163 Stage four: Mapping the data  
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45 164 Two independent reviewers will do the data extraction in an excel file. As been agreed by all researchers,  
46  
47 165 the heading of data extraction data will include at least the following: author's name; publication date;  
48  
49 166 country and study location; type of population; study design; aim of the study; type of intervention such  
50  
51 167 as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual  
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3 168 Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria  
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5 169 elimination status, prevalence/ incidence).  
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9 171 We will involve stakeholders to review the data extraction form. After that, each member will be  
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11 172 independently charting the data from all included literature studies. The validation of the data extraction  
12  
13 173 will be known by discussing samples of literature (e.g., 20%) with other authors.  
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18 175 Stage five: Collating, summarizing, and reporting the results

19  
20 176 For our scoping review, the studies identified will be analyzed using both qualitative and quantitative  
21  
22 177 methods. An overview of the research will be displayed through all the findings. Related to qualitative  
23  
24 178 aspects, all reports will be coded by the WHO framework (6). Meanwhile, the quantitative data will be  
25  
26 179 briefly summarized. However, although we are likely to include many different types of studies, our overall  
27  
28 180 assessment of the evidence strength will be more narrative rather than quantitative.  
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34 182 Stage six: Consultation and stakeholder involvement

35  
36 183 Consultation with stakeholders, experts, and key informants will be conducted to clarify potential missing  
37  
38 184 studies or ongoing relevant interventions. Moreover, by involving stakeholders, we will have more insights  
39  
40 185 into what happened in the literature. The consultation will include the Ministry of Health, UN Agencies  
41  
42 186 such as UNICEF and WHO, APMEN, APLMA and Non-Governmental Organizations working in malaria.  
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47 188 **Patient and Public Involvement**

48  
49 189 No patient involved.  
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54 191 **Dissemination and ethics**  
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3 192 This scoping review will only be curating data from secondary data; thus, it does not require ethics  
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5 193 approval. Results will be disseminated through a peer-reviewed publication and/or conferences.  
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30 204 **Contributors**

31  
32 205 All authors made substantial contributions to the work. UC designed the review, including the search  
33  
34 206 strategies and producing the initial draft. EH, IE, and AP were involved in conception the protocol. EH, NR,  
35  
36 207 AP, IE, RA, and UC editing and reviewed the protocol. All authors read and approved the final protocol.  
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48 212 **Disclaimer**

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51

52 214 **Competing interests**

53  
54  
55 215 None declared.  
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3 216 **Patient consent for publication**  
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3 **List of Table**  
4

5 Table 1. Identification of Population, Concept, and Context (PCC)  
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10 **List of Figure**  
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12 Figure 1. Elimination status and target of malaria elimination in Asia-Pacific countries  
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14 Source: World Malaria Report 2020 and World Health Organization

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16 (<https://www.who.int/teams/global-malaria-programme/elimination/countries-and-territories-certified-malaria-free-by-who>)  
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21 *Figure 2. Malaria in Asia-Pacific countries border, 2020*  
22

23 Source: <https://malariaatlas.org/explorer/>  
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27 **Table 1.** Identification of Population, Concept, and Context (PCC)  
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Population	Concept	Context
People or community at risk who live in the cross border area	Malaria at the cross border or any human-intervention model	Any community Any areas (districts level, countries level) Any elimination phases Any type of mobility in cross border

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## Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	Page #1 See title  <i>"Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping Review Protocol"</i>
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page #2 See abstract  As this is a protocol, results and conclusions are not provided yet in the summary.
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page #4-5  The scoping review was chosen because our topic (malaria and cross border; in combination) has not yet been extensively reviewed.  <i>"In conclusion, there has been no scoping review related to cross border control efforts in the Asia-Pacific."</i>
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page #5-6 See purpose and objectives in page #5. See key elements in page #6 and table 1
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	The protocol is not submitted to PROSPERO (as been suggested by BMJ Open) because scoping review is the exclusion criteria. Screenshot the trial submission is provided below this checklist.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page #6 See inclusion and exclusion criteria  <i>The following eligibility criteria will be used to guide the search and reviewing articles: (i) study location in Asia-Pacific, (ii) countries with malaria nationwide elimination program (iii) data collection in the last ten years (from January 1st 2010 – June 30st 2021), (iv) articles written in English. The explicit exclusion criteria identified are:</i>
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as	Page #6 (line 134-137) See stage 2: search for relevant studies





SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page #6 (line 131-132)  Four electronic databases are going to used.  <i>We agreed to use four electronic databases, namely EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles.</i>
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page #7  See stage three: study selection
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page #7-8  See stage four: mapping the data
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page #7-8 (line 164-169)  <i>Author's name; publication date; country and study location; type of population; study design; aim of the study; type of intervention such as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria elimination status, prevalence/incidence).</i>
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Critical appraisal is not yet done as it is a protocol manuscript.
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page #8 See stage five and six.  <i>After mapping the data, there are stages namely: collating, summarizing and reporting the results; followed by consultation and involvement of stakeholder for further clarification.</i>
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Not yet done. This paper describes the protocol of scoping review.
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Not yet done. This paper describes the protocol of scoping review.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not yet done. This paper describes the protocol of scoping review.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Not yet done. This paper describes the protocol of scoping review.
Limitations	20	Discuss the limitations of the scoping review process.	Page #3 See strength and limitation of the study
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Not yet done. This paper describes the protocol of scoping review.
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page #9 See funding.

JB1 = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

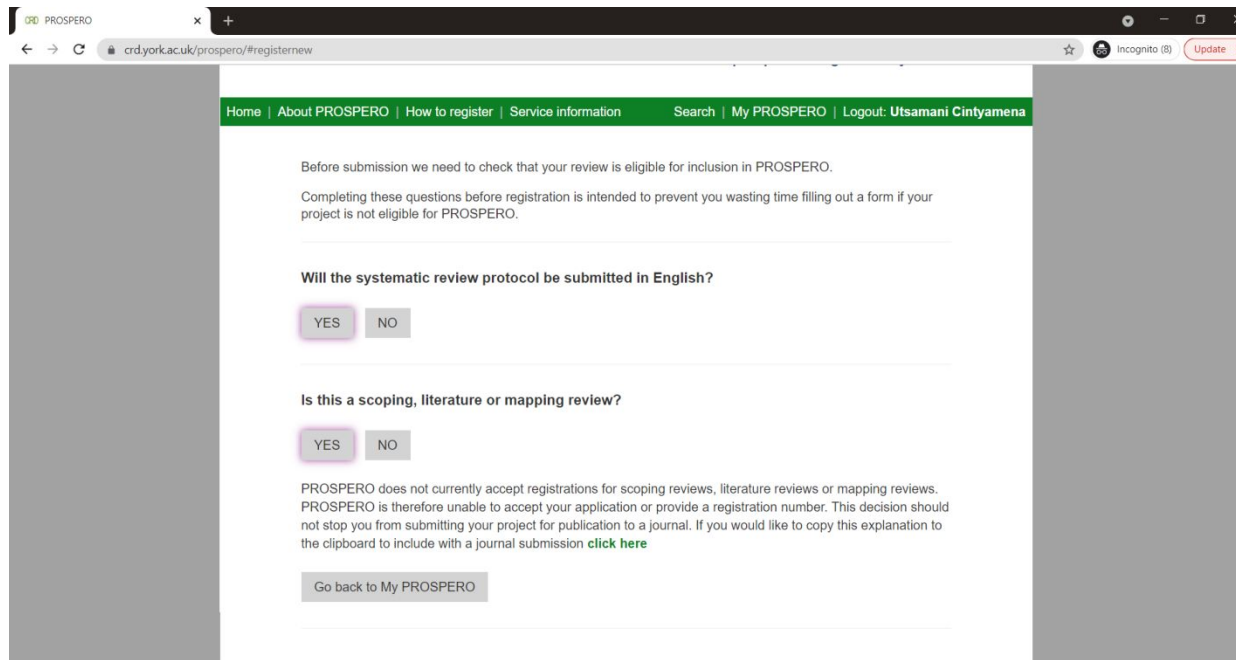
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).



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Peer review only



# BMJ Open

## Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A Scoping Review Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-056265.R1
Article Type:	Protocol
Date Submitted by the Author:	12-Nov-2021
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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Infectious diseases
Keywords:	PUBLIC HEALTH, Tropical medicine < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

SCHOLARONE™  
Manuscripts

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3 1 **Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A**  
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5  
6 2 **Scoping Review Protocol**  
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3 **25 Abstract**  
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7 **27 Introduction**  
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10 28 An ambitious epidemiology strategy has been set by World Health Organization, targeting malaria  
11  
12 29 elimination for at least 35 countries in 2030. Challenges in preventing malaria cross borders require  
13  
14 30 greater attention to achieve the elimination target. This scoping review aims to identify successful forms  
15  
16 31 of interventions to control malaria transmission across national borders in the Asia-Pacific region.  
17

18  
19 **32 Methods and Analysis**  
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21 33 This scoping review will search four electronic databases (PubMed, ScienceDirect, EBSCOhost, and  
22  
23 34 ProQuest) limiting the time of publication to the last 10 years. Two independent reviewers will screen all  
24  
25 35 titles and abstracts during the second stage. Study characteristics will be recorded; qualitative data will  
26  
27 36 be extracted and evaluated, while quantitative data will be extracted and summarized. Overall, we will  
28  
29 37 follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping  
30  
31 38 Reviews (PRISMA-ScR) guidelines.  
32  
33

34 **39 Ethics and Dissemination**  
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36  
37 40 This scoping review has received ethical approval from the Faculty of Medicine, Public Health and Nursing,  
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39 41 Universitas Gadjah Mada. The results will be disseminated through peer-reviewed publications and  
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41 42 conference presentations. The data used will be from publicly available secondary sources.  
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### 49 **Strengths and limitations of this study**

- 50 • The study is a first comprehensive scoping review to understand malaria interventions related to
- 51 malaria elimination efforts in cross border settings in the Asia-Pacific region.
- 52 • Stakeholders will be engaged throughout the review process.
- 53 • This scoping review is limited to land borders, according to its main definition.
- 54 • Only the latest interventions or activities related to malaria elimination will be identified
- 55 (Literature searching not to include publications before 2010).

### 57 **Introduction**

59 Malaria is a public health burden caused by the *Plasmodium* parasite, which is transmitted from person

60 to person by the *Anopheles* mosquito as a vector. This disease creates a significant health and socio-

61 economic burden, with 3.7 billion people at risk of being infected with malaria (1). Globally, there were

62 an estimated 229 million malaria cases and over 400 thousand deaths across 87 malaria-endemic

63 countries in 2019, with the African region contributed for 94% of the global case burden (1).

64

65 Some countries in Asia Pacific have low-intensity transmission, and have specific challenges that should

66 be overcome, including lack of surveillance (2–4), dominance of *P. vivax* (5), starting to find resistance to

67 artemisinin drugs and insecticides, diversity of malaria vectors, and having hard-to-reach populations (5–

68 7), and cross border malaria problems (8).

69

70 Cross border intervention is critical to accelerating the malaria elimination effort because no country can

71 achieve and maintain an exclusive malaria elimination status (9). As emphasized by the World Health

72 Organization (WHO) in their strategic plan, there is an urgency to collaborate in accelerating elimination

1  
2  
3 73 efforts by paying attention to prevention and treatment management and the importance of surveillance  
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5 74 (10). There are three main pillars developed in the WHO strategic plan that emphasize the importance of  
6  
7 75 the cross border intervention: (i) Maximize access to malaria interventions in border areas (within national  
8  
9 76 boundaries), (ii) Maximize malaria surveillance and response as well as M&E in border areas, and (iii)  
10  
11 77 Maximize cross border coordination mechanisms that provide an enabling environment (10).  
12  
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15  
16 79 Also, adaptation to the local context is imperative to support this strategic planning (11). In the Asia-Pacific  
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18 80 region, attention to malaria elimination efforts is promoted by a strategically united networking of the  
19  
20 81 Asia-Pacific Malaria Elimination Network (APMEN), the Asia Pacific Leaders Malaria Alliance (APLMA), and  
21  
22 82 the Global Fund to Fight AIDS, Tuberculosis and Malaria (The Global Fund) (12–14). APMEN started in  
23  
24 83 2009 to support capacity building, advocacy, and research in member countries, with the main aims to  
25  
26 84 solve problems of malaria control in the area (7,9). In line with APMEN, since 2013, ALPMA provides  
27  
28 85 political commitment through a high-level advocacy platform to eliminate malaria from the Asia Pacific  
29  
30 86 by 2030 (5,12). Meanwhile, the Global Fund is more focused on providing and leveraging funding to  
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32 87 support malaria elimination efforts (14,15).  
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39 89 However, the effectiveness of cross border malaria control activities remains unclear. Existing reviews  
40  
41 90 mainly discussed the characteristics and challenges of malaria in the Asia-Pacific region and its relation to  
42  
43 91 the technical strategy of malaria elimination (5,6,9). Other reviews identified issues related to malaria and  
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45 92 cross borders challenges involving mobile populations, cross border characteristics, and multidrug  
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47 93 resistance (8,16,17).  
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3 95 Conclusively, there has been no specific scoping review related to cross border control efforts in this  
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5 96 region. Therefore, we aim to identify and summarize existing evidence on any interventions related to  
6  
7 97 malaria elimination efforts in cross border settings among the Asia-Pacific regions.  
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## 11 12 99 **Methods and analysis**

### 13 14 100 **Protocol design**

15  
16 101 To address the purpose and objectives of the proposed study, we will use the scoping review method  
17  
18 102 described by Arksey and O'Malley (18). There are six stages: (i) identify research questions, (ii) search for  
19  
20 103 relevant studies, (iii) select studies, (iv) mapping data, (v) collate, summarize and report results, and (vi)  
21  
22 104 consultation. The study will cover all malaria borders, where there is a potential for malaria transmission  
23  
24 105 between countries sharing land borders, in the Asia-Pacific region (19). The scoping review will be  
25  
26 106 conducted until April 2022, and will include all original articles, case studies, and grey literatures including  
27  
28 107 selected reports. We will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses:  
29  
30 108 extension for Scoping Review (PRISMA-ScR) checklist in all stages (20). Quality appraisal of studies will be  
31  
32 109 conducted by guidance from the Joanna Briggs Institute (JBI) website.  
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#### 38 39 111 Stage one: Identifying research questions

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41 112 Our research question is developed and refined through an iterative process and consultations held by  
42  
43 113 the research team. The objective of this review is to identify the most successful interventions or  
44  
45 114 innovations in accelerating malaria elimination goals in a cross-border setting among Asia-Pacific regions.  
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50 116 Moreover, within this stage the team will also decide the parameters for the Population, Concept, and  
51  
52 117 Context (PCC) of the study (Table 1). Our team will decide to use the PCC approach as a second screening  
53  
54 118 after all literature search is combined.  
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120 [Insert Table 1 here]

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122 Stage two: Search for relevant studies

123 At this stage, the team will deliberate and decide upon criteria for eligibility, databases to search, and  
124 formulate a search strategy and key terms. We agreed to use four electronic databases, namely  
125 EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles. For grey literatures, we  
126 will search for publications from organization or institution websites supporting malaria elimination, such  
127 as the WHO, APMEN, APLMA, Global Funds reports.

128

129 The search strategy uses malaria-related and cross border keywords as our primary filtering methods, and  
130 all researchers have agreed with this approach. The secondary research terms will include broader  
131 keywords on intervention and migration or cross border movement. The filtering methods of ranged date,  
132 English, and non-review articles will be used in all databases. For example, in using PubMed database, the  
133 search strategy will be developed to specific MeSH terms. Keywords that will be search are malaria\*  
134 title/abstract, cross\$border OR border\* title/abstract. Then we will use “English” as the language filter “1  
135 Jan 2010” and “31 Oct 2021” as the initial and final time filter.

136

137 The following eligibility criteria will be used to guide the search and reviewing published articles and grey  
138 literature: (i) study location in Asia-Pacific region, (ii) countries with malaria nationwide elimination  
139 program (iii) data collection in the last ten years (from January 1<sup>st</sup> 2010 to October 31<sup>st</sup> 2021), and (iv)  
140 articles written in English. The explicit exclusion criteria identified are:

- 141 - Transnational malaria; an importation of malaria parasites from airport and seaport international  
142 border areas.

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3 143 - review articles including systematic reviews, meta-analysis, meta-synthesis, scoping reviews,  
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5 144 narrative reviews, rapid reviews, critical reviews, and integrative reviews.  
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10 146 Stage three: Study selection

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12 147 All retrieved papers will be uploaded to a reference management software (Mendeley). We will design a  
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14 148 two-level screening. First, an independent reviewer will review titles and abstracts to determine eligibility  
15  
16 149 based on inclusion and exclusion criteria. The second part of the selection process will include two  
17  
18 150 reviewers about the PCC suitability. When differences arise or any uncertainty appears, the citation will  
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20 151 not be eliminated for consideration in the next stage. For studies that have multiple publications of the  
21  
22 152 same outcomes reported, we will use the one with the newest publication.  
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27  
28 154 The next stage of the study selection process is a full-text review. In this stage, each reviewer will assess  
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30 155 whether the articles meet the eligibility criteria. Any lack of agreement will be discussed until consensus  
31  
32 156 is received or by involving a third reviewer if disagreement still arises. Those fulfilling criteria will be  
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34 157 retrieved for review and meta-analysis in this study.  
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39 159 Stage four: Mapping the data

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41 160 Two independent reviewers will do the data extraction in an Excel file. As agreed by all researchers, the  
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43 161 heading of data extraction data will include at least the following: author's name; publication date;  
44  
45 162 country and study location; type of population; study design; aim of the study; type of intervention such  
46  
47 163 as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual  
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49 164 Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria  
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51 165 elimination status, prevalence/ incidence).  
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3 167 We will involve stakeholders to review the data extraction form. After that, each member will be  
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5 168 independently charting the data from all included literature studies. The validation of the data extraction  
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7 169 will be known by discussing samples of literature (e.g., 20%) with other authors. When there is a differing  
8  
9 170 opinion, one author will be the third reviewer.  
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14 172 Stage five: Collating, summarizing, and reporting the results

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16 173 For our scoping review, the studies identified will be analyzed using both qualitative and quantitative  
17  
18 174 methods. We will use the PRISMA-ScR checklist for summarizing the data. An overview of the research  
19  
20 175 will be displayed through all the findings. Related to qualitative aspects, all reports will be coded by the  
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22 176 WHO framework (6). The WHO/global framework is the most familiar and is a global consensus, which  
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24 177 will make it easier for global audiences to understand and use it in their context. We will use the pillars in  
25  
26 178 the WHO framework as a reference guide, and any intervention found will be grouped and summarized  
27  
28 179 according to these pillars. Meanwhile, the quantitative data will be briefly summarized with descriptive  
29  
30 180 statistics. However, although we are likely to include many different types of studies, our overall  
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32 181 assessment of the evidence strength will be more narrative than quantitative.  
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39 183 Stage six: Consultation and stakeholder involvement

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41 184 Consultation with stakeholders, experts, and key informants will be conducted to clarify potential missing  
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43 185 studies or ongoing relevant interventions. Moreover, by involving stakeholders, we will have more insights  
44  
45 186 into what is discussed in the literature. The consultations will include the Ministry of Health, UN Agencies  
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47 187 such as UNICEF and WHO, APMEN, APLMA and Non-Governmental Organizations working in the malaria  
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49 188 elimination efforts.  
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3 190 The initial potential stakeholders are obtained from the discussion results with the National Malaria  
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5 191 Program (NMP). Additional potential participants will be possibly recruited with the snowball sampling  
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7 192 technique.  
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10 193

### 11 194 **Patient and Public Involvement**

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14 195 No patient involved.  
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16  
17 196

### 18 197 **Ethics and Dissemination**

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20  
21 198 This scoping review has received ethical approval from the Medical and Health Research Ethics Committee  
22  
23 199 of the Faculty Medicine, Public Health and Nursing, Universitas Gadjah Mada (KE/0873/08/2021), as part  
24  
25 200 of World Class Research – Malaria Cross Border study. Results will be disseminated through a peer-  
26  
27 201 reviewed publication and/or conferences, for example, in APMEN or APLMA meetings.  
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4  
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6  
7 215 AP, IE, RA, and UC editing and reviewed the protocol. All authors read and approved the final protocol.  
8  
9

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16 219 2716/UN1/DITLIT/DIT-LIT/PT/2021.  
17

#### 18 220 **Disclaimer**

19 221 This article is based on the author's view and not the funders.  
20  
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#### 22 222 **Competing interests**

23 223 None declared.  
24  
25

#### 26 224 **Patient consent for publication**

27 225 Not required.  
28  
29

#### 30 226 **Provenance and peer review**

31 227 Not commissioned; externally peer reviewed.  
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#### 34 228 **Open access**

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39 231 for any purpose, provided the original work is properly cited, appropriate credit is given, and any changes  
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41 232 made indicated. See: <https://creativecommons.org/licenses/by/4.0/>.  
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2  
3 **List of Table**  
4

5 Table 1. Identification of Population, Concept, and Context (PCC)  
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10 **Table 1.** Identification of Population, Concept, and Context (PCC)  
11

Population	Concept	Context
People or community at risk who live in the cross border area	Malaria at the cross border or any human-intervention model	Any community Any areas (districts level, countries level) Any elimination phases Any type of mobility in cross border

## Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	Page #1 See title  <i>"Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping Review Protocol"</i>
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page #2 See abstract  As this is a protocol, results and conclusions are not provided yet in the summary.
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page #4-5  The scoping review was chosen because our topic (malaria and cross border; in combination) has not yet been extensively reviewed.  <i>"In conclusion, there has been no scoping review related to cross border control efforts in the Asia-Pacific."</i>
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page #5-6 See purpose and objectives in page #5. See key elements in page #6 and table 1
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	The protocol is not submitted to PROSPERO (as been suggested by BMJ Open) because scoping review is the exclusion criteria. Screenshot the trial submission is provided below this checklist.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page #6 See inclusion and exclusion criteria  <i>The following eligibility criteria will be used to guide the search and reviewing articles: (i) study location in Asia-Pacific, (ii) countries with malaria nationwide elimination program (iii) data collection in the last ten years (from January 1st 2010 – June 30st 2021), (iv) articles written in English. The explicit exclusion criteria identified are:</i>
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as	Page #6 (line 134-137) See stage 2: search for relevant studies



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page #6 (line 131-132)  Four electronic databases are going to used.  <i>We agreed to use four electronic databases, namely EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles.</i>
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page #7  See stage three: study selection
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page #7-8  See stage four: mapping the data
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page #7-8 (line 164-169)  <i>Author's name; publication date; country and study location; type of population; study design; aim of the study; type of intervention such as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria elimination status, prevalence/incidence).</i>
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Critical appraisal is not yet done as it is a protocol manuscript.
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page #8 See stage five and six.  <i>After mapping the data, there are stages namely: collating, summarizing and reporting the results; followed by consultation and involvement of stakeholder for further clarification.</i>
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Not yet done. This paper describes the protocol of scoping review.
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Not yet done. This paper describes the protocol of scoping review.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not yet done. This paper describes the protocol of scoping review.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Not yet done. This paper describes the protocol of scoping review.
Limitations	20	Discuss the limitations of the scoping review process.	Page #3 See strength and limitation of the study
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Not yet done. This paper describes the protocol of scoping review.
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page #9 See funding.

JB1 = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).



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Before submission we need to check that your review is eligible for inclusion in PROSPERO.  
Completing these questions before registration is intended to prevent you wasting time filling out a form if your project is not eligible for PROSPERO.

Will the systematic review protocol be submitted in English?

YES  NO

Is this a scoping, literature or mapping review?

YES  NO

PROSPERO does not currently accept registrations for scoping reviews, literature reviews or mapping reviews. PROSPERO is therefore unable to accept your application or provide a registration number. This decision should not stop you from submitting your project for publication to a journal. If you would like to copy this explanation to the clipboard to include with a journal submission [click here](#)

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# BMJ Open

## Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A Scoping Review Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-056265.R2
Article Type:	Protocol
Date Submitted by the Author:	04-Jan-2022
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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Infectious diseases
Keywords:	PUBLIC HEALTH, Tropical medicine < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

SCHOLARONE™  
Manuscripts

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3 1 **Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A**  
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5  
6 2 **Scoping Review Protocol**  
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3 **25 Abstract**  
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7 **27 Introduction**  
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10 28 An ambitious epidemiology strategy has been set by the World Health Organization, targeting malaria  
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12 29 elimination for at least 35 countries in 2030. Challenges in preventing malaria cross borders require  
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14 30 greater attention to achieve the elimination target. This scoping review aims to identify successful forms  
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16 31 of interventions to control malaria transmission across national borders in the Asia-Pacific region.  
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19 **32 Methods and Analysis**  
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21 33 This scoping review will search four electronic databases (PubMed, ScienceDirect, EBSCOhost, and  
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23 34 ProQuest) limiting the time of publication to the last 10 years. Two independent reviewers will screen all  
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25 35 titles and abstracts during the second stage. Study characteristics will be recorded; qualitative data will  
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27 36 be extracted and evaluated, while quantitative data will be extracted and summarized. Overall, we will  
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29 37 follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping  
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31 38 Reviews (PRISMA-ScR) guidelines.  
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34 **39 Ethics and Dissemination**  
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37 40 This scoping review has received ethical approval from the Faculty of Medicine, Public Health and Nursing,  
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39 41 Universitas Gadjah Mada. The results will be disseminated through peer-reviewed publications,  
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41 42 conference presentations, and policy briefs.  
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### 49 **Strengths and limitations of this study**

- 50 • This scoping review will be the first related to malaria cross border interventions or activities in  
51 the Asia-Pacific region.
- 52 • Stakeholders will be engaged throughout the review process.
- 53 • This scoping review is limited to land borders, according to its main definition.
- 54 • Only the latest interventions or activities related to malaria elimination will be identified  
55 (Literature searching not to include publications before 2010).

### 57 **Introduction**

59 Malaria is a public health burden caused by the *Plasmodium* parasite, which is transmitted from person  
60 to person by the *Anopheles* mosquito as a vector. This disease creates a significant health and socio-  
61 economic burden, with 3.7 billion people at risk of being infected with malaria (1). Globally, there were  
62 an estimated 229 million malaria cases and over 400 thousand deaths across 87 malaria-endemic  
63 countries in 2019, with the African region contributing 94% of the global case burden (1). Some countries  
64 in the Asia-Pacific region have low-intensity transmission, and there are specific challenges that should be  
65 overcome, including lack of surveillance (2–4), dominance of *P. vivax* (5). Additionally, epidemiologists are  
66 starting to find resistance to artemisinin drugs and insecticides, and diversity of malaria vectors, while  
67 identifying hard-to-reach populations (5–7), and cross border malaria problems (8).

69 Cross border intervention is critical to accelerating the malaria elimination efforts because no country can  
70 achieve and maintain an exclusive malaria elimination status (9). As emphasized by the World Health  
71 Organization (WHO) in their strategic plan, there is an urgency to collaborate in accelerating elimination  
72 efforts by paying attention to prevention and treatment management and the importance of surveillance

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3 73 (10). There are three main pillars developed in the WHO strategic plan that emphasize the importance of  
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5 74 the cross border intervention: (i) Maximize access to malaria interventions in border areas (within national  
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7 75 boundaries), (ii) Maximize malaria surveillance and response, as well as monitoring and evaluation (M&E)  
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9 76 in border areas, and (iii) Maximize cross border coordination mechanisms that provide an enabling  
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11 77 environment (10).  
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16 79 Also, adaptation to the local context is imperative to support this strategic planning (11). In the Asia-Pacific  
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18 80 region, attention to malaria elimination efforts is promoted by a strategically united networking of the  
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20 81 Asia-Pacific Malaria Elimination Network (APMEN), the Asia Pacific Leaders Malaria Alliance (APLMA), and  
21  
22 82 the Global Fund to Fight AIDS, Tuberculosis and Malaria (The Global Fund) (12–14). APMEN started in  
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24 83 2009 to support capacity building, advocacy, and research in member countries, with the main aims to  
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26 84 solve problems of malaria control in the area (7,9). In line with APMEN, since 2013, ALPMA provides  
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28 85 political commitment through a high-level advocacy platform to eliminate malaria from the Asia Pacific  
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30 86 by 2030 (5,12). Meanwhile, the Global Fund is more focused on providing and leveraging funding to  
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32 87 support malaria elimination efforts (14,15).  
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38 89 However, the effectiveness of cross border malaria control activities remains unclear. Existing reviews  
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40 90 mainly discussed the characteristics and challenges of malaria in the Asia-Pacific region and its relation to  
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42 91 the technical strategy of malaria elimination (5,6,9). Other reviews identified issues related to malaria and  
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44 92 cross borders challenges involving mobile populations, cross border characteristics, and multidrug  
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46 93 resistance (8,16,17).  
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3 95 Conclusively, there has been no specific scoping review related to cross border control efforts in this  
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5 96 region. Therefore, we aim to identify and summarize existing evidence on interventions related to malaria  
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7 97 elimination efforts in cross border settings among the Asia-Pacific regions.  
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## 11 12 99 **Methods and analysis**

### 13 14 100 **Protocol design**

15  
16 101 To address the purpose and objectives of the proposed study, we will use the scoping review method  
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18 102 described by Arksey and O'Malley (18). There are six stages: (i) identify research questions, (ii) search for  
19  
20 103 relevant studies, (iii) select studies, (iv) mapping data, (v) collate, summarize and report results, and (vi)  
21  
22 104 consultation. The study will cover all malaria borders, where there is a potential for malaria transmission  
23  
24 105 between countries sharing land borders, in the Asia-Pacific region (19). The scoping review will be  
25  
26 106 conducted up to six months after the protocol is finished, and will include all original articles, case studies,  
27  
28 107 and grey literatures including selected reports. We will follow the Preferred Reporting Items for  
29  
30 108 Systematic reviews and Meta-Analyses: extension for Scoping Review (PRISMA-ScR) checklist in all stages  
31  
32 109 (20). Quality appraisal of studies will be conducted by guidance from the Joanna Briggs Institute (JBI)  
33  
34 110 website.  
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#### 41 112 Stage one: Identifying research questions

42  
43 113 Our research question was developed and refined through an iterative process and consultations held by  
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45 114 the research team. The objective of this review is to identify the most successful interventions or  
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47 115 innovations in accelerating malaria elimination goals in a cross border setting among Asia-Pacific regions.  
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52 117 Moreover, within this stage, the team will use the Population, Concept, and Context (PCC) of the study  
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54 118 (Table 1). The PCC approach is used as a second screening after all literatures search is combined.  
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120 [Insert Table 1 here]

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122 Stage two: Search for relevant studies

123 At this stage, the team will deliberate and decide upon criteria for eligibility, databases to search, and  
124 formulate a search strategy and key terms. We agreed to use four electronic databases, namely  
125 EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles. For grey literatures, we  
126 will search for publications from organization or institution websites supporting malaria elimination, such  
127 as the WHO, APMEN, APLMA, and Global Funds reports.

128

129 The search strategy uses malaria-related and cross border keywords as our primary filtering methods, and  
130 all researchers have agreed with this approach. The secondary research terms will include broader  
131 keywords on intervention and migration or cross border movement. The filtering methods of ranged date,  
132 English, and non-review articles will be used in all databases. For example, in using PubMed database, the  
133 search strategy will be developed to specific MeSH terms. Keywords search terms will include malaria\*  
134 title/abstract, cross\$border OR border\* title/abstract. Then we will use “English” as the language filter “1  
135 Jan 2010” and “31 Oct 2021” as the initial and final time filter.

136

137 The following eligibility criteria will be used to guide the search and reviewing published articles and grey  
138 literatures: (i) all primary studies, quantitative, qualitative and mixed method published articles, (ii) grey  
139 literatures such as reports of projects and programs, government documents or documents from ministry  
140 websites from countries in the Asia-Pacific region and documents from organization related malaria  
141 elimination efforts, such as UN agencies and APMEN-APLMA, (iii) study location in the Asia-Pacific region,  
142 (iv) countries with malaria nationwide elimination program (v) data collection in the last ten years (from

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3 143 January 1st 2010 to October 31st 2021), and (vi) articles written in English. The explicit exclusion criteria  
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5 144 identified are:

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8 145 - Transnational malaria; an importation of malaria parasites from airport and seaport international  
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10 146 border areas.  
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12 147 - review articles including systematic reviews, meta-analysis, meta-synthesis, scoping reviews,  
13  
14 148 narrative reviews, rapid reviews, critical reviews, and integrative reviews.  
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19 150 Stage three: Study selection

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21 151 All retrieved papers will be uploaded to a reference management software (Mendeley). We will design a  
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23 152 two-level screening. First, an independent reviewer will review titles and abstracts to determine eligibility  
24  
25 153 based on inclusion and exclusion criteria. The second part of the selection process will include two  
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27 154 reviewers about the PCC suitability. When differences arise or any uncertainty appears, the citation will  
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29 155 not be eliminated for consideration in the next stage. For studies that have multiple publications, we will  
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31 156 use all publications that have different outcomes.  
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37 158 The next stage of the study selection process is a full-text review. In this stage, each reviewer will assess  
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39 159 whether the articles meet the eligibility criteria. Any lack of agreement will be discussed until consensus  
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41 160 is received or by involving a third reviewer if disagreement still arises. Those articles fulfilling criteria will  
42  
43 161 be retrieved for review and meta-analysis in this study.  
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48 163 Stage four: Mapping the data

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50 164 Two independent reviewers will do the data extraction in an Excel file. As agreed by all researchers, the  
51  
52 165 heading of data extraction data will include at least the following: (1) author's name; (2) publication date;  
53  
54 166 (3) country and study location; (4) type of population; (5) study design; (6) aim of the study; (7) type of  
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3 167 interventions such as: (i) quality assurance of malaria diagnosis, treatment, and prevention, (ii) vectors  
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5 168 control (Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), Indoor Residual Spray (IRS)), (iii)  
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7 169 equity in migrant, mobile population, and other vulnerable populations, (iv) community and civil society  
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10 170 engagement, (v) collaboration activities the use of ACTs, intersectoral collaboration, (vi) case-based  
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12 171 surveillance system, (vii) data sharing, (viii) joint M&E, (ix) regulation, policies, strategies, and  
13  
14 172 collaboration, and (x) joint capacity building and research implementation (Figure 1); and (8) outcomes  
15  
16 173 (e.g., malaria elimination status, prevalence/ incidence). These data extraction headings are adapted from  
17  
18 174 the WHO pillars of cross border collaboration and the WHO framework for malaria elimination (10,21).  
19  
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22  
23 176 [Insert Figure 1]  
24

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28 178 We will involve stakeholders who are involved in malaria-cross border elimination efforts, such as  
29  
30 179 expertise in surveillance, public health and program planning, to review the data extraction form. Those  
31  
32 180 stakeholders include MoH, WHO, UNICEF, APMEN, and APLMA. After receiving their feedback, each team  
33  
34 181 member will be independently charting the data from all included literature studies. The validation of the  
35  
36 182 data extraction will be known by discussing samples of literature (e.g., 20%) with other authors. When  
37  
38 183 there is a differing opinion, one author will be the third reviewer.  
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43 185 Stage five: Collating, summarizing, and reporting the results  
44

45  
46 186 For our scoping review, the studies identified will be analyzed using both qualitative and quantitative  
47  
48 187 methods. We will use the PRISMA-ScR checklist for summarizing the data. An overview of the research  
49  
50 188 will be displayed through all the findings. Related results of qualitative literatures, all reports will be coded  
51  
52 189 by the WHO framework, such as: (1) prevent and/or reduce transmission and disease burden, with special  
53  
54 190 emphasis on minimizing risk of importation of malaria cases; (2) prevent, and/or rapidly respond to, and  
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2  
3 191 control malaria epidemics; and (3) prevent re-establishment of malaria transmission (10). The  
4  
5 192 WHO/global framework is the most familiar and is a global consensus, which will make it easier for global  
6  
7 193 audiences to understand and use it in their context. We will use the pillars in the WHO framework as a  
8  
9  
10 194 reference guide, and any intervention found will be grouped and summarized according to these pillars.  
11  
12 195 Meanwhile, the quantitative data will be briefly summarized with descriptive statistics. However, although  
13  
14 196 we are likely to include many different types of studies, our overall assessment of the evidence strength  
15  
16 197 will be more narrative than quantitative.  
17  
18

19 198

#### 21 199 Stage six: Consultation and stakeholder involvement

23 200 Consultation with stakeholders, experts, and key informants will not be our primary data, but serve as  
24  
25 201 triangulation of data sources in reviewing findings or as inputs in the synthesized results. This approach  
26  
27 202 will be conducted to clarify potential missing studies or ongoing relevant interventions. Moreover, by  
28  
29 203 involving stakeholders, we will have more insights into what is discussed in the literature. The  
30  
31 204 consultations will include the Ministry of Health, UN Agencies such as UNICEF and WHO, APMEN, APLMA  
32  
33 205 and Non-Governmental Organizations working in the malaria elimination efforts. The stage aims at  
34  
35 206 triangulation of findings, especially adding insights into policy documents or guidelines.  
36  
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39 207

41 208 The initial potential stakeholders are obtained from the discussion results with the National Malaria  
42  
43 209 Program (NMP). Additional potential participants will be possibly recruited with the snowball sampling  
44  
45 210 technique.  
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48 211

#### 50 212 **Patient and Public Involvement**

52 213 No patient involved.  
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54  
55 214



## 215 **Ethics and Dissemination**

216 This scoping review has received ethical approval from the Medical and Health Research Ethics Committee  
217 of the Faculty Medicine, Public Health and Nursing, Universitas Gadjah Mada (KE/0873/08/2021), as part  
218 of World Class Research – Malaria Cross Border study. Results will be disseminated through a peer-  
219 reviewed publication and/or conferences, for example, in APMEN or APLMA meetings. Moreover, we will  
220 also produce policy briefs for relevant stakeholders.

221

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232 All authors made substantial contributions to the work. UC designed the review, including the search  
233 strategies and producing the initial draft. EH, IE, and AP were involved in conception the protocol. EH, NR,  
234 AP, IE, RA, and UC editing and reviewed the protocol. All authors read and approved the final protocol.

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238 2716/UN1/DITLIT/DIT-LIT/PT/2021.

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3 **239 Disclaimer**  
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5 240 This article is based on the author's view and not the funders.  
6

7 **241 Competing interests**  
8

9 242 None declared.  
10

11 **243 Patient consent for publication**  
12

13 244 Not required.  
14

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16

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18

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3 **List of Table**  
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5 Table 1. Identification of Population, Concept, and Context (PCC)  
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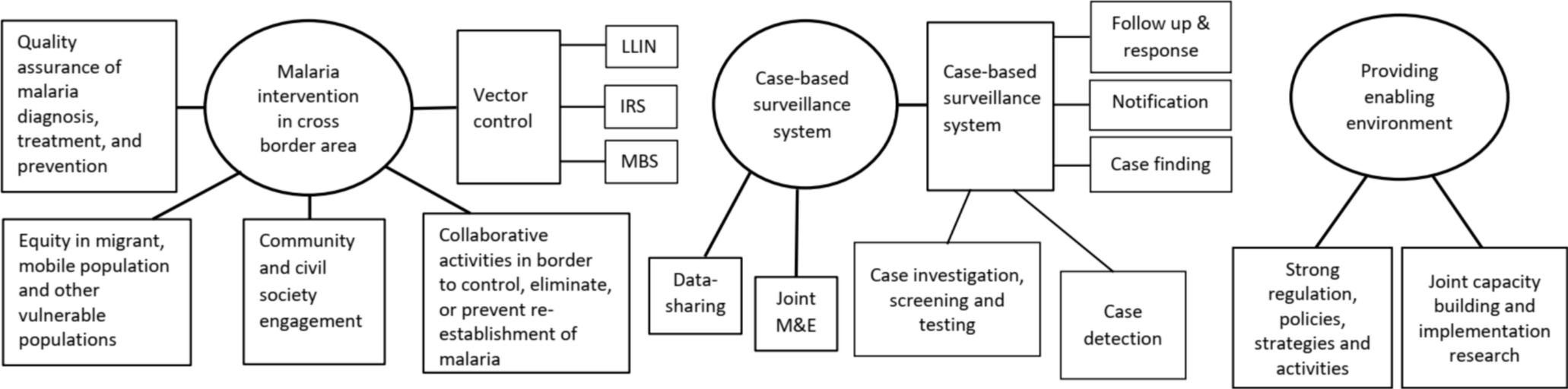
10 **List of Figure**  
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12 Figure 1. Interventions and activities related malaria cross border  
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16  
17 **Table 1.** Identification of Population, Concept, and Context (PCC)  
18

Population	Concept	Context
People or community at risk who live in the cross border area	Malaria at the cross border or any human-intervention model	Any community Any areas (districts level, countries level) Any elimination phases Any type of mobility in cross border

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**Figure 1.** Interventions and activities related malaria cross border.  
 Notes: LLIN: Long-Lasting Insecticide Net, IRS: Indoor Residual Spraying, MBS; Mass Blood Survey, ME: Monitoring and Evaluation

## Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	Page #1 See title  <i>"Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping Review Protocol"</i>
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page #2 See abstract  As this is a protocol, results and conclusions are not provided yet in the summary.
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page #4-5  The scoping review was chosen because our topic (malaria and cross border; in combination) has not yet been extensively reviewed.  <i>"In conclusion, there has been no scoping review related to cross border control efforts in the Asia-Pacific."</i>
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page #5-6 See purpose and objectives in page #5. See key elements in page #6 and table 1
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	The protocol is not submitted to PROSPERO (as been suggested by BMJ Open) because scoping review is the exclusion criteria. Screenshot the trial submission is provided below this checklist.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page #6 See inclusion and exclusion criteria  <i>The following eligibility criteria will be used to guide the search and reviewing articles: (i) study location in Asia-Pacific, (ii) countries with malaria nationwide elimination program (iii) data collection in the last ten years (from January 1st 2010 – June 30st 2021), (iv) articles written in English. The explicit exclusion criteria identified are:</i>
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as	Page #6 (line 134-137) See stage 2: search for relevant studies



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page #6 (line 131-132)  Four electronic databases are going to used.  <i>We agreed to use four electronic databases, namely EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles.</i>
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page #7  See stage three: study selection
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page #7-8  See stage four: mapping the data
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page #7-8 (line 164-169)  <i>Author's name; publication date; country and study location; type of population; study design; aim of the study; type of intervention such as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria elimination status, prevalence/incidence).</i>
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Critical appraisal is not yet done as it is a protocol manuscript.
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page #8 See stage five and six.  <i>After mapping the data, there are stages namely: collating, summarizing and reporting the results; followed by consultation and involvement of stakeholder for further clarification.</i>
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Not yet done. This paper describes the protocol of scoping review.
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Not yet done. This paper describes the protocol of scoping review.



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not yet done. This paper describes the protocol of scoping review.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Not yet done. This paper describes the protocol of scoping review.
Limitations	20	Discuss the limitations of the scoping review process.	Page #3 See strength and limitation of the study
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Not yet done. This paper describes the protocol of scoping review.
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page #9 See funding.

JB1 = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).



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# BMJ Open

## Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A Scoping Review Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-056265.R3
Article Type:	Protocol
Date Submitted by the Author:	20-Jan-2022
Complete List of Authors:	Cintyamena, Utsamani; UGM, Center for Tropical Medicine, Faculty of Medicine, Public Health, and Nursing Murhandarwati, Elsa; UGM, Center for Tropical Medicine, Faculty of Medicine, Public Health, and Nursing; UGM, Parasitology Elyazar, Iqbal; Eijkman Institute for Molecular Biology, Eijkman-Oxford Clinical Research Unit Probandari, Ari; UGM, Centre for Tropical Medicine, Faculty of Medicine, Public Health and Nursing; Sebelas Maret University Faculty of Medicine, Public Health Ahmad, Riris; UGM, Centre for Tropical Medicine, Faculty of Medicine, Public Health, and Nursing; UGM, Department of Biostatistics, Epidemiology, and Population Health, Faculty of Medicine, Public Health and Nursing
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Infectious diseases
Keywords:	PUBLIC HEALTH, Tropical medicine < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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3 1 **Identifying Forms of Interventions Towards Cross Border Malaria in the Asia-Pacific Region: A**  
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6 2 **Scoping Review Protocol**  
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## 25 **Abstract**

26

## 27 **Introduction**

28 An ambitious epidemiology strategy has been set by the World Health Organization, targeting malaria  
29 elimination for at least 35 countries in 2030. Challenges in preventing malaria cross borders require  
30 greater attention to achieve the elimination target. This scoping review aims to identify successful forms  
31 of interventions to control malaria transmission across national borders in the Asia-Pacific region.

## 32 **Methods and Analysis**

33 This scoping review will search four electronic databases (PubMed, ScienceDirect, EBSCOhost, and  
34 ProQuest) limiting the time of publication to the last 10 years. Two independent reviewers will screen all  
35 titles and abstracts during the second stage. Study characteristics will be recorded; qualitative data will  
36 be extracted and evaluated, while quantitative data will be extracted and summarized. Overall, we will  
37 follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping  
38 Reviews (PRISMA-ScR) guidelines.

## 39 **Ethics and Dissemination**

40 This scoping review has received ethical approval from the Faculty of Medicine, Public Health and  
41 Nursing, Universitas Gadjah Mada. The results will be disseminated through peer-reviewed publications,  
42 conference presentations, and policy briefs.

## 43 **Strengths and limitations of this study**

- 44 ● The data extraction headings are adapted from the WHO pillars of cross border collaboration and  
45 the WHO framework for malaria elimination.
- 46 ● Stakeholders will be engaged throughout the review process.
- 47 ● This scoping review is limited to land borders, according to its main definition.

- 1  
2  
3 48       • Only publications regarding interventions or activities related to malaria elimination since 2010  
4  
5 49           will be included.  
6  
7  
8 50

9  
10 51 **Introduction**  
11

12 52  
13  
14 53 Malaria is a public health burden caused by the *Plasmodium* parasite, which is transmitted from person  
15  
16 54 to person by the *Anopheles* mosquito as a vector. This disease creates a significant health and socio-  
17  
18 55 economic burden, with 3.7 billion people at risk of being infected with malaria (1). Globally, there were  
19  
20 56 an estimated 229 million malaria cases and over 400 thousand deaths across 87 malaria-endemic  
21  
22 57 countries in 2019, with the African region contributing 94% of the global case burden (1). Some countries  
23  
24 58 in the Asia-Pacific region have low-intensity transmission, and there are specific challenges that should be  
25  
26 59 overcome, including lack of surveillance (2–4), dominance of *P. vivax* (5). Additionally, epidemiologists are  
27  
28 60 starting to find resistance to artemisinin drugs and insecticides, and diversity of malaria vectors, while  
29  
30 61 identifying hard-to-reach populations (5–7), and cross border malaria problems (8).  
31  
32  
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36

37 63 Cross border intervention is critical to accelerating the malaria elimination efforts because no country can  
38  
39 64 achieve and maintain an exclusive malaria elimination status (9). As emphasized by the World Health  
40  
41 65 Organization (WHO) in their strategic plan, there is an urgency to collaborate in accelerating elimination  
42  
43 66 efforts by paying attention to prevention and treatment management and the importance of surveillance  
44  
45 67 (10). There are three main pillars developed in the WHO strategic plan that emphasize the importance of  
46  
47 68 the cross border intervention: (i) Maximize access to malaria interventions in border areas (within national  
48  
49 69 boundaries), (ii) Maximize malaria surveillance and response, as well as monitoring and evaluation (M&E)  
50  
51 70 in border areas, and (iii) Maximize cross border coordination mechanisms that provide an enabling  
52  
53 71 environment (10).  
54  
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3 72  
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5 73 Also, adaptation to the local context is imperative to support this strategic planning (11). In the Asia-Pacific  
6  
7 74 region, attention to malaria elimination efforts is promoted by a strategically united networking of the  
8  
9  
10 75 Asia-Pacific Malaria Elimination Network (APMEN), the Asia Pacific Leaders Malaria Alliance (APLMA), and  
11  
12 76 the Global Fund to Fight AIDS, Tuberculosis and Malaria (The Global Fund) (12–14). APMEN started in  
13  
14 77 2009 to support capacity building, advocacy, and research in member countries, with the main aims to  
15  
16 78 solve problems of malaria control in the area (7,9). In line with APMEN, since 2013, ALPMA provides  
17  
18 79 political commitment through a high-level advocacy platform to eliminate malaria from the Asia Pacific  
19  
20 80 by 2030 (5,12). Meanwhile, the Global Fund is more focused on providing and leveraging funding to  
21  
22 81 support malaria elimination efforts (14,15).  
23  
24  
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26 82

27  
28 83 However, the effectiveness of cross border malaria control activities remains unclear. Existing reviews  
29  
30 84 mainly discussed the characteristics and challenges of malaria in the Asia-Pacific region and its relation to  
31  
32 85 the technical strategy of malaria elimination (5,6,9). Other reviews identified issues related to malaria and  
33  
34 86 cross borders challenges involving mobile populations, cross border characteristics, and multidrug  
35  
36 87 resistance (8,16,17).  
37  
38  
39 88

40  
41 89 Conclusively, there has been no specific scoping review related to cross border control efforts in this  
42  
43 90 region. Therefore, we aim to identify and summarize existing evidence on interventions related to malaria  
44  
45 91 elimination efforts in cross border settings among the Asia-Pacific regions.  
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48 92

## 93 **Methods and analysis**

### 94 **Protocol design**

1  
2  
3 95 To address the purpose and objectives of the proposed study, we will use the scoping review method  
4  
5 96 described by Arksey and O'Malley (18). There are six stages: (i) identify research questions, (ii) search for  
6  
7 97 relevant studies, (iii) select studies, (iv) mapping data, (v) collate, summarize and report results, and (vi)  
8  
9 98 consultation. The study will cover all malaria borders, where there is a potential for malaria transmission  
10  
11 99 between countries sharing land borders, in the Asia-Pacific region (19). The scoping review will be  
12  
13 100 conducted until June 2022, and will include all original articles, case studies, and grey literatures including  
14  
15 101 selected reports. We will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses:  
16  
17 102 extension for Scoping Review (PRISMA-ScR) checklist in all stages (20). Quality appraisal of studies will be  
18  
19 103 conducted by guidance from the Joanna Briggs Institute (JBI) website.  
20  
21  
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23  
24

#### 25 105 Stage one: Identifying research questions

26  
27 106 Our research question was developed and refined through an iterative process and consultations held by  
28  
29 107 the research team. The objective of this review is to identify the most successful interventions or  
30  
31 108 innovations in accelerating malaria elimination goals in a cross border setting among Asia-Pacific regions.  
32  
33  
34 109  
35  
36 110 Moreover, after this stage, the team will use the Population, Concept, and Context (PCC) of the study  
37  
38 111 (Table 1). The PCC approach is used as a second screening after all literatures search is combined.  
39  
40  
41  
42

43 113 [Insert Table 1 here]

44  
45 114

#### 47 115 Stage two: Search for relevant studies

48  
49 116 At this stage, the team will deliberate and decide upon criteria for eligibility, databases to search, and  
50  
51 117 formulate a search strategy and key terms. We agreed to use four electronic databases, namely  
52  
53 118 EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles. For grey literatures, we  
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2  
3 119 will search for publications from organization or institution websites supporting malaria elimination, such  
4  
5 120 as the WHO, APMEN, APLMA, and Global Funds reports.  
6  
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9  
10 122 The search strategy uses malaria-related and cross border keywords as our primary filtering methods, and  
11  
12 123 all researchers have agreed with this approach. The secondary research terms will include broader  
13  
14 124 keywords on intervention and migration or cross border movement. The filtering methods of ranged date,  
15  
16 125 English, and non-review articles will be used in all databases. For example, we will select 'Academic Search  
17  
18 126 Complete' and 'MEDLINE with Full Text' databases from EBSCOHOST website. Meanwhile, in using  
19  
20  
21 127 PubMed database, the search strategy will be developed to specific MeSH terms. Keywords search terms  
22  
23 128 will include malaria\* title/abstract, cross\$border OR border\* title/abstract. Then we will use "English" as  
24  
25 129 the language filter "1 Jan 2010" and "31 Oct 2021" as the initial and final time filter. The full search  
26  
27  
28 130 strategies are available in the online supplementary file 1.  
29

30 131  
31  
32 132 The following eligibility criteria will be used to guide the search and reviewing published articles and grey  
33  
34 133 literatures: (i) all primary studies, quantitative, qualitative and mixed method published articles, (ii) grey  
35  
36 134 literatures such as reports of projects and programs, government documents or documents from ministry  
37  
38 135 websites from countries in the Asia-Pacific region and documents from organization related malaria  
39  
40  
41 136 elimination efforts, such as UN agencies and APMEN-APLMA, (iii) study location in the Asia-Pacific region,  
42  
43 137 (iv) countries with malaria nationwide elimination program (v) data collection in the last ten years (from  
44  
45 138 January 1st 2010 to October 31st 2021), and (vi) articles written in English. The explicit exclusion criteria  
46  
47  
48 139 identified are:

49  
50 140 - Transnational malaria; an importation of malaria parasites from airport and seaport international  
51  
52 141 border areas.  
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1  
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3 142 - review articles including systematic reviews, meta-analysis, meta-synthesis, scoping reviews,  
4  
5 143 narrative reviews, rapid reviews, critical reviews, and integrative reviews.  
6  
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8 144

9  
10 145 Stage three: Study selection  
11

12 146 All retrieved papers will be uploaded to a reference management software (Mendeley). We will design a  
13  
14 147 two-level screening. First, an independent reviewer will review titles and abstracts to determine eligibility  
15  
16 148 based on inclusion and exclusion criteria. The second part of the selection process will include two  
17  
18 149 reviewers about the PCC suitability. When differences arise or any uncertainty appears, the citation will  
19  
20 150 not be eliminated for consideration in the next stage. For studies that have multiple publications, we will  
21  
22 151 use all publications that have different outcomes.  
23  
24  
25  
26 152

27  
28 153 The next stage of the study selection process is a full-text review. In this stage, each reviewer will assess  
29  
30 154 whether the articles meet the eligibility criteria. Any lack of agreement will be discussed until consensus  
31  
32 155 is received or by involving a third reviewer if disagreement still arises. Those articles fulfilling criteria will  
33  
34 156 be retrieved for review and meta-analysis in this study.  
35  
36  
37 157

38  
39 158 Stage four: Mapping the data  
40

41 159 Two independent reviewers will do the data extraction in an Excel file. As agreed by all researchers, the  
42  
43 160 heading of data extraction data will include at least the following: (1) author's name; (2) publication date;  
44  
45 161 (3) country and study location; (4) type of population; (5) study design; (6) aim of the study; (7) type of  
46  
47 162 interventions such as: (i) quality assurance of malaria diagnosis, treatment, and prevention, (ii) vectors  
48  
49 163 control (Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), Indoor Residual Spray (IRS)), (iii)  
50  
51 164 equity in migrant, mobile population, and other vulnerable populations, (iv) community and civil society  
52  
53 165 engagement, (v) collaboration activities the use of ACTs, intersectoral collaboration, (vi) case-based  
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3 166 surveillance system, (vii) data sharing, (viii) joint M&E, (ix) regulation, policies, strategies, and  
4  
5 167 collaboration, and (x) joint capacity building and research implementation (Figure 1); and (8) outcomes  
6  
7 168 (e.g., malaria elimination status, prevalence/ incidence). These data extraction headings are adapted from  
8  
9 169 the WHO pillars of cross border collaboration and the WHO framework for malaria elimination (10,21).  
10  
11  
12 170

13  
14 171 [Insert Figure 1]  
15  
16 172

17  
18 173 We will involve stakeholders who are involved in malaria-cross border elimination efforts, such as  
19  
20 174 expertise in surveillance, public health and program planning, to review the data extraction form. Those  
21  
22 175 stakeholders include MoH, WHO, UNICEF, APMEN, and APLMA. After receiving their feedback, each team  
23  
24 176 member will be independently charting the data from all included literature studies. The validation of the  
25  
26 177 data extraction will be known by discussing samples of literature (e.g., 20%) with other authors. When  
27  
28 178 there is a differing opinion, one author will be the third reviewer.  
29  
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31 179

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34 180 Stage five: Collating, summarizing, and reporting the results  
35

36  
37 181 For our scoping review, the studies identified will be analyzed using both qualitative and quantitative  
38  
39 182 methods. We will use the PRISMA-ScR checklist for summarizing the data. An overview of the research  
40  
41 183 will be displayed through all the findings. Related results of qualitative literatures, all reports will be coded  
42  
43 184 by the WHO framework, such as: (1) prevent and/or reduce transmission and disease burden, with special  
44  
45 185 emphasis on minimizing risk of importation of malaria cases; (2) prevent, and/or rapidly respond to, and  
46  
47 186 control malaria epidemics; and (3) prevent re-establishment of malaria transmission (10). The  
48  
49 187 WHO/global framework is the most familiar and is a global consensus, which will make it easier for global  
50  
51 188 audiences to understand and use it in their context. We will use the pillars in the WHO framework as a  
52  
53 189 reference guide, and any intervention found will be grouped and summarized according to these pillars.  
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3 190 Meanwhile, the quantitative data will be briefly summarized with descriptive statistics. However, although  
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5 191 we are likely to include many different types of studies, our overall assessment of the evidence strength  
6  
7 192 will be more narrative than quantitative.  
8  
9

10 193

11  
12 194 Stage six: Consultation and stakeholder involvement  
13

14 195 Consultation with stakeholders, experts, and key informants will not be our primary data, but serve as  
15  
16 196 triangulation of data sources in reviewing findings or as inputs in the synthesized results. This approach  
17  
18 197 will be conducted to clarify potential missing studies or ongoing relevant interventions. Moreover, by  
19  
20 198 involving stakeholders, we will have more insights into what is discussed in the literature. The  
21  
22 199 consultations will include the Ministry of Health, UN Agencies such as UNICEF and WHO, APMEN, APLMA  
23  
24 200 and Non-Governmental Organizations working in the malaria elimination efforts. The stage aims at  
25  
26 201 triangulation of findings, especially adding insights into policy documents or guidelines.  
27  
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29

30 202

31  
32 203 The initial potential stakeholders are obtained from the discussion results with the National Malaria  
33  
34 204 Program (NMP). Additional potential participants will be possibly recruited with the snowball sampling  
35  
36 205 technique.  
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40  
41 207 **Patient and Public Involvement**  
42

43 208 No patient involved.  
44  
45

46 209

47  
48 210 **Ethics and Dissemination**  
49

50 211 This scoping review has received ethical approval from the Medical and Health Research Ethics Committee  
51  
52 212 of the Faculty Medicine, Public Health and Nursing, Universitas Gadjah Mada (KE/0873/08/2021), as part  
53  
54 213 of World Class Research – Malaria Cross Border study. Results will be disseminated through a peer-  
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3 214 reviewed publication and/or conferences, for example, in APMEN or APLMA meetings. Moreover, we will  
4  
5 215 also produce policy briefs for relevant stakeholders.  
6  
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### 27 28 29 30 226 **Contributors**

31  
32 227 All authors made substantial contributions to the work. UC designed the review, including the search  
33  
34 228 strategies and producing the initial draft. EH, IE, and AP were involved in conception the protocol. EH, NR,  
35  
36 229 AP, IE, RA, and UC editing and reviewed the protocol. All authors read and approved the final protocol.

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50 235 This article is based on the author's view and not the funders.

### 51 52 53 236 **Competing interests**

54  
55 237 None declared.  
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3 **238 Patient consent for publication**  
4

5 239 Not required.  
6

7  
8 **240 Provenance and peer review**  
9

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3 **List of Table**  
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5 Table 1. Identification of Population, Concept, and Context (PCC)  
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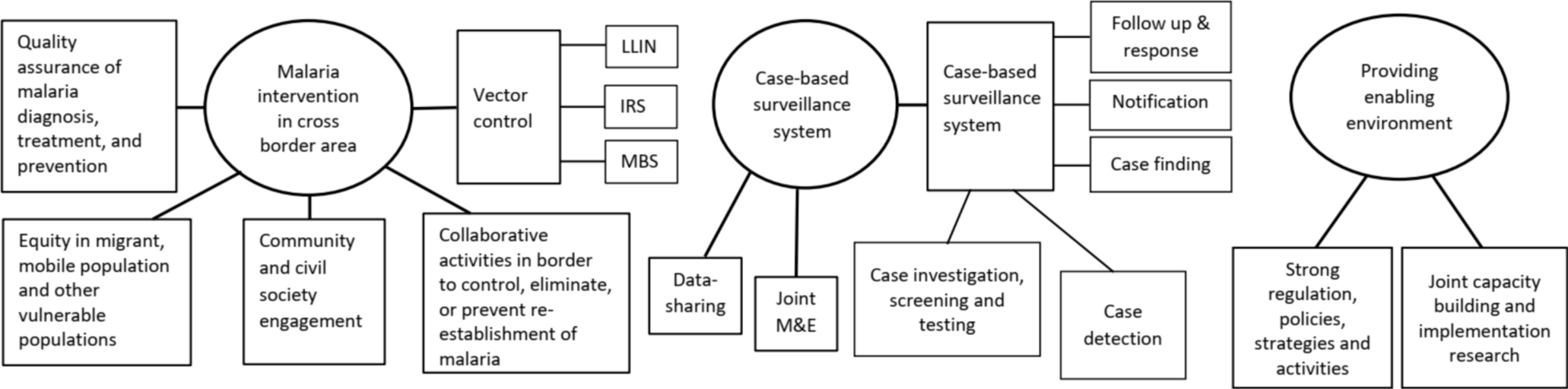
10 **List of Figure**  
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12 Figure 1. Interventions and activities related malaria cross border  
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16 **Table 1.** Identification of Population, Concept, and Context (PCC)  
17

Population	Concept	Context
People or community at risk who live in the cross border area	Interventions model or activities of malaria control program at the cross border	Any areas (districts level, countries level) Any antimalarial activities or phases of malaria control program Any type of mobility in cross border

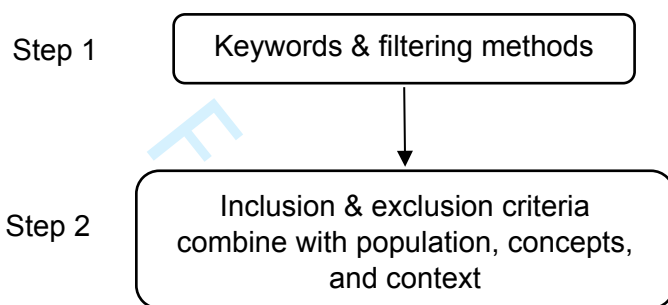
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**Figure 1.** Interventions and activities related malaria cross border.  
 Notes: LLIN: Long-Lasting Insecticide Net, IRS: Indoor Residual Spraying, MBS; Mass Blood Survey, ME: Monitoring and Evaluation

## Supplementary file 1

### Detailed search strategy:



### Step 1 – Main search strategy and filtering option

Database	Keyword (1)	Keyword (2)	Language filter	Publication time filter
PubMed	malaria* (MeSH Terms)	cross\$border OR border* (title/abstract)	English	1 Jan 2010 to 31 Oct 2021
EBSCOHOST	malaria* (title)	crossborder OR cross border OR cross-border OR border* (abstract)	English	1 Jan 2010 to 31 Oct 2021
ProQuest	malaria* (title)	crossborder OR cross border OR cross-border OR border (abstract)	English	1 Jan 2010 to 31 Oct 2021
ScienceDirect	malaria* (title)	crossborder OR cross border OR cross-border OR border* (abstract)	English	2010-2021

## Step 2 – Hand search strategy for Population, Concepts, and Context (OR)

<b>Population</b>	
People or community at risk who live in the cross border area	Men OR women; all/document text Pregnant; all/document text Children OR child; all/document text Migrant; all/document text Nomad OR mobile population; all/document text Traveler OR miner OR forest worker; all/document text Vulnerable populations; all/document text
<b>Concepts</b>	
Interventions model or activities of malaria control program at the cross border	Intervention OR activity*; all/document text Diagnosis OR treatment OR prevention; all/document text LLIN OR IRS OR MBS; all/document text Surveillance; all/document text Data sharing; all/document text Notification; all/document text Case finding; all/document text Monitoring and evaluation; all/document text Capacity building; all/document text
<b>Context</b>	
Any areas (districts level, countries level)	National OR district OR village; all/document text (China OR North Korea OR Lao DPR OR Myanmar OR Bhutan OR Nepal OR Vietnam OR Afghanistan OR Bangladesh OR India OR Cambodia OR Malaysia OR Indonesia OR Timor Leste OR Papua New Guinea OR Iran OR Yamen OR Saudi Arabia); all/document text NOR Africa NOR Europe NOR America NOR Australia; abstract
Any antimalarial activities or phases of malaria control program	Control OR elimination OR prevention of re-establishment; all/document text
Any type of mobility in cross border	Land border; all/document text NOR sea border NOR port border; abstract

## Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	Page #1 See title  <i>"Identifying Forms of Interventions Towards Cross Border Malaria in Asia-Pacific: Scoping Review Protocol"</i>
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page #2 See abstract  As this is a protocol, results and conclusions are not provided yet in the summary.
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page #4-5  The scoping review was chosen because our topic (malaria and cross border; in combination) has not yet been extensively reviewed.  <i>"In conclusion, there has been no scoping review related to cross border control efforts in the Asia-Pacific."</i>
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page #5-6 See purpose and objectives in page #5. See key elements in page #6 and table 1
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	The protocol is not submitted to PROSPERO (as been suggested by BMJ Open) because scoping review is the exclusion criteria. Screenshot the trial submission is provided below this checklist.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page #6 See inclusion and exclusion criteria  <i>The following eligibility criteria will be used to guide the search and reviewing articles: (i) study location in Asia-Pacific, (ii) countries with malaria nationwide elimination program (iii) data collection in the last ten years (from January 1st 2010 – June 30st 2021), (iv) articles written in English. The explicit exclusion criteria identified are:</i>
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as	Page #6 (line 134-137) See stage 2: search for relevant studies



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		the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page #6 (line 131-132)  Four electronic databases are going to used.  <i>We agreed to use four electronic databases, namely EBSCOhost, PubMed, ProQuest, and ScienceDirect, to get more diverse articles.</i>
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page #7  See stage three: study selection
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page #7-8  See stage four: mapping the data
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page #7-8 (line 164-169)  <i>Author's name; publication date; country and study location; type of population; study design; aim of the study; type of intervention such as Mass blood survey (MBS), Long-lasting insecticidal nets (LLINs), vector control such as Indoor Residual Spray (IRS), the use of ACTs, intersectoral collaboration, border-notification; and outcomes (e.g., malaria elimination status, prevalence/incidence).</i>
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Critical appraisal is not yet done as it is a protocol manuscript.
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page #8 See stage five and six.  <i>After mapping the data, there are stages namely: collating, summarizing and reporting the results; followed by consultation and involvement of stakeholder for further clarification.</i>
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Not yet done. This paper describes the protocol of scoping review.
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Not yet done. This paper describes the protocol of scoping review.

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Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not yet done. This paper describes the protocol of scoping review.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Not yet done. This paper describes the protocol of scoping review.
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Not yet done. This paper describes the protocol of scoping review.
Limitations	20	Discuss the limitations of the scoping review process.	Page #3 See strength and limitation of the study
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Not yet done. This paper describes the protocol of scoping review.
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page #9 See funding.

JB1 = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).



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Completing these questions before registration is intended to prevent you wasting time filling out a form if your project is not eligible for PROSPERO.

Will the systematic review protocol be submitted in English?

YES NO

Is this a scoping, literature or mapping review?

YES NO

PROSPERO does not currently accept registrations for scoping reviews, literature reviews or mapping reviews. PROSPERO is therefore unable to accept your application or provide a registration number. This decision should not stop you from submitting your project for publication to a journal. If you would like to copy this explanation to the clipboard to include with a journal submission [click here](#)

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