

BIBLIOMETRIC ANALYSIS ON COVID-9 IN THE CONTEXT OF MIGRATION HEALTH

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ABSTRACT

Introduction: Human mobility has been pivotal to the spread of COVID-19 through travel and migration. To mitigate the spread, most countries have imposed strict travel restrictions that have severely affected both the wellbeing and livelihoods of many migrant and mobile populations (both internally and internationally), particularly those from impoverished communities, affected by humanitarian crises, displaced and/or living in camps and camp-like settings. The need to include migrants (both regular and those irregular “undocumented”) in the national strategic response plans in disease prevention and control has been increasingly recognized. A better understanding of the existing scientific evidence in migration health to effectively respond is crucial. This study aimed to provide valuable information to support evidence mapping and assessment of research activities on COVID-19 and migration health, including the identification of important research gaps.

Methods: A bibliometric analysis of scientific publications on COVID-19 and migration health published from 1 January 2020 to 31 December 2020 was implemented using Elsevier’s Scopus abstract and citation database.

Results: A total of 1,953 publications were retrieved on COVID-19 and migration health. The mean number of authors per document was 4.8, while the mean number of citations per document was 38. The International Journal of Environmental Research and Public Health was the most active journal (2.0%; n=39), while the London School of Hygiene and Tropical Medicine was the most active institution (2.2%; n=43) on this topic. The top countries of author affiliation in terms of the number of authored/co-authored publications were USA (24.5%; n=478) and China (16.4%; n=320). International research collaboration appeared to be strongest between these two countries. The retrieved publications were mainly on public health interventions (42.7%; n=833), disease epidemiology and mathematical modelling (28.2%; n=550), and impact assessment and policy analysis (17.5%; n=342). These themes were clearly reflected in the keywords that dominated the clusters in the visualized maps except for the third theme. There was a limited number of publications on migrant-specific themes (i.e., migrant protection services and camp coordination management), clinical management, diagnostic and testing strategies, and candidate therapeutics and vaccines. Moreover, the studies involving specific migrant populations were few and limited to refugees, asylum seekers, international students, migrant workers, immigrants, and patient mobility. Most of the studies investigated cases of COVID-19 in the context of population movement.

Conclusion: Findings from the bibliometric analysis provide an overview of the extent of research activities in COVID-19 and migration health, including the key actors (i.e., authors and institutions) and major research areas in the field. The important research gaps identified suggest the need to push for an inclusive research strategy in the context of migration health in the investigation of COVID-19. As evidence on COVID-19 continues to develop, the overall research landscape is very likely to change; the study findings provide researchers and relevant stakeholders with a good starting point in developing further research and

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maximizing existing research networks that are tailored towards addressing the critical gaps identified.

Keywords: COVID-19, Coronavirus, SARS-CoV-2, Bibliometric Analysis, Scopus, global migration health, human mobility

Ethics and dissemination: This analysis draws on publicly available data and does not directly involve human participants; ethics review is not required.

INTRODUCTION

Migration health and COVID-19

Human mobility played a central role in the spread of the coronavirus disease 2019 (COVID-19) [1, 2]. In late December 2019, a cluster of pneumonia cases of unknown etiology was detected in Wuhan City, a major transport hub in the People's Republic of China [3]. This quickly spread to other provinces in China, including Guangdong Province, Beijing Municipality, and Shanghai Municipality. Within a month from the discovery of the novel coronavirus, officially named SARS-CoV-2, Thailand, Japan, and the Republic of Korea reported confirmed cases of COVID-19, which were all linked to travel in China [4]. Since then, the number of confirmed and suspected cases has expanded worldwide, especially in populations with travel history to affected areas or contact with infected persons [5]. Three months later, on 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic [6]. As of 27 October 2021, there have been over 244 million confirmed cases of COVID-19 and nearly 5 million deaths globally [7].

In the early quarter of 2020, several governments issued travel restrictions or outright bans on the entry of persons from countries or areas with known cases of COVID-19 and/ or suspension of domestic and international flights, which limited internal and international movement [1, 8]. In May 2020, a total of 216 countries, territories or areas have put into effect over 45,300 travel restrictions to contain and reduce the spread of COVID-19; about 69 percent (524 out of 763) of airports were partially operational (n=281) or fully closed (n=243); and, about 81.8 percent of land border crossings were partially (690 out of 2,120) or fully closed (1,045 out of 2,120) [9]. In mid-2020, points of entry were slowly reopened with strict health control measures in place. Still, many countries continue to implement route restrictions and/or maintain close border closures. In the late quarter of 2020, countries battled with the second (or third) wave of the infections with the rising cases of new variants of the virus. Health control measures continued in 2021 to respond to the COVID-19 crisis and the threat of new variants. The report resulting from the collaboration by the International Organization for Migration (IOM) and the Migration Policy Institute (MPI) marks the first comprehensive analysis of the travel measures and border closures that governments around the world took during 2020—which at their peak in mid-December exceeded 111,000 in place at one time. The MPI analysis of IOM's COVID-19 Mobility Impacts platform collected data on countries implementing border closures, travel restrictions, health control measures/ travel requirements for travelers to respond to the COVID-19 crisis, surge of cases, and virus mutations.

The relationship between migration and health is complex, and its impact varies considerably across migrant groups, and from person to person within such groups. Migration, among other factors, is considered a social determinant of health [10]. Conditions surrounding the migration process can increase the vulnerability to ill health. The process of migration exposes migrant groups to various "health risks through unsafe travel, exposure to diseases, limited access to health services, poor nutrition, psychosocial stressors, and harsh living and working conditions." [11, 12]. There may be differences in the disease profiles and health risk factors between migrant and host populations, within various migrant categories, and inequalities in the access/uptake of preventive

interventions and treatment outcomes based on migration. Governments, international agencies and scholars have iterated the importance of integrating and including migration and population mobility as key components in formulating national, sub-national, regional and global health policy and interventions [11].

Although various measures have been implemented in the COVID-19 pandemic response, these measures largely focus on protecting the local communities in host countries [13, 14]. Culturally appropriate public health measures inclusive of migrant populations are recommended [ibid]. It is also essential to consider migrants throughout the stages of an outbreak (i.e., initiation, propagation, resolution phase), and direct research endeavors toward exploring the migration and health nexus. For example, adverse working conditions and poor access to health service among the low-waged (and often undocumented) migrant workers in intensive animal rearing and meat processing industries in some countries and potential for such settings for cross-species transmission (zoonosis) remains poorly explored [13, 15].

Mitigating a global pandemic requires equal access to health services, regardless of migration status or curtailing mobility for non-citizens. Addressing the health of migrants and mobile populations is an important aspect of ensuring global health security. Accessible and quality health care for migrant workers and their families protects the people in transit and the receiving communities—where “Migration health is a shared responsibility with public health impacts that extend beyond national boundaries” [11].

Impact of COVID-19 among migrant populations

The International Organization for Migration (IOM) defines the term ‘migration’ as “the movement of a person or a group of persons, either across an international border or within a State” [16, 17]. The term ‘internal migration’ refers to the movement of people within a State involving the establishment of a new temporary or permanent residence. ‘Internal migrants’ include people who have been displaced from their habitual place of residence (i.e., internally displaced persons or IDPs), as well as persons who have decided to move to a new place (i.e., rural-urban migration) [17].

The term ‘international migration’ refers to the “movement of people between different countries”, while the term ‘international migrant’ refers to “any person who is moving or has moved across an international border away from his/her habitual place of residence for at least one year regardless of the cause, legal status, and length of the stay.” [16, 18]. In 2019, the number of international migrants was estimated at 272 million, which is 3.5 percent of the global population, with higher estimates of internal migrants in the year 2009 at 740 million [18].

The majority of ‘international migrants’ are ‘migrant workers’ who are moving to work in another country where labor or particular skills are needed. This mainly happens through formal employment pathways. Such ‘international migrant workers’ comprises more than half of the stock of international migrants (163.8 million), and is defined as “a person who is to be engaged, is engaged or has been engaged in a remunerated activity in a State of which he or she is not a national” [18, 19]. Migrants – particularly in lower-paid jobs – may be more affected by and vulnerable to the spread of COVID-19 in countries already impacted and those countries where the pandemic is spreading [20]. Migrant workers accounted for 20.6 percent and 17.8 percent of all workers in Northern America, and in Northern, Southern and Western Europe, respectively [21]. They, therefore, represent about one in five workers in those countries and may be among the first to be affected by lay-offs and movement restrictions and lockdowns impacting livelihoods such as losing their businesses. Living conditions in crowded housing pose a particular risk to the spread of COVID-19 among migrant workers.

However, migrant workers also play an important role in the response to COVID-19 by working in critical sectors. As an illustration, available international data show that at least ten countries – the United States America (USA), Spain, Italy, Germany, France, the United Kingdom, Belgium, the Netherlands, Canada and Switzerland – depend on foreign-born workers in the critical sector of healthcare services. On the higher end, 47 percent of doctors and 32 percent of nurses in Switzerland in 2015/6 were foreign-born. On the lower end, four percent of doctors in Italy and four percent of nurses in Spain were foreign-born [22].

Refugees and asylum seekers make up about 10 percent of all international migrants, with four out of every five hosted in economically poorer developing regions. In 2019, there were an estimated 25.9 million refugees (i.e., those who are forced to leave their country owing to a well-founded fear of conflict or persecution) and 3.9 million stateless persons (i.e., those who are not considered a national by any State) [18]. These forcibly displaced populations are at heightened risk of contracting diseases due to poor living conditions and high population density with limited access to healthcare services, and often bounded by the political system of host countries [13].

The COVID-19 pandemic has affected these migrant and mobile populations in multiple pathways – and perhaps to a greater extent than the general population [23]. The unique conditions surrounding the migration process expose migrants, refugees, and internally displaced populations to additional health risks. In this pandemic, migrants and mobile populations are one of the most vulnerable populations. Factors that contribute to this vulnerability include: (1) Precarious working environment and poor living conditions (e.g., temporary shelters, refugee camps), particularly for low-wage migrant workers, refugees, asylum seekers, and IDPs; (2) Limited or no access to health care services due to the legal and practical barriers to healthcare. There is also clear evidence that migrants have been excluded in national pandemic plans [24]; (3) Travel restrictions that lead to a mass exodus of migrant worker populations (international and internal); (4) Economic impact of the pandemic on migrant workers; and (5) Increasing xenophobia in migrant populations due to importation risks [15, 19, 25-27]. They are frequently neglected, stigmatized, and may face difficulties accessing health services that are otherwise available to the general population. In the context of the Interim Guidance on Scaling-up COVID-19 Outbreak in Readiness and Response Operations in Camps and Camp-like Settings, the people in humanitarian situations affected by this guidance may include IDPs, host communities, asylum seekers, refugees and returnees, and migrants when in similar situations [28].

Global response strategies to COVID-19

The IOM, as part of the Inter-Agency Standing Committee (IASC), and in partnership with WHO, other United Nations (UN) organizations and coordination groups as well as non-UN stakeholders, is assisting Member States (MS) and partners to prepare for and respond to COVID-19, with operational, technical and policy support. One of the priorities outlined in IOM's COVID-19 Global Strategic Preparedness and Response Plan (SRP) involves supporting efforts that properly consider the cross-cutting humanitarian and development needs of migrants, IDPs, and other vulnerable populations in reducing COVID-19-related illness and deaths [29].

Research mapping: A migration health research priority

The 2nd Global Consultation on Migrant Health (2017) recognized the need to “take stock of current research, map the existing landscape of published literature, identify areas of focus and gaps to better organize a global research agenda on migration health” [30].

Bibliometric analysis is the quantitative analysis of publications (e.g., research articles and books) using bibliographic data (i.e., author information, citation, and publication information) to produce measures of

‘research productivity’ (i.e., number of publications), ‘research impact’ (i.e., citation counts, journal impact factor, etc.), and national or international networks/ collaborations of authors/ researchers, institutions/ organizations, and country/ author affiliation). Although the bibliometric method does not provide analysis and interpretation of the content of a research publication, it has been firmly established as a scientific specialty and an integral part of research evaluation methodology. It provides useful information on the growth, impact, gaps, and trends of research publications within a particular field or discipline [31-33].

In this paper, we present a bibliometric study that aims to identify and analyze research publications on COVID-19 focusing on migration, migrants and human mobility; specifically mapping research productivity on COVID-19 in the context of migration health by author, country, institution/ organization, health theme, and migrant topic (i.e., migrant type and country coverage). The findings from this study will provide useful information in enhancing the strategic response to COVID-19 and will contribute to improving efforts in the successful integration of different migrant groups into the national health systems and ultimately support COVID- 19 prevention and control.

METHODOLOGY

CITATION DATABASE

Scopus, a citation and abstract database of peer-reviewed literature developed by Elsevier, was used to retrieve publications on COVID-19 and migration health. Scopus provides a comprehensive overview of global research output in different disciplines and covers 100 percent of MEDLINE publications. The advantage of Scopus over other citation databases was extensively discussed in previous studies [31, 34, 35].

SEARCH STRATEGY

INCLUSION STEP

The search strategy was developed on 30 March 2020 and updated on 4 May 2020. Two search queries were developed for COVID-19 and migration health (i.e., one query for each search component). For the COVID-19 search query, the identification and selection of keywords were based on reviewing the WHO COVID-19 repository [36] and bibliometric studies on COVID-19 [37, 38].

The COVID-19 search query was applied in the publication title to minimize false-positive results. Search terms and Boolean separators for COVID-19 include “covid*” OR “covid-19” OR “covid19” OR “SARS-CoV-2” OR “ncov” OR “2019-nCov” OR “2019nCov” OR “corona virus” OR “coronavirus” and a combination of COVID-19 specific terms.

A separate search query was developed for migration (health). The search query was grouped into three main topics: ‘international’, ‘migration and migrant’, and ‘mobility and travel’. The first two topics adopted the search strategy developed for global migration and health [31]. The ‘mobility and travel’ terms were captured using synonymous and related terms to mobility (i.e., ‘movement’, ‘displaced’, ‘displacement’, ‘travelling’, and ‘traveler’). The migration (health) search query was then applied in the title, abstract and keywords of publications.

The search queries for COVID-19 and migration (health) were combined using the Boolean operator “AND”. The search results of these queries contained all publications on COVID-19 with ‘migration’, ‘migrant’ and ‘mobility’ terms. It should be noted that while the analysis intends to capture publications on COVID-19 and “migration health”,

the search query on migration health largely focused on migration-, migrant- and mobility-related terms as the health aspects of migration are effectively subsumed in the COVID-19 search query. The full search strategy is available in Appendix 1.

EXCLUSION STEP

The following steps were applied to the search strategy to eliminate irrelevant publications or false-positive results.

- Restricted the publication year to 2020.
- Excluded publications indexed in irrelevant subject areas (e.g., Veterinary) after careful review of the retrieved publications. (NB: Scopus classifies retrieved publications based on the field and scope of the sources or publishing journal).
- Excluded publications with irrelevant or out-of-scope topics.
 - a. The research team (JL, SA) and members of MHADRI performed title and abstract (if available) screening of the retrieved publications using MS Excel. If no abstract was available in Scopus, the reviewers checked the source publication. To guide the screening, below exclusion criteria was applied stepwise:
 - (i) Animal model studies that do not include human subjects.
 - (ii) Title or abstract does not have terms related to ‘migrant’, ‘migration’, ‘mobility’ or ‘travel’. NB: Exemptions - publications that implied a review of travel history and/or restriction in mobility were included.
 - (iii) Abstract does not refer to at least one of the following populations: migrants, displaced populations, refugees, asylum seekers, travelers, mobile populations. For example, publications that focus on the aviation industry (as a business component) with no health angle.
 - (iv) No abstract available (in Scopus and source publication) NB: exemptions - short commentaries with no abstract but with full article in the source publication.
 - (v) No English translation of the title and/or abstract (for non-English publications).
 - (vi) Retracted publications.
 - b. The screened publications were checked for completeness. The publications identified as “uncertain” and “excluded (criteria iii)” were discussed by the team (SA and JL) until a consensus was reached on whether to include or exclude them. Note that other publications identified as “excluded” in other criteria items were not included because the listed reasons were straight forward.
- Excluded confirmed duplicates; duplicates were identified using MS Excel and EndNote based on the following parameters: author names; publication title; source title; and, volume and issue number. After careful review, a total of three publications were dropped. The publications with complete and/or correct entries (i.e., publication details) were retained.
- Included publications were then compiled in Scopus using its built-in ‘list’ feature. These were checked and verified using the Scopus-assigned unique ID of each publication. There were 17

publications that were no longer available in Scopus, further checking found that these were no longer available in the publication source. Thus, these were excluded from the final list of publications.

VALIDITY OF THE SEARCH STRATEGY

In every step of the search query, the search results were reviewed to check the publication yield. The search strategy was adjusted if known relevant publications were not captured in the search. Careful screening of the title and abstract (if available) was done to ensure the validity of search results. The methodological rigor of the study was reviewed and validated by a bibliometric analysis expert.

DATA ITEMS AND DATA EXTRACTION

The Scopus search output was exported into several formats, including CSV (for screening, classification, analysis, and visualization), RIS (for screening duplicates in EndNote), and BibTex (for analysis). All fields were exported, including the broad categories citation information, bibliographic information, abstract and keywords, funding details (where available) and cited references.

Bibliometric information recorded from the online Scopus analysis include the following:

- Author names (with number of publications by author)
- Source title (with number of citations by source)
- Institution or organization name (with number of publications by institution/ organization)
- Country name from author affiliation address in Scopus (with number of publications by country)
- Publication type (with number of publications by type)
- Subject area (as defined by Scopus)
- Author and index keywords
- Funding source (number of publications by source)

Note that the validation and checking of 'included' publications were done at the screening stage in MS Excel. The entries (i.e., tagging of theme, subtheme, migrant/ mobility topic, and country topic) were checked for consistency and were cleaned prior to the compilation and extraction of the 'final list' of publications. The 'final list' of publications were then searched and compiled using the 'list' and 'document search' features (using 'DOI' or 'publication title') in Scopus. This list was then exported and validated using the Scopus assigned unique ID.

BIBLIOMETRIC ANALYSIS

Scopus, Biblioshiny, and MS Excel were used to analyze bibliometric information, including authors, citations, publications, and sources (or journals). Scopus has a built-in analysis function that can generate a list of leading publications, sources (or journals), authors, country author affiliations, institutions or organizations, and aggregates of publication types, and subject areas. Further analyses were done on the leading authors, publications, and sources (or journals) using the profile feature available in Scopus. Biblioshiny is an open-source web-interfaced bibliometrics tool that uses the R program, a statistical software [39]. Biblioshiny provides metrics on intra-country (SCP) and inter-country (MCP) collaboration. MS Excel was used to produce the counts and percentages of publications by theme, subtheme, migrant topic, and country topic/coverage.

CITATION ANALYSIS

The two bibliometric tools (Scopus, Biblioshiny) provided the number of citations received for each publication and allowed the sorting of publications based on the number of citations. Scopus has a built-in feature for comparing journal metrics. For this study, SCImago Journal Rank (SJR) was extracted. The SJR indicator measures the scientific influence of scholarly journals, where higher SJR values are meant to indicate greater journal prestige. A journal's SJR indicates the average number of weighted citations received during a selected year per document published in that journal during the previous three years [40]. Note that the citation counts were extracted in October 2021.

NETWORK VISUALIZATION MAPPING

VOSviewer version 1.6.15 [41], a software tool for constructing and visualizing bibliometrics networks, was utilized to analyze and visualize the networks of co-authorship relations between author, countries, and institution, and co-occurrence relations between keywords. To present a clean map, VOSviewer thesaurus files were prepared to standardize terms and exclude generic and out-of-scope terms.

The fractional counting method was selected in creating the co-authorship and co-occurrence keyword network maps. In the authors' network map, fractional counting means that the strength of a co-authorship between two authors accounts for the number of publications they co-authored and the total number of authors of each of the co-authored publications. Therefore, each publication has the same overall weight [42].

A threshold number (i.e., number of occurrences of keywords and number of co-authored publications) was set for each type of map. To present a clean map, VOSviewer thesaurus files were prepared to standardize terms and exclude generic or out-of-scope terms. In the keyword maps, for example, coronavirus-related terms, generic terms (e.g., health survey, diseases, humans, viral disease), and type of publication or study (e.g., article, case report, editorial) were excluded. Further, commonly cited keywords which are often linked with COVID-19, including 'pneumonia', 'pandemic', 'epidemic', and 'outbreak' were excluded to better reflect clarity in the visualization.

Network visualization mode in Vosviewer was used in the creation of all network maps. Table 1 lists the bibliographic data used for the four visualization network maps (i.e., authorship, institution, country, and keyword networks) [43]. Items in networks are represented by circles. A network consists of a set of items linked together by lines. A network map contains at least one cluster; each cluster is represented by a different color. The maps generated only present those networks with the largest set of links or connections. For example, the size of the circle represents the more frequently occurring keyword or the highest number of co-authored publications in the retrieved set of publications from Scopus. The strength of links indicates the number of publications that two authors have co-authored (for co-authorship links) or the number of publications in which two keywords occur together (for co-occurrence links). The distance between two items in the visualization indicates the relatedness (i.e., co-authorship or co-occurrences) of items. The shorter the distance between two items, the stronger the relatedness. Colors represent clusters of items that are relatively strongly related to each other based on their co-occurrence in the bibliometric data (i.e., not necessarily a conceptual link).

For this study, visualization mapping of authors was excluded from the results. It was observed that many authors had similar initials that crowded the mapping and were found to be inconsistent with the author analysis results using Scopus and MS Excel. Thus, the mapping may not show the true co-authorship network. Note that Vosviewer captures data using the recorded author name. On the other hand, Scopus has a built-in validation feature of author names using an assigned unique author ID.

Table 1. Bibliographic data used in creating the visualization network maps in VOSviewer

Links*	Items**	Network
Co-authorship	Institutions/ Organizations	Institution collaboration
	Authors	Author collaboration
	Countries	Country collaboration
Co-occurrences	Keywords***	Keyword co-occurrences network

* A connection or a relation between two items in a visualization network map, represented by lines.

** Refers to the specified bibliographic data that will be used in the network mapping.

*** For this study, both author and indexed keywords were selected to ensure thorough coverage, especially because some publications do not include author keywords (i.e., keywords chosen by authors themselves). The indexed keywords are keywords chosen by Scopus content suppliers and are standardized based on publicly available vocabularies.

RESEARCH THEMES AND SUBTHEMES

The retrieved publications were classified into themes and subthemes reflective of the relevant migration health-related topics and IOM's COVID-19 Strategic Preparedness and Response Plan (SPRP) [29]. Below is a description of each of the themes and subthemes:

1. Public health intervention

Description: Publications that cover topics on any combination of program elements or strategies related to addressing COVID-19-related health concerns in different populations.

Subthemes: Government measures; travel-related measures (e.g., travel restrictions and point-of-entry health screening); disease surveillance; community screening; case identification and management; contact tracing and management; personal protective measures (e.g., face masks and hand washing); social distancing measures (e.g., city lockdown and quarantine); environmental measure (e.g., disinfection of public spaces); health education; health promotion (e.g., awareness campaign); and mental health support.

2. Health system capacity

Description: Publications involving topics related to health system capacity.

Subthemes: Health systems; leadership and governance (e.g., legal frameworks); health workforce (i.e., adequacy and capacity); medical products, vaccine, and technology (i.e., availability and procurement); health facility information (e.g., patient database); health financing; service delivery; continuity of routine health programs (e.g., maternal, child and reproductive health); and, coordination and partnerships (i.e., coordination among relevant actors to support the pandemic response).

3. Clinical management

Description: Publications that cover topics on characterizing the disease based on observing actual patients, treatment algorithms, management of patients and preventing and controlling infections (i.e., patient-level management).

Subthemes: Clinical examination; clinical characterization (i.e., symptoms, characteristics, and disease progression); clinical guidance; and clinical management (e.g., patient-level supportive treatment).

4. Candidate therapeutics and vaccine

Description: Publications that cover topics on the use of potential therapeutics (existing therapeutics) and vaccines (development of new ones).

Subthemes: Potential therapeutics; and candidate vaccines.

5. Disease epidemiology and mathematical modelling

Description: Publications that cover topics on disease etiology, distribution, and potential determinants (may include epidemiological approaches or other mathematical modelling).

Subthemes: disease etiology (e.g., virus origin, viral structure); disease transmission; disease distribution (e.g., frequency, pattern); disease determinants (e.g., exposure variables and importation risks); and mathematical modelling.

6. Diagnostic and testing strategies

Description: Publications that cover topics on diagnostic procedures and tests for COVID-19.

Subthemes: Diagnostic procedures; and COVID-19 tests.

7. Impact assessment and policy analysis

Description: Publications that cover topics on socio-economic and health impact of COVID-19, health policy analysis and health diplomacy.

Subthemes: Cost-effective analysis; socio-economic analysis; and health impact analysis.

8. Migrant-specific themes

Description: Publications that cover topics specific to migrant support services.

Subthemes: Camp coordination and management (i.e., refugee camp and displacement site level); and migrant protection (i.e., support services or programs for migrant health protection).

Classification of themes and subthemes of relevant publications were on the careful review of abstracts (and/or full text if not available). These were then randomly checked and/or validated.

MIGRATION, MOBILITY AND COUNTRY TOPIC/COVERAGE

Migrants and mobile populations (e.g., international students, tourists, migrant workers, immigrants, refugees, asylum seekers, displaced population, travelers, and patient mobility) were identified in the set of retrieved publications. Publications with no specific migrant or mobile population group were screened for terms relevant to 'human mobility' (i.e., travel, transportation, and any form of movement within and across countries). The search terms were applied in the publication title and abstract (if needed and available).

Further, 'country topic/coverage' was determined by scanning the title and abstract (if needed and available) of the publications. The term 'country topic/coverage' refers to the country or countries identified as the main topic of the publication (i.e., where the study was implemented, where the data used in the study was obtained, or the country of citizenship and/or origin of the study population).

RESULTS

Number, type, and subject area of retrieved publications

The search retrieved a total of 1,953 publications from 159 different sources with three or more publications on COVID-19 and migration health, published from 1 January 2020 to 31 December 2020. Majority of the retrieved publications were research articles⁴ (59.9%, n=1170) followed by letters⁵ (13.6%, n=265), notes⁶ (9.7%, n=189), reviews⁷ (8.1%, n=159), and editorials⁸ (4.2%, n=82), short surveys⁹ (1.1%, n=22), data papers¹⁰ (0.4%, n=8), book chapter¹¹ (0.1%, n=8), and erratum¹² (0.1%, n=1). More than half of the publications were on medicine (61.0%, n=1191)¹³, followed by the following: social sciences (21.1%, n=413); environmental science (7.6%, n=148); biochemistry, genetics and molecular biology (5.9%, n=116); immunology and microbiology (5.8%, n=114); business management and accounting (5.3%, n=108); and, multidisciplinary (5.1%, n=100). Only a few of the publications were on engineering (4%, n=79), computer science (3.9%, n=76), economics, econometrics and finance (3.6%, n=71), and arts and humanities (3.1%, n=61), and others.¹⁴ The subject categories are not mutually exclusive.

The study flowchart shows the steps in the search strategy and the number of retrieved publications in each step (Figure 1). The complete search strategy is available in the appendices section.

⁴ Scopus definition: Original research or opinion.

⁵ Scopus definition: Letter or correspondence with the editor.

⁶ Scopus definition: Note, discussion or commentary.

⁷ Scopus definition: Significant review of original research, also includes conference papers. The two review articles in this study pertain to the following topics: (1) an overview of the COVID-19 outbreak; and, (2) a review of publications on the effects of SARS, MERS, and other coronavirus infections on pregnant women and their infants. Reviews refers to an article with a significant review of original research, also includes conference papers. (Elsevier, 2017).

⁸ Scopus definition: Summary of several articles or provides editorial opinions or news.

⁹ Scopus definition: Short or mini-review of an original research. NB: short surveys are similar to reviews, but usually are shorter (not more than a few pages) and with a less extensive bibliography.

¹⁰ Scopus definition: Searchable metadata documents describing an online accessible dataset, or group of datasets.

¹¹ Scopus definition: A complete chapter in a book or book series volume where the item is identified as a chapter by a heading or section indicator.

¹² Scopus definition: Report of an error, correction, or retraction of a previously published paper. In this study, the erratum publication was a correction of a previously published article in the same journal. This was included because the link to the original publication was not available in Scopus at the time of extraction.

¹³ Denominator, n=1953. Note that subject areas are not mutually exclusive; the total percentage is more than 100%.

¹⁴ Other publications (n≤60 publications) include the following: mathematics, agricultural and biological sciences, decision sciences, health professionals, nursing, pharmacology, toxicology and pharmaceuticals, etc.

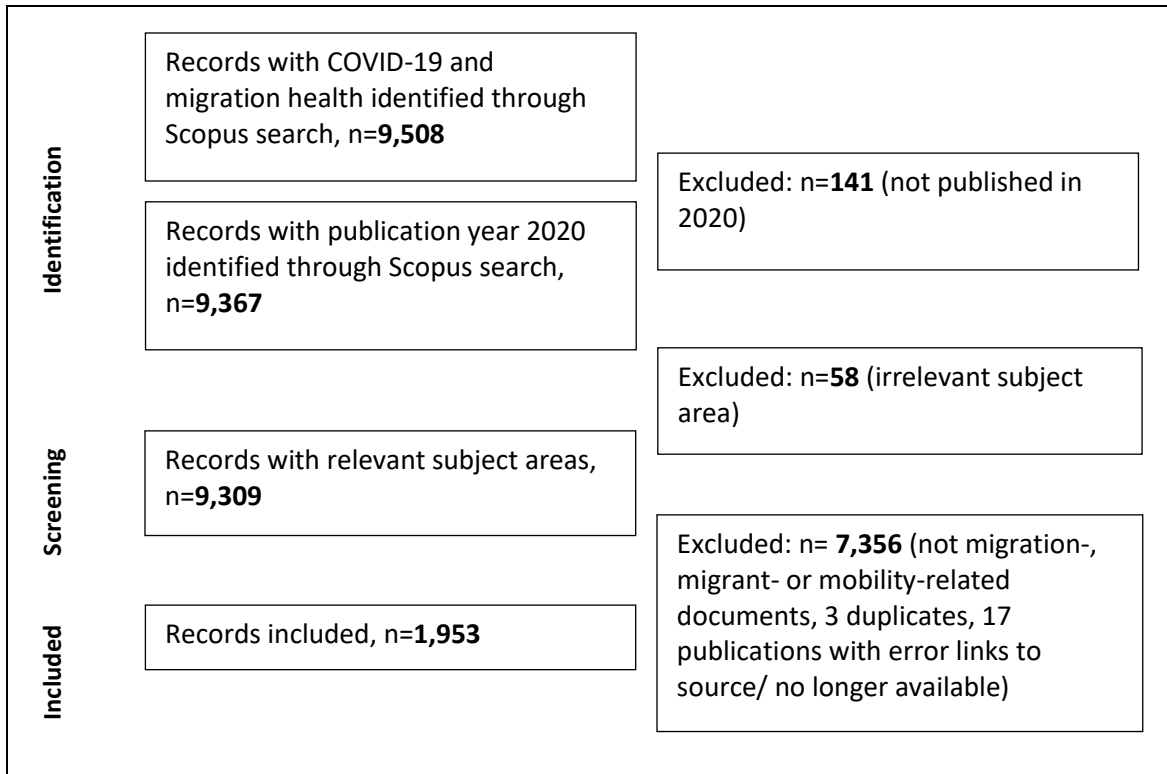


Figure 1. Search and Selection Flow Chart

Top active authors and research networks

A total of 159 authors with three or more publications, were found in the retrieved publications, with a mean of 4.78 authors per publication. About 16 percent (n=303) of the publications were single-authored publications, while the remaining were multi-authored (≥ 4 authors) publications. The top active authors and list of authored or co-authored publications by the lead author are listed in Tables 2 and 3, respectively. The lead author (Wiwanitkit Viroj, V.) has co-authored most of the publications with fellow authors from Asia (Table 3). The second active author affiliated from the United Kingdom and the United States (Kraemer, M.) has co-authored six publications with the fifth ranking author from the United States of America (Pybus, OG). There were three authors that had affiliations from Hong Kong Special Administrative Region of China and China (Table 2).

Table 2. List of most active* authors on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Author	n	%	C	Affiliation**	Country***
1	Wiwanitkit Viroj, V.	16	0.8	18	2017 - 2020 D Y Patil University, Navi Mumbai, Navi Mumbai, India 2019 - 2020 Patil University, Pune, India 2020 DY Patil University, India 2020 TWS Medical Center, Bangkok, Thailand 2020 Medical University, Wuxi, China	India, China, Thailand
2	Kraemer, Moritz U.G.	12	0.6	2600	2014 - 2021 University of Oxford, Oxford, United Kingdom 2017 - 2021 Harvard University, Cambridge, United States 2017 - 2021 Children's Hospital Boston, Boston, United States 2017 - 2021 Harvard Medical School, Boston, United States 2021 University of California, San Francisco, San Francisco, United States	United Kingdom, United States
3	Zhao, Shi	10	0.5	611	2017 - 2021 Hong Kong Polytechnic University, Kowloon, Hong Kong 2020 - 2021 Chinese University of Hong Kong, Hong Kong, Hong Kong 2020 - 2021 The Chinese University of Hong Kong, Shenzhen, Shenzhen, China	China, Hong Kong SAR
4	He, Daihai	9	0.5	599	2013 - 2021 Hong Kong Polytechnic University, Kowloon, Hong Kong	Hong Kong SAR
5	Pybus, Oliver George	9	0.5	2017	1999 - 2021 University of Oxford, Oxford, United Kingdom 2020 - 2021 Royal Veterinary College University of London, London, United Kingdom	United Kingdom
6	Yang, Lin	8	0.4	571	2014 - 2021 Hong Kong Polytechnic University, Kowloon, Hong Kong 2021 Fudan University, Shanghai, China	China, Hong Kong SAR

7	Bogoch, Isaac Israel	7	0.4	362	2004 - 2021 University of Toronto, Toronto, Canada 2009 - 2021 University Health Network University of Toronto, Toronto, Canada 2012 - 2021 Toronto General Hospital, Toronto, Canada 2013 - 2021 University Health Network, Toronto, Canada 2021 Réseau Universitaire de Santé, Toronto, Canada	Canada
8	Colizza, Vittoria	7	0.4	741	2011 - 2021 Inserm, Paris, France 2011 - 2021 Sorbonne Universite, Paris, France 2014 - 2021 Institut Pierre Louis d'Epidémiologie et de Santé Publique, Paris, France 2020 - 2021 Tokyo Institute of Technology, Tokyo, Japan	France, Japan
9	Flasche, Stefan	7	0.4	1269	2013 - 2021 London School of Hygiene & Tropical Medicine, London, United Kingdom 2021 University of Cambridge, Cambridge, United Kingdom 2021 Faculty of Mathematics, Cambridge, United Kingdom	United Kingdom
10	Rodriguez- Morales, Alfonso J.	7	0.4	333	2012 - 2021 Universidad Tecnológica de Pereira, Pereira, Colombia 2014 - 2021 Asociación Colombiana de Infectología, Bogota, Colombia 2018 - 2021 Universidad Franz Tamayo/UNIFRANZ, Cochabamba, Bolivia 2018 - 2021 Universidad Privada Franz Tamayo UNIFRANZ, Cochabamba, Bolivia 2019 - 2021 Colombian Association of Infectious Diseases ACIN, Bogota, Colombia	Colombia, Plurinational State of Bolivia

N= total number of publications; C = total number of citations (as of 5 October 2021)

*Refers to authors with 7 or more authored/ co-authored publications.

**Refers to author affiliated institutions/ organizations in 2020-2021. Taken from the Scopus author profile on 4 Oct 2021.

***Refers to country address of the author affiliated institution/ organization in 2020-2021. See affiliation note.

Table 3. List of publications authored/ co-authored by the leading active* author on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Author	County**	Title	Source	C
1	Mungmunpantipantip R., Wiwanitkit V.	Thailand, India, China	Afebrile Wuhan Coronavirus Infection and Expected False Negative of Thermoscanning for Screening of Immigrant	Journal of Medical Sciences (Taiwan)	0
2	Joob B., Wiwanitkit V.	Thailand, India	COVID-19 and migrant workers: Lack of data and need for specific management	Public Health	2
3	Joob B., Wiwanitkit V.	Thailand, India, China	2019 novel coronavirus and awareness	Journal of the Chinese Medical Association	0
4	Sriwijitalai W., Wiwanitkit V.	Thailand, India, China	Incidence of COVID-19 among immigration police: Observation from Thailand	Medical Journal Armed Forces India	0
5	Wiwanitkit V.	India	COVID-19, detection in a country and treatment in another country – issue on international referral	JMS - Journal of Medical Society	0
6	Wiwanitkit V., Joob B.	Thailand, India, China	Density of COVID-19 and mass population movement during long holiday: Simulation comparing between using holiday postponement and no holiday postponement	Journal of Research in Medical Sciences	1
7	Sookaromdee P., Wiwanitkit V.	Thailand, India, China	Precautions list of risk countries with COVID-19 for primary prevention: Experience on case traveling from the country out of the list	International Journal of Preventive Medicine	0
8	Mungmunpantipantip R., Wiwanitkit V.	Thailand, India, China	Spreading from hot foci of COVID-19 to another country: Observation from Thailand on disease importation by foreigner	International Journal of Preventive Medicine	0
9	Yasri S., Wiwanitkit V.	Thailand, India, China, Nigeria	Total distance and radius of wandering of patients with COVID19 before the first final diagnosis: GPS tracking analysis	International Journal of Preventive Medicine	0
10	Apaijitt P., Wiwanitkit V.	Thailand, India, China	Recognition on Possibility of No-Fever and No-History of Travel to Risk Country among Nurse in Rural Area of a Country That COVID-19 Already Existed: Observation	International Journal of Preventive Medicine	0

11	Sriwijitalai W., Wiwanitkit V.	Thailand, India, China	COVID-19 outbreak in international airport - Where the incidence case occurs?	International Journal of Preventive Medicine	0
12	Joob B., Wiwanitkit V.	Thailand, India, China	Patients with COVID-19 and disguising on travel history: A challenge in disease screening	International Journal of Preventive Medicine	1
13	Yasri S., Wiwanitkit V.	Thailand, India, China	Exported Wuhan novel coronavirus infection: An expected rate with reference to main destination of Chinese tourist, Thailand	International Journal of Preventive Medicine	3
14	Sriwijitalai W., Wiwanitkit V.	Thailand, India, China	Positive screening for Wuhan novel coronavirus infection at international airport: What's the final diagnosis for positive cases	International Journal of Preventive Medicine	10
15	Sookaromdee P., Wiwanitkit V.	Thailand, India, China	Imported Wuhan coronavirus infection: Is there any correlation with number of immigrants from endemic area and period after the first outbreak?	International Journal of Preventive Medicine	0
16	Yasri S., Wiwanitkit V.	Thailand, India, China	COVID-19, guests and crews of cruise: Observation on Thai citizens	International Maritime Health	1

C = total number of citations

*Refers to top author by number of authored/ co-authored publications (see Table 2).

**Refers to the country address of author affiliated institution/ organization. Listed country is from the records of all recorded authors of the publication. See affiliation note.

Most active countries by authors' affiliation

The authors of retrieved publications came from over 128 countries¹⁵. The country information in Scopus was taken from the authors' affiliated institution or organization address in the retrieved publications. United States ranked first in the list of most active countries with 478 publications having at least one author affiliated to United Kingdom (15.06%, 72 out of 478) and China (12.55%, 60 out of 478), followed by China with 320 publications. It was noted that China has the highest number of citations and research collaborations. Authors from these countries have the greatest number of collaborations with other countries. There were no countries from Africa, South America and the Caribbean, and Middle East (Table 4) in the list of most active countries.

Table 4. List of most active* countries by authors' affiliation** on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Country	n	%	C	SCP***, n (%)	MCP***, n (%)
1	United States	478	24.5	23953	158	57
2	China	320	16.4	29351	168	66
3	United Kingdom	262	13.4	17433	50	46
4	India	173	8.9	2203	79	8
5	Italy	124	6.3	5677	51	17
6	Australia	110	5.6	2351	35	23

C = total number of citations; SCP = single country partnership, means that the authors of a publication come from the same country; MCP = multiple country partnership, means that the authors of a publication come from different countries

*Countries with 100 or more publication in Scopus.

**This is based on the recorded author affiliation address from the retrieved publications in Scopus.

***SCP and MCP counts were taken from Biblioshiny.

¹⁵ There were 78 publications with undefined country author affiliation.

Most active international research collaborations

The network visualization map shows the largest set of international research collaboration among the active countries in the field of COVID-19 and migration health formed three clusters (Figure 2). The map clearly shows that the countries with the greatest number of co-authored publications (represented by the size of the circles) were the United States, China, and the United Kingdom. The thickness of the line connecting countries represents the strength of research collaboration between two countries. International research collaboration appears to be strongest between the United States and United Kingdom, followed by the United States and China, and the United Kingdom and China. Further, the map showed a strong link between China and the Hong Kong Administrative Region of China and India. The red cluster consists of 13 countries, namely: United States, United Kingdom, Italy, Germany, Canada, Spain, France, South Africa, Switzerland, Brazil, Sweden, Netherlands, and Turkey. The green cluster consists of China, India, Hong Kong Special Administrative Region of China, Singapore, Taiwan, Malaysia, Saudi Arabia, and the Republic of Korea. The blue cluster includes Australia and Japan.

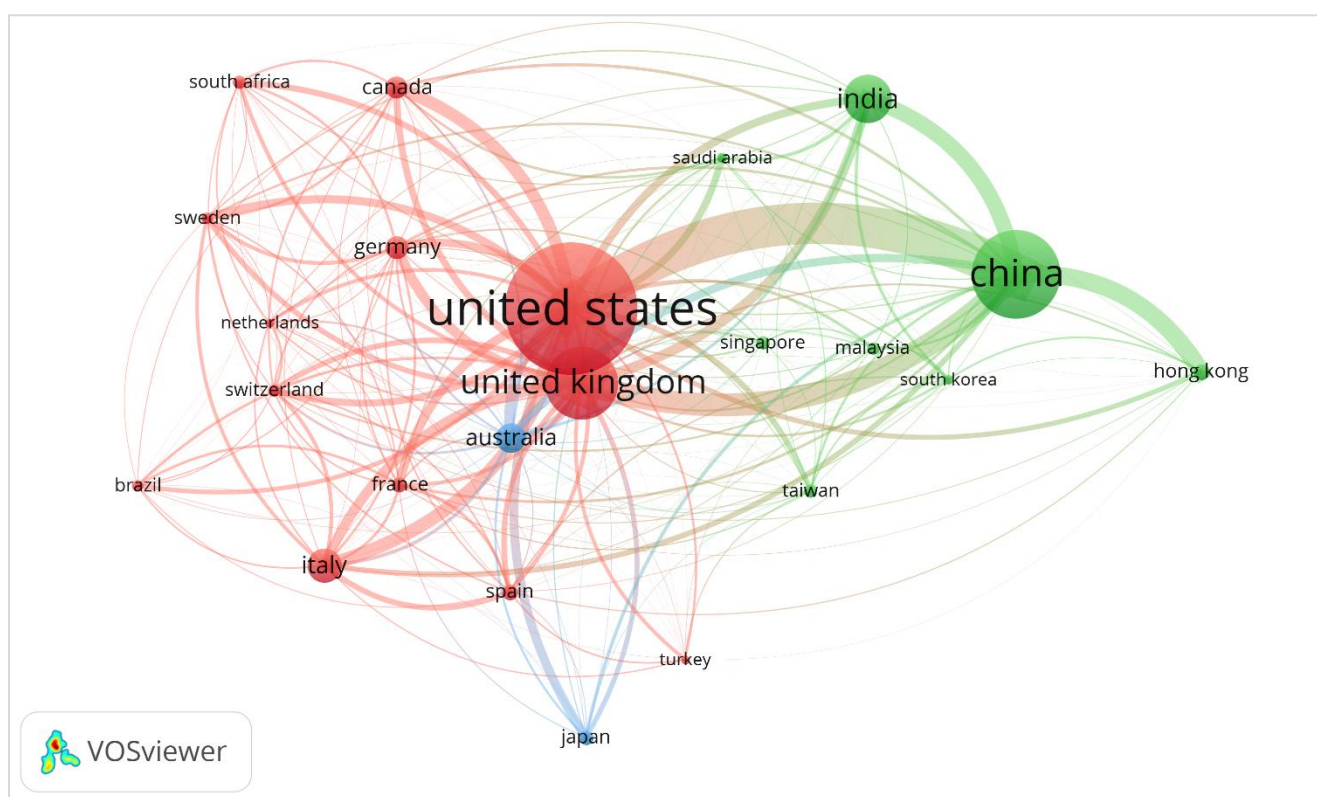


Figure 2. Network visualization map (international research collaboration) of countries active on COVID-19 and migration health (linked by co-authorship) with a minimum of 30 co-authored publications

Most cited country topic or coverage of study

Approximately 29 percent of the retrieved publications were about China ($n=309$), followed by the United States (9.2%, $n=180$), India (5.8%, $n=113$), Italy (3.9%, $n=77$), and United Kingdom (2.8%, $n=55$). Other countries covered less than 50 publications. Note that some publications may cover two or more countries.

Most preferred journals

The retrieved publications were published in over 800 journals, of which 159 had three or more publications. The most preferred journals were International Journal of Environmental Research and Public Health (2.0%, n=39), Travel Medicine and Infectious Disease (2.0%, n=39), Journal of Travel Medicine (1.9%, n=38), Plos One (1.8%, n=35), and The Lancet (1.6%, n=31). Table 5 shows the list of top journals with 19 or more publications and the corresponding publisher and subject areas, nearly all were categorized as high (Q1) ranking journals. Majority of the active journals were published from the Netherlands, and United States. Half of the active journals were in the field of infectious diseases. There were three journals on public health, three on environmental and occupational health, and three on general medicine. Note the overlapping of publications in terms of subject areas.

Table 5. List of top* journals on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Source/ Journal Title	n	%	C	Publisher	Country	Subject area (category)**	SJR***
1	International Journal of Environmental Research and Public Health	39	2.0	723	Frontiers Media S.A	Switzerland	Medicine: Public health, environmental and occupational health Environmental Science: Pollution Environmental Science: Health, Toxicology and Mutagenesis	0.747
2	Travel Medicine and Infectious Disease	39	2.0	847	Elsevier	Netherlands	Medicine: Public health, environmental and occupational health; infectious diseases	1.209
3	Journal of Travel Medicine	38	1.9	1746	Oxford University Press	United Kingdom	Medicine: Public health, environmental and occupational health; Infectious diseases	1.985
4	Plos One	35	1.8	474	Public Library of Science	United States	Multidisciplinary	0.99
5	Lancet Infectious Diseases	31	1.6	5225	Elsevier	Netherlands	Medicine: infectious Diseases	7.475
6	The Lancet	29	1.5	9337	Elsevier	Netherlands	Medicine: General medicine	13.103
7	International Journal of Infectious Diseases	26	1.3	1810	Elsevier	Netherlands	Medicine: Infectious diseases; Microbiology (medical)	1.278
8	Emerging Infectious Diseases	21	1.1	1433	Center for Disease Control and Prevention (CDC)	United States	Medicine: Infectious diseases; microbiology (medical); epidemiology	2.54
9	Journal of the American Medical Association (JAMA)	20	1.0	5026	American Medical Association	United States	Medicine: General medicine	4.688
10	The BMJ	19	1.0	403	BMJ Publishing Group	United Kingdom	Medicine: General Medicine	1.831

*Refers to journals with the greatest number of publications, 19 or more.

**Subject area and category taken from the Source Profile in Scopus on 5 October 2021.

*** SJR rank refers to journal ranking quartiles within a subdiscipline using the SJR citation index. Thus, a first quartile journal (i.e., Q1) has an SJR in the top 25% of journals for at least one of its classified subdisciplines. The SJR indicator accounts for both the number of citations received by a journal and the importance or prestige of the journals where the citations come from [40].

Most active institutions

The most active institutions or organizations (i.e., with 21 or more publications) are shown in Table 6. The London School of Hygiene and Tropical Medicine from the United Kingdom ranked first with 43 publications, followed by the University of Hong Kong with 38 publications, the Harvard Medical School from the United States (n=33), and the University of Oxford from the United Kingdom (n=33).

Table 6. List of top* institutions or organizations on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Institution/ Organization	n	%	Country
1	London School of Hygiene & Tropical Medicine	43	2.2	United Kingdom
2	The University of Hong Kong (HKU)	38	1.9	Hong Kong SAR
3	Harvard Medical School	33	1.7	Unites States
4	University of Oxford	33	1.7	United Kingdom
5	Ministry of Education China	26	1.3	China
6	Chinese University of Hong Kong	26	1.3	Hong Kong SAR
7	Harvard University	26	1.3	United States
8	University College London	25	1.3	United Kingdom
9	Harvard T.H. Chan School of Public Health	24	1.2	United States
10	Johns Hopkins Bloomberg School of Public Health	22	1.1	United Kingdom
11	Imperial College London	22	1.1	United Kingdom
12	The University of New South Wales (UNSW)	22	1.1	Australia
13	The University of Sydney	21	1.1	Australia
14	The University of Hong Kong Li Ka Shing Faculty of Medicine (HKUMed)	21	1.1	Hong Kong SAR

*Refers to institutions or organizations with the greatest number of publications, 21 or more.

Research collaboration among institutions/ organizations

The visualized map (Figure 3) of institutions showing the highest number of research collaborations (in terms of co-authorship) formed three clusters. The University of Oxford, United Kingdom, has the highest number of co-authored publications (n=7), represented by the biggest bubble. This institution has collaborated with the Boston Children's Hospital, USA, Harvard Medical School, USA, and the University of Toronto, Canada (red cluster). In the green cluster, the Ministry of Education, China collaborated with the University of Southampton, United Kingdom and the University of Washington, USA. The smallest cluster (green) showed collaboration between the ISI Foundation, Italy and London School of Tropical Health Medicine, United Kingdom.

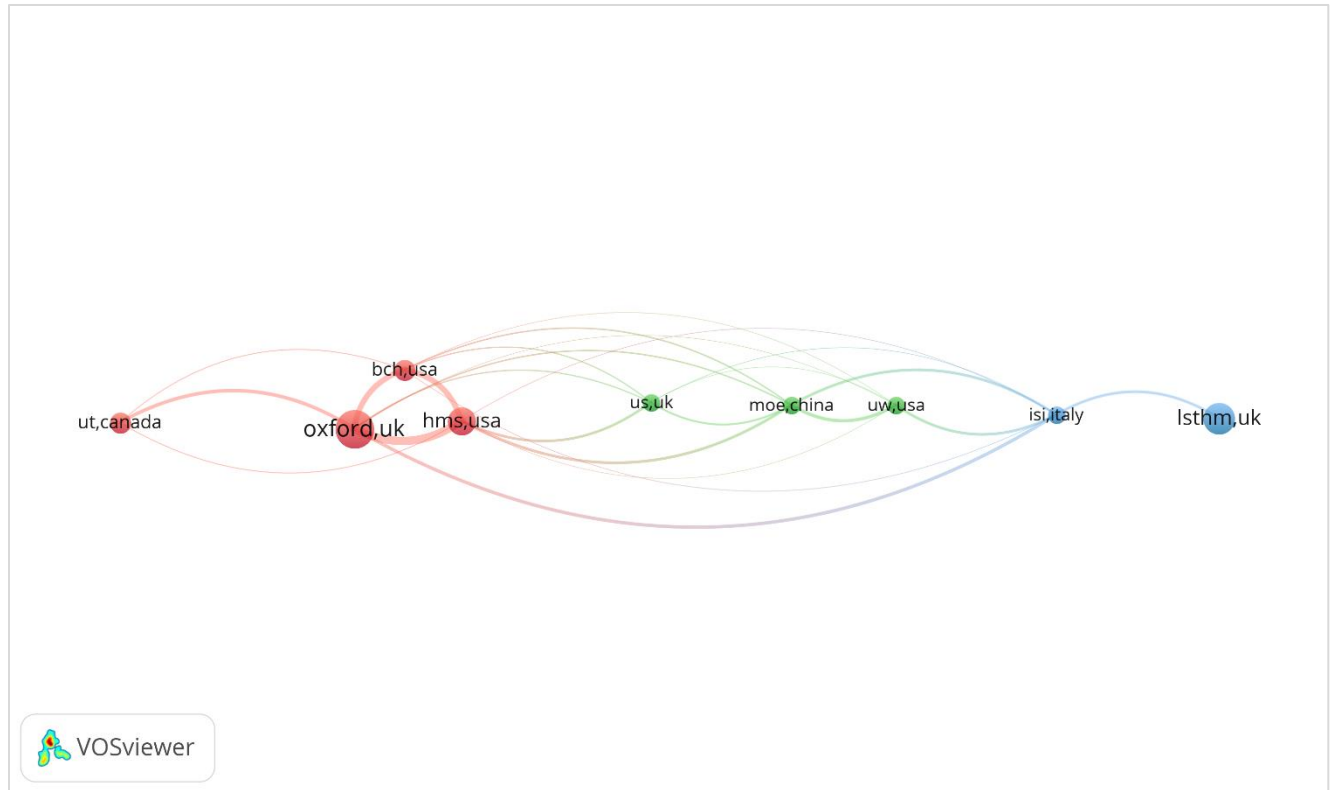


Figure 3. Network visualization map (research collaboration) of institutions on COVID-19 and migration health (linked by co-authorship) with a minimum of five co-authored publications (bch,usa = Boston Children's Hospital, United States; hms,usa = Harvard Medical School, United States; oxford,uk = University of Oxford, United Kingdom; ut,Canada = University of Toronto, Canada; moe,china = Ministry of Education, China; us,uk = University of Southampton, United Kingdom; uw,usa = University of Washington, United States; isi,Italy = ISI foundation, Italy; lsthm,uk = London School of Tropical Health and Medicine, United Kingdom)

Citation analysis and top cited articles

The retrieved documents received 2,669 citations with an average of 9.7 citations per document. Nearly all the top cited publications involved disease epidemiology and management, specifically disease transmission (Table 7). The majority of the list of top cited publications were authored in China and Hong Kong Administrative Region of China. The article that received the highest citation presents the epidemiological, clinical, laboratory, radiological, and microbiological findings of five patients in a family cluster who presented with unexplained pneumonia after returning to Guangdong province, China, following a visit to Wuhan, and an additional family member who did not travel to Wuhan.

Table 7. List of most cited publications on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Title	Journal	C	Publication type	Country*
1	A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster	The Lancet	504	Article	China, Hong Kong SAR
2	Pathological findings of COVID-19 associated with acute respiratory distress syndrome	The Lancet Respiratory Medicine	227	Article	China
3	Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study	The Lancet	200	Article	Hong Kong SAR
4	Presumed Asymptomatic Carrier Transmission of COVID-19	JAMA - Journal of the American Medical Association	150	Letter	China, Hong Kong SAR
5	Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan	Emerging Microbes and Infections	108	Article	China, Hong Kong SAR
6	Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2)	Science (New York, N.Y.)	76	Article	United States, United Kingdom, China, Hong Kong SAR
7	Incubation period of 2019 novel coronavirus (2019- nCoV) infections among travelers from Wuhan, China, 20 28 January 2020	Eurosurveillance	65	Review	Netherlands
8	Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020	Eurosurveillance	44	Review	United States, United Kingdom, Japan
9	Evidence of SARS-CoV-2 infection in returning travelers from Wuhan, China	New England Journal of Medicine	42	Letter	Germany
10	The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned?	International journal of epidemiology	41	Article	China, Bangladesh, Islamic Republic of Iran, Malaysia, United States

*Refers to the authors' country affiliation as recorded in Scopus as of 5 October 2021. C=number of citations

Migrant and mobile population

Approximately 22 percent (n=426) of the retrieved publications mentioned or referred to a 'migrant' in the title or abstract (Table 8). Of this figure, specific migrant groups were as follows: migrant workers (33.1%, n=141), immigrants (26.1%, n=111), returning migrants (6.8%, n=29), undocumented migrants (6.6%, n=28), migrants in detention (3.5%, n=15), irregular migrants (0.5%, n=2), and migrant families, dependents, and children (n=10).

Of the retrieved publications, about 22 percent mentioned 'travelers' (n=426), wherein 24 percent (n=100) involved China. Approximately 12 percent of the publications included the term 'refugee' (n=112) and 'tourist' (n=122). Less than 7 percent covered international students (n=45), asylum seekers (n=44), displaced population (n=32), and patient mobility (n=8). The rest of the retrieved publications pertain to travel or mobility within and across international borders.

Table 8. Number of publications by migrant or mobile population group*, 1 January 2020 to 31 December 2020 (N=1,953)

Migrant group/ mobile population	N	%
Migrants**	426	21.8
Travelers***	426	21.8
Tourists	122	6.2
Refugees	112	5.7
International students	45	2.3
Asylum seekers	44	2.3
Displaced population****	32	1.6
Patient mobility	8	0.4

*Includes publications with the search terms specific to a migrant group or mobile population; the study population, source data, or main topic covered in the publication.

**Includes 'migrant workers' (n=141), 'immigrants' (n=111, n=12 in detention), 'returning migrants' (n=29), 'undocumented migrants' (n=28), 'migrants in detention' (n=15), 'migrant families, dependents and children' (n=10), and 'irregular migrants' (n=2). Note that there were 104 publications that covered 'migrants' only, with no specific migrant group mentioned.

***Includes 'returning travelers' (n=44)

****Includes 'internally displaced population' (n=22)

Research themes

The majority of the retrieved publications were on: (1) public health measures (42.7%, n=833) 47 percent of which involved social distancing measures; (2) disease epidemiology and modelling (28.2%, n=550) with about 35 percent of this covering topics on mathematical modelling; and, (3) impact assessment and policy analysis (17.5%, n=342) with about 77 percent of publications on socio-economic analysis. Other research themes included the following: health system capacity (10%, n=196); migrant-specific themes (9.5%, n=186); clinical management (8.3%, n=163); diagnostic testing and strategies (2.3%, n=45); and, candidate therapeutics and vaccine (0.8%, n=15). The number of publications by theme and subtheme is shown in Tables 9 and 10. The classification of themes and subthemes was not mutually exclusive – some publications may be classified under two or more themes.

Table 9. Number of publications by theme on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

No.	Research Theme	n	%
1	Public health intervention (PHI)	833	42.7
2	Disease epidemiology and mathematical modelling (DEM)	550	28.2
3	Impact assessment and policy analysis (IAPA)	342	17.5
4	Health system capacity (HSC)	196	10.0
5	Migrant specific themes (MST)	186	9.5
6	Clinical management (CM)	163	8.3
7	Diagnostic and testing strategies (DTS)	45	2.3
8	Candidate therapeutics and vaccines (CTV)	15	0.8

Table 10. Number of publications by theme and subtheme on COVID-19 and migration health, 1 January 2020 to 31 December 2020 (N=1,953)

Theme: PHI	n	%, N=833	Theme: DEM	n	%, N=550
Social distancing measures	392	47.1	Mathematical modelling	190	34.5
Travel-related measures	372	44.7	Disease transmission	173	31.5
Government measures	251	30.1	Disease distribution	157	28.5
Mental health & psychosocial support	108	13.0	Disease determinants	56	10.2
Contact tracing and management	55	6.6	Disease etiology	35	6.4
Personal protective measures	52	6.2			
Disease surveillance	33	4.0			
Health promotion	31	3.7			
Case identification and management	30	3.6			
Environmental measures	24	2.9			
Community screening	21	2.5			
Health education	17	2.0			
Theme: IAPA	n	%, N=342	Theme: HSC	n	%, N=196
Socio-economic analysis	264	77.2	Continuity of routine health programs*	75	38.3
Policy impact analysis	83	24.3	Health system	50	25.5
Cost-effective analysis	3	0.9	Service delivery	32	16.3
			Health workforce capacity	23	11.7
			Coordination and partnerships	22	11.2
			Leadership and governance (health sector)	16	8.2
			Medical products, vaccine and technology (availability, supply chain, procurement)	11	5.6
			Health financing	6	3.1
			Health facility information	2	1.0

Theme: MST	n	%, N=186
Migrant protection	163	87.6344
Camp coordination and management	39	20.9677
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Theme: DTS	n	%, N=45
Diagnostic procedures	28	62.2
COVID-19 tests	21	46.7

*at the time of COVID-19 pandemic

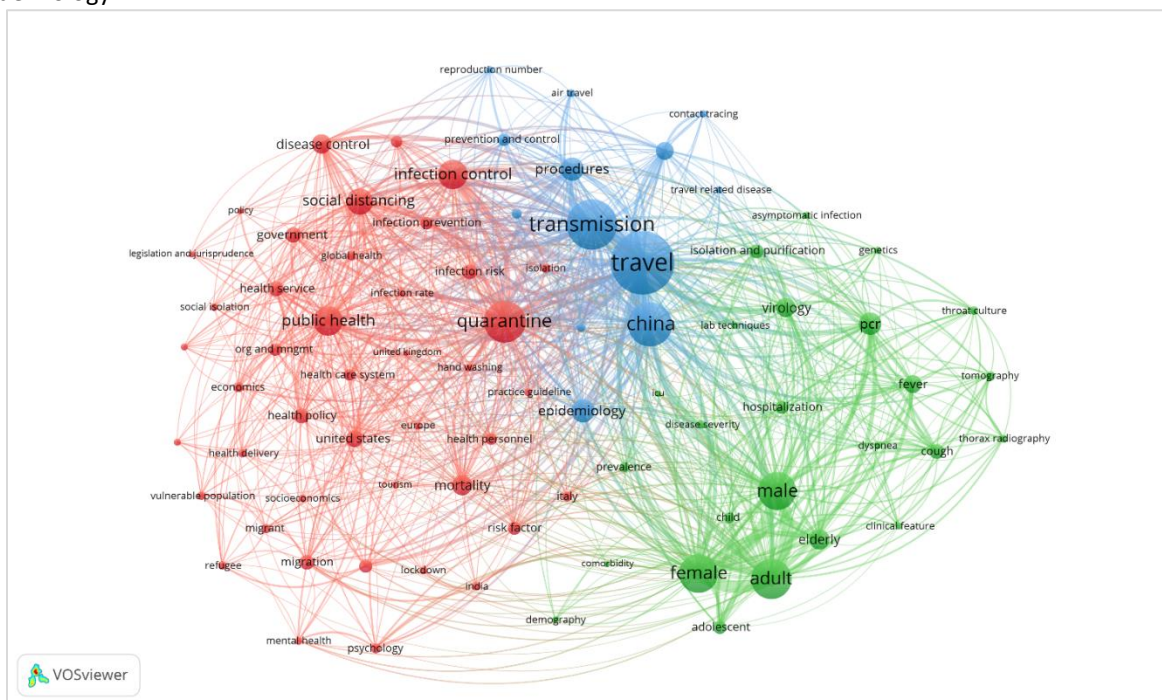
Theme: CM	n	%, N=163
Clinical characterization	139	85.3
Clinical examination	48	29.4
Clinical management	20	12.3
Clinical guidance	6	3.7
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Theme: CTV	n	%, N=15
Potential therapeutics	11	73.3
Candidate vaccines	6	40.0

Visualization of keywords

Mapping of frequently occurring keywords reveals a network or clusters of linked keywords. The selected maps show only those keywords with the largest network. The bubble size reflects the most frequently used keywords in the co-occurrence network, while the line thickness and color refer to link strength and clustering, respectively. By default, the clusters are represented by the colors: red, green, blue, and yellow denoting a range of cluster sizes from the largest (red) to the smallest (yellow).

The visualization of all keywords found in the retrieved publications revealed three clusters (red, green, and blue) consisting of 81 keywords (Figure 4). The map was dominated by keywords related to disease epidemiology (i.e., 'mortality', 'infection risk, risk factor', 'infection rate', etc.) and public health measures (i.e., 'quarantine', 'infection control', 'social distancing', 'disease control', 'lockdown', 'isolation', etc.). These were followed by keywords related to health system capacity (i.e., 'health service', 'health policy', 'health personnel', 'health care access', etc.) and diagnostic procedures (i.e., 'PCR', 'tomography', and 'isolation and purification', etc.), and clinical management and symptoms (i.e., 'practice guidelines', 'fever', 'cough', 'dyspnea', etc.). A few keywords were related to policy and economics, and migrant specific groups (i.e., 'migrant' and 'refugee'). There were no keywords on candidate therapeutics and vaccine.

In terms of the number of occurrences, the most encountered keywords were: 'travel' (n=563), 'transmission' (n=446), 'China' (n=395), 'quarantine' (n=374), 'adult' (n=359), 'female' (n=346), 'male' (n=342), 'infection control' (n=265), 'public health' (n=261), and 'social distancing' (n=239). The largest cluster (red) were mostly related to public health measures, disease epidemiology, and health system capacity. The keywords, 'refugee', 'migrant' and 'vulnerable population' are found in this cluster. The map revealed countries and region associated in these cluster include: 'United States', 'Italy', 'India', 'Europe', and 'United Kingdom'. The next cluster (green) were mainly related to population characteristics and diagnostic procedures. In the blue cluster, the term 'travel', 'transmission' and 'China' were strongly linked, this indicates the number of publications in which these keywords co-occurred. Majority of the associated terms in these clusters were related to public health control measures and disease epidemiology.



(4a)

A closer look at the common keywords encountered by research theme were as follows (Figures 6a to 6f):

1. Public health intervention (Figure 5a)

The most frequently occurring keyword ‘travel’ was associated with public health measures (i.e., ‘social distancing’, ‘contact examination’, ‘prevention’, ‘quarantine’, ‘disease control’) and health system capacity (i.e., ‘public health’, ‘government’, ‘organization and management’, ‘health policy’, ‘health service’, ‘health care system’, ‘health care personnel’), and disease epidemiology (i.e., ‘transmission’, ‘mortality’, ‘economics’, and ‘risk assessment’). The green cluster linked keywords related to population characteristics (i.e., ‘adult’, ‘female’, ‘male’, ‘elderly’) and disease epidemiology (i.e., epidemiology, risk factor, and migration) with ‘psychology’, ‘mental health’, and ‘lockdown’. The blue cluster showed links between ‘China’, ‘procedure’, ‘United States’, ‘prevention and control’, and ‘virology.’

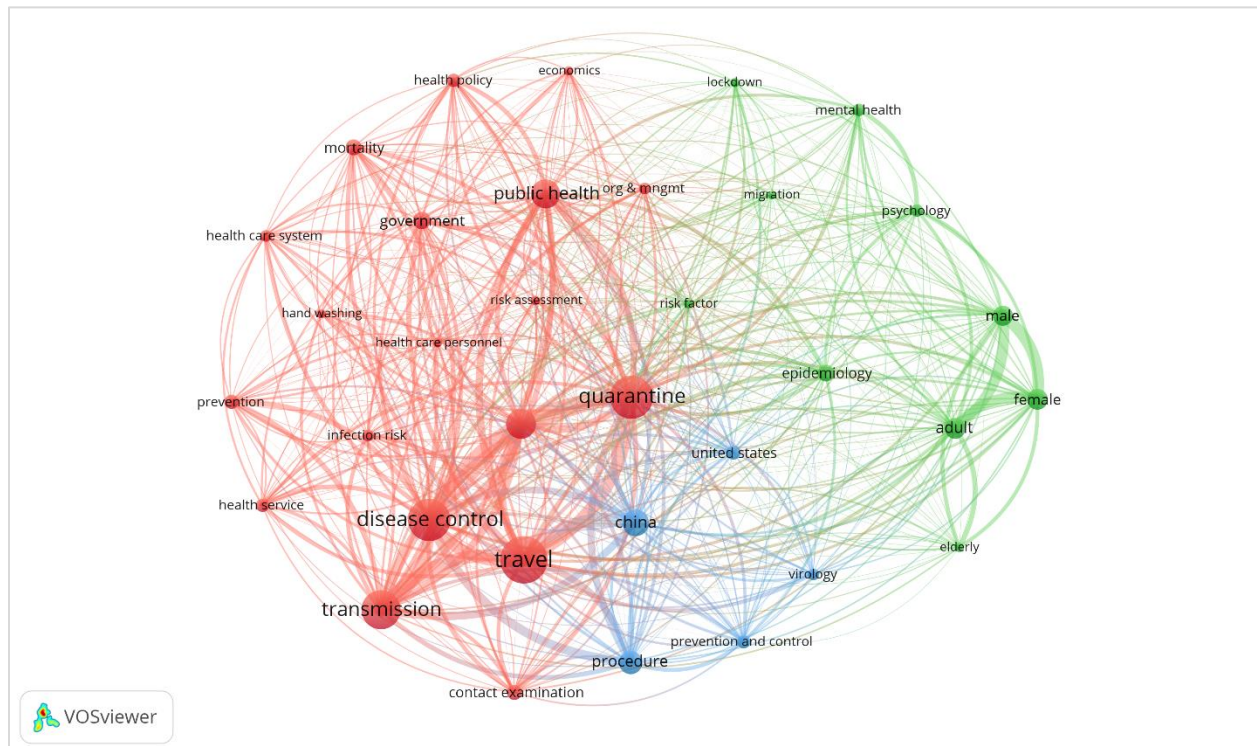


Figure 5a. Most frequent keywords in publications pertaining to **public health intervention** in COVID-19 and migration health (with minimum occurrence of 45 keywords)

2. Disease epidemiology and modelling (Figure 5b)

The most frequently occurring keywords, 'travel', 'transmission', and 'China' were found to be closely related to each other (red cluster). These keywords were associated with control measures (i.e., prevention and control, disease control, quarantine, public health, and social distancing), mathematical modelling, and disease distribution-related terms (i.e., population statistics, epidemiology, incidence, and mortality), and other keywords were related to disease transmission and determinants (i.e., risk assessment, risk factor, migration, infection risk, reproduction number, transmission, air travel). Other associated keywords were United States, and procedures. In the green cluster, keywords related to population characteristics (adult, male, female, elderly, child, adolescent) were mainly associated with virus etiology (virology, viral genome), symptoms (cough, fever, asymptomatic disease). Other keywords in the green cluster were 'polymerase chain reaction', 'isolation and purification', 'contact examination', 'genetics', 'hospitalization', and 'prevalence'.

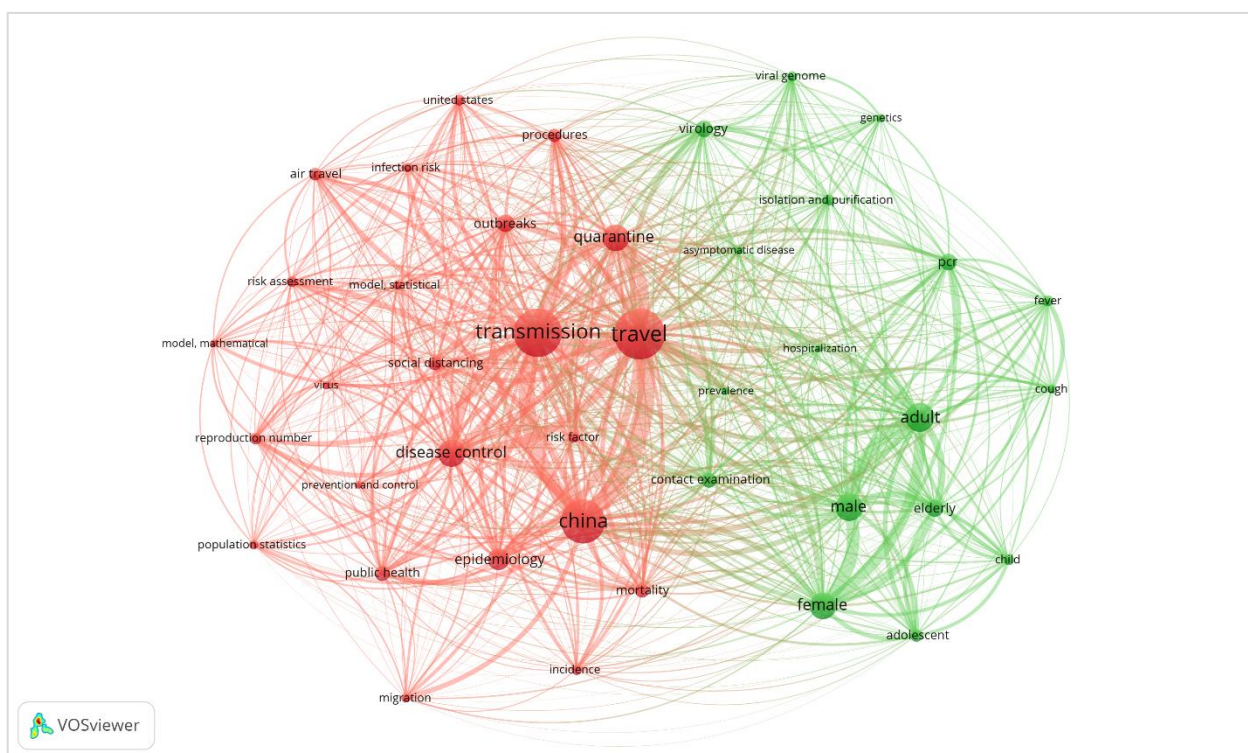


Figure 5b. Most frequent keywords in publications pertaining to **disease epidemiology and mathematical modelling** in COVID-19 and migration health (with minimum occurrence of 35 keywords)

3. Impact assessment and policy analysis (Figure 5c)

The most frequently occurring keywords ‘disease control’ and ‘travel’ were associated with ‘government’, ‘organization and management’, ‘international cooperation’, ‘healthcare system’, ‘socioeconomics’, ‘economics’, ‘poverty’, ‘United States’, ‘social distancing’, and ‘tourism’. In the green cluster, the keywords, ‘public health’, ‘mortality’, and ‘transmission’ were closely linked and found to be associated with ‘health policy’, ‘procedures’, ‘India’, ‘vulnerable population’, and ‘China’.

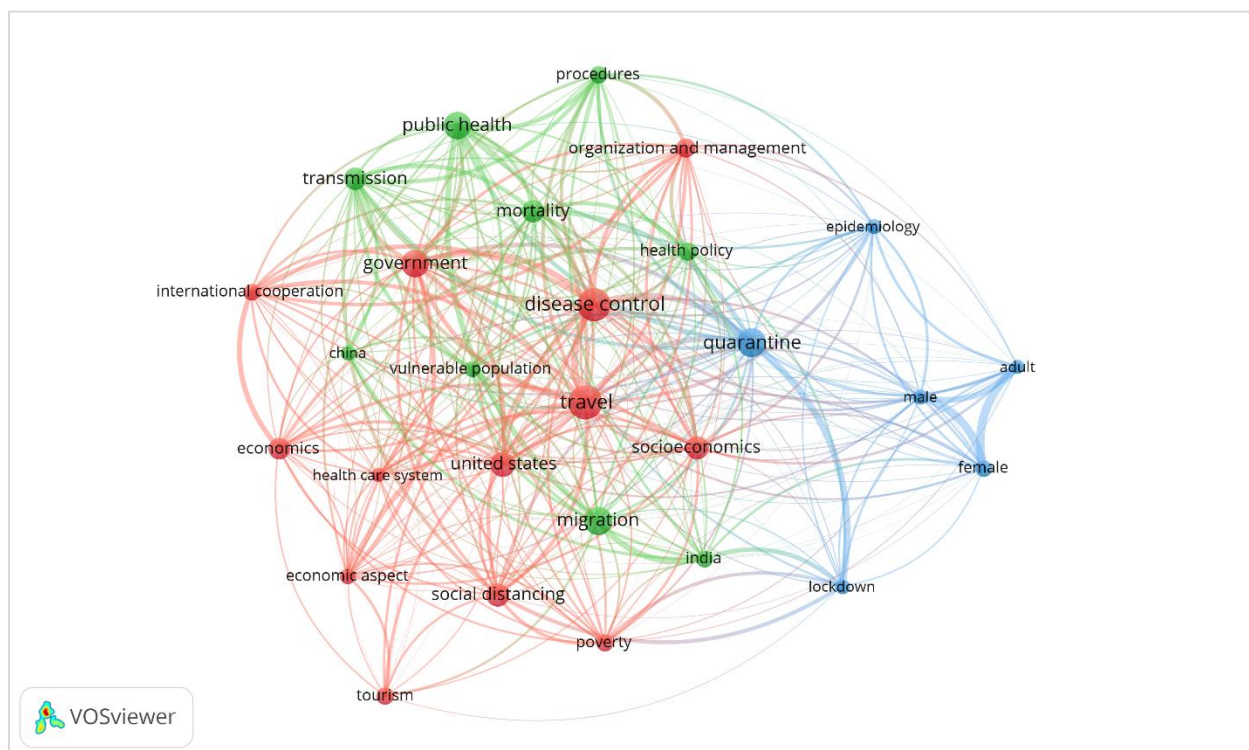


Figure 5c. Most frequent keywords in publications pertaining to **impact assessment and policy analysis** in COVID-19 and migration health (with minimum occurrence of five keywords)

4. Health system capacity (Figure 5d)

The keyword 'organization and management' was associated with 'health care personnel', 'public health', 'health care system', 'health care delivery', 'health service', 'government', 'telemedicine', 'health care policy', 'epidemiology', 'mortality', 'surveillance', 'disease control', and the 'United States' (red cluster). In the green cluster, the keyword 'travel' was associated with 'disease control', 'transmission', 'quarantine', 'China', 'infection risk', 'practice guideline', 'prevention', 'hand washing', 'emergency health service', and fever.

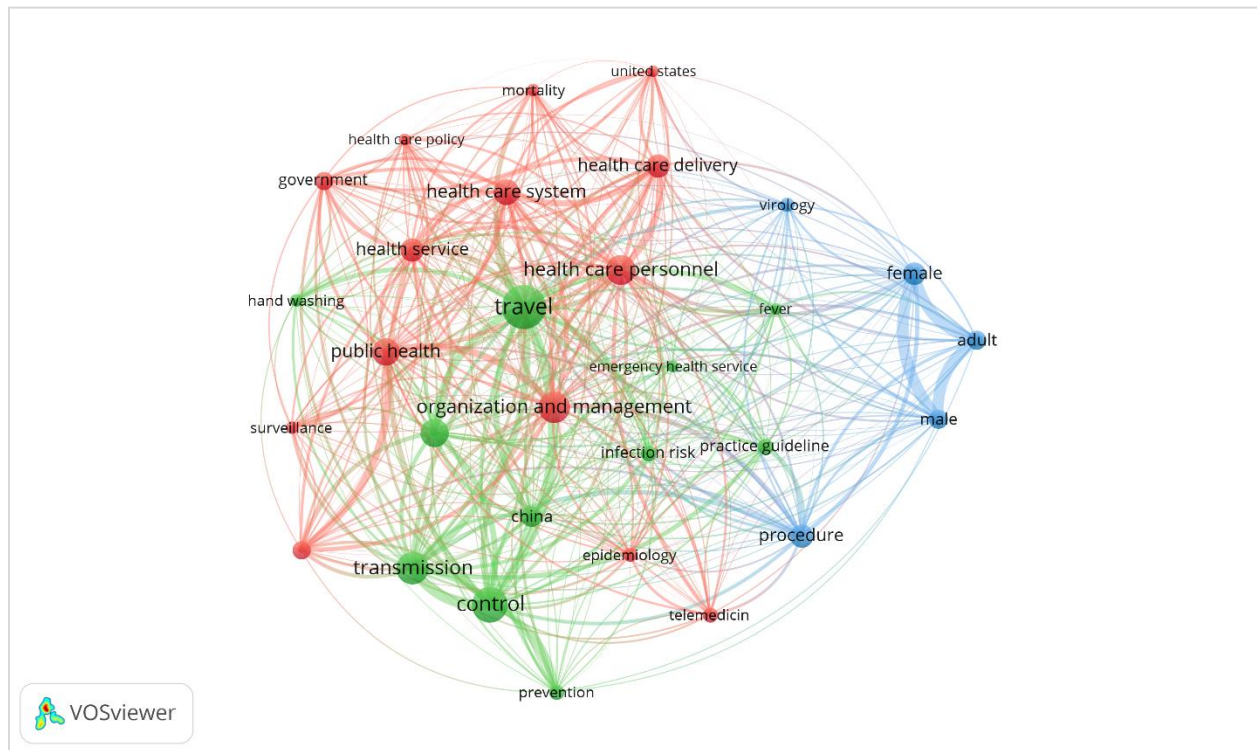


Figure 5d. Most frequent keywords in publications pertaining to **health systems capacity** in COVID-19 and migration health (with minimum occurrence of **15** keywords)

5. Migrant-specific themes (Figure 5e)

The most frequent keyword was 'refugee' followed by 'health service' and 'vulnerable population'. These were associated with 'public health', 'quarantine,' 'health care access', 'social distancing', 'transmission', 'government', 'health policy', 'disease control', 'mortality', 'infection risk', and 'refugee camp' (red cluster). The keywords, 'migration' and 'United States' were associated with population characteristics, including specific migrant groups ('adult', 'female', 'male', 'ethnology', 'immigrant', and 'migrant worker') (green cluster). In the next cluster (blue), the most frequently occurring keyword, 'migrant' was associated with 'health care delivery', 'epidemiology', 'organization and management', and 'emigrants and immigrants'.

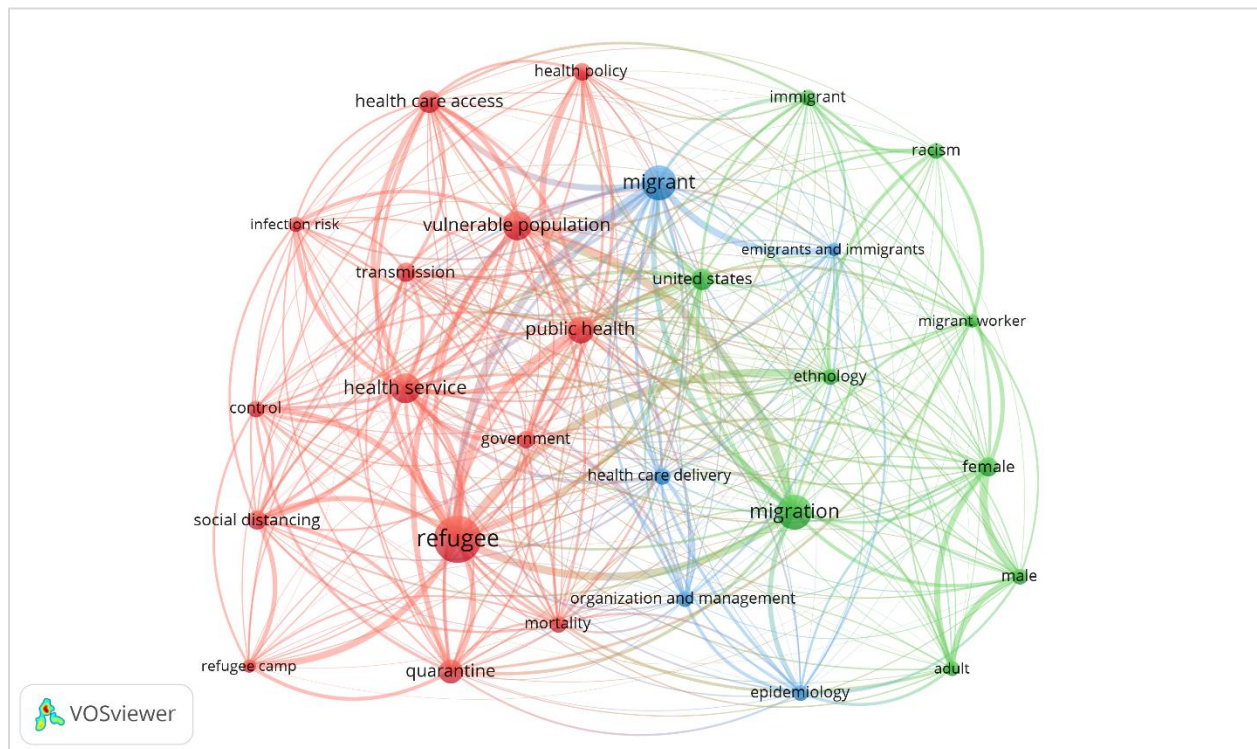


Figure 5e. Most frequent keywords in publications pertaining to **migrant-specific themes** in COVID-19 and migration health (with minimum occurrence of 15 keywords)

6. Clinical management (Figure 5f)

The largest cluster focused on the adult male population and was associated with clinical characteristics ('cough', 'fever', 'myalgia', 'headache', 'sore throat', 'fatigue', 'asymptomatic infection'), and diagnostic procedures ('real-time PCR', 'thorax radiography'). The green cluster connects the terms 'China', 'travel' and 'disease epidemiology' ('epidemic', 'outbreak') with terms related to clinical characteristics ('incubation time', 'severity'), and clinical management ('infection control', 'artificial ventilation'), and 'disease transmission'. The blue cluster linked keywords – 'patient isolation', 'pathology,' 'genetics', 'female' and 'child'. In the yellow cluster, the term 'pandemic' was associated with terms related to diagnostics ('throat culture', 'tomography', 'diagnostic imaging') and clinical characteristics (i.e., 'pneumonia', 'complication').

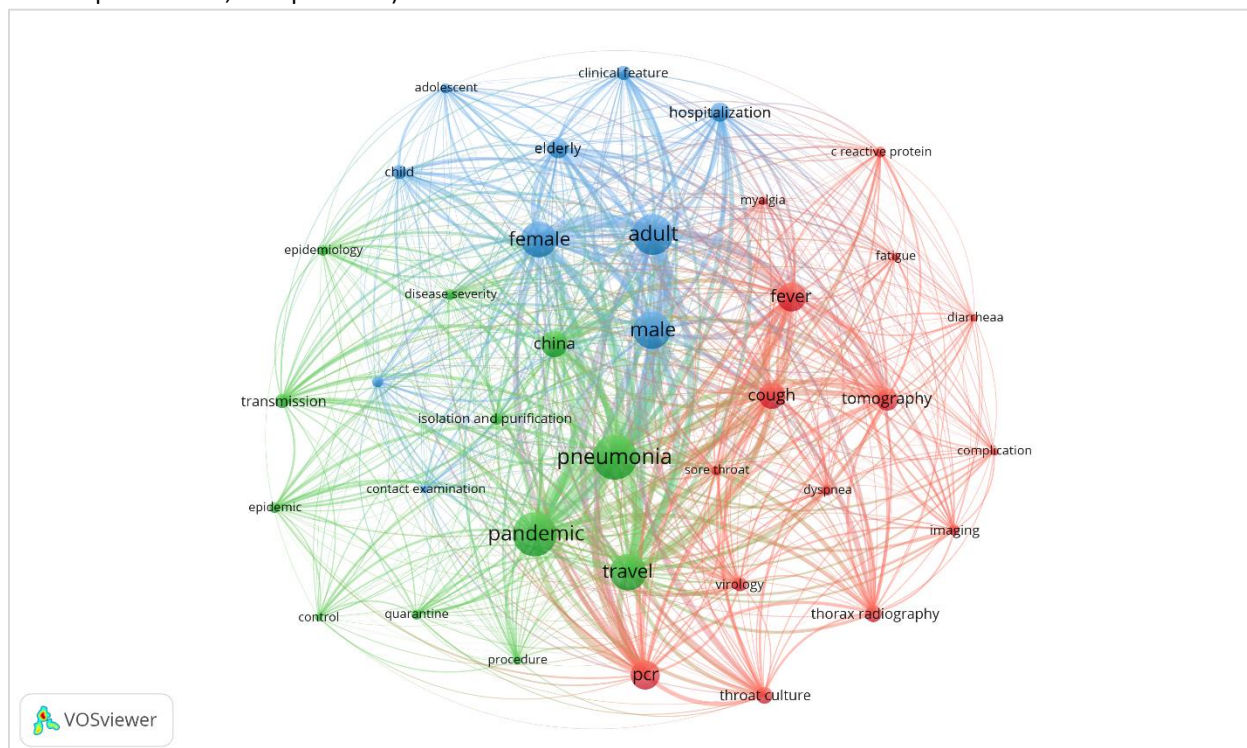


Figure 5f. Most frequent keywords in publications pertaining to **clinical management** in COVID-19 and migration health (with minimum occurrence of **20** keywords)

LIMITATIONS

This is the first bibliometric study on COVID-19 and migration health publications. Although there have been several bibliometric studies on COVID-19 [37, 38, 44], none were done in the context of migration health. At the start of 2020, the research community across the globe has focused its efforts in coming up with useful scientific evidence on COVID-19. This is evidenced by the increasing number of publications on COVID-19 from 1 January 2020 to 31 December 2020.

The depth and breadth of the findings from bibliometric analysis will depend on the information available in Scopus and the search strategy applied. Noted limitations inherent in a bibliometric study are as follows: (1) Relevant publications might be missed, particularly those published in preprint servers. Research papers in the online preprint servers are not indexed in Scopus as these have yet to be peer-reviewed or accepted by traditional academic journals. Nevertheless, articles-in-pre (i.e., pre-published versions of accepted research articles) are included in Scopus. (2) There are some scientific sources or journals that are not indexed in Scopus. Therefore, relevant

publications published in non-indexed journals cannot be captured by the search. (3) New publications might be missed due to time lag in the Scopus indexing (NB: Fully-indexed publications are estimated to appear in Scopus within three to four weeks from publication on the publisher's website). However, publishers and database producers are handling COVID-19 articles on a priority basis. (4) Bibliometrics only measures impact in terms of research productivity and not the research quality. (5) The Scopus yield or search results will depend on the overall search strategy. The search query for COVID-19 was applied to the publication title. Therefore, any relevant publication with no COVID-19 related terms in the publication title will be missed. (6) Results obtained reflect how publication information were recorded and presented in Scopus. For example, active institutions, author names, and countries with different spellings will be spread out in the results. Another possible scenario is that certain publications indexed as a 'research article' may be a 'letter to editor' upon reviewing the full text. (7) COVID-19 research is a growing field. Thus, the publications retrieved at the time of search may change in time. Also, any change of information or indexing of the retrieved publications will affect the search results. (8) Lastly, a bibliometric analysis uses the bibliographic attributes or metadata (i.e., authors' names, title, keywords, etc.) of retrieved publications to describe the scope of research. This method does not synthesize the research findings.

DISCUSSION

Findings from the bibliometric analysis of publications on COVID-19, in the context of migration and health, present the gradually developing research landscape in this field. Majority of the publications on public health measures cover topics on social distancing measures, travel-related measures, and government measures in general. Noting that nearly half of the retrieved publications pertain to travel or mobility within and across international borders (46.5%, n=908). There were about 17 percent of the retrieved publications that looked at policy analysis. There were limited publications that cover topics on migrant-specific themes (i.e., migrant protection services and camp coordination management) and clinical management. There were only a few studies on diagnostic and therapeutic strategies and candidate therapeutics and vaccines.

Approximately 35 percent (190 out of 550) of the publications on disease epidemiology used mathematical modelling to predict spread, importation risk, effectiveness and/or impact of public health control measures (i.e., social distancing, border closures, etc.), and impacts on the health care system capacities. Of this number, about 28 percent (54 out of 190) were global in scope and about 25 percent (48 out of 190) covered China. There were only two studies that investigated situations in camps settings. These findings highlight the importance of considering the migrant- and migration-health-related concepts in research and scientific communications.

The most productive countries and institutions in the field of COVID-19 and migration health come from the United States, United Kingdom, and China (the first reported place of origin of the virus). Similar to findings of other bibliometric studies on COVID-19, the United States is the country that produced the highest number of publications, but China has the highest research impact (based on the citation count) and collaboration (i.e., within the country and with other countries) [44-46]. The institutions with the highest number of publications also suggest how the pandemic has developed in one year. Although China was initially observed as the epicenter of the early outbreak, the United States and a few European countries have seen an increasing number of confirmed cases in 2020 [47]. While establishing a direct correlation between the number of confirmed cases and the research productivity may not be necessary, the finding on the most productive countries suggests a geographic outlook of the early developments in the global scientific knowledge base on COVID-19 specific to migration health. This information can help researchers, practitioners, and policy makers, especially those coming from resource-limited settings in maximizing the research productivity of existing networks and reaching out to relevant experts if needed. The inclusion of vulnerable populations such as migrants in detention, irregular migrants, and displaced populations in COVID-19 research is critical given the potentially differential impact of the pandemic in these settings. The diversity of subject areas of the top journals on COVID-19 and migration health – which ranged from journals on infectious diseases, general medicine, public health, environmental science – also provides insights into the importance of approaching COVID-19 as a complex health problem from a multidisciplinary perspective.

Despite the large number of global publications on COVID-19, the coverage of migrant and migration health aspects

of the pandemic in the current scientific knowledge base has so far been limited to concepts related to “travel and mobility or movement within and across international borders” – primarily viewing population movement as an important factor in disease transmission and suppression strategies. Nearly half of the retrieved publications referred to human mobility or movement (n=900, 46.1% out of 1953). And about 29 per cent (562 out of 1953) of the publications covered specific migrant groups (i.e., international students, migrant workers, immigrants, migrants, refugees, asylum seekers, etc.), with majority covering public health interventions (n=193, 34.3% out of 562).

Over one-fourth (n=521, 26.7% out of 1953) of the publications covered non-specific mobile populations (i.e., tourists and travelers) with majority covering public health interventions (n=205, 39.3% out of 521) and disease epidemiology (n=190, 36.5% out of 521) (Table 8). In any migrant research, it should be noted that there is limited inclusion of migrant status within data collection practices in routine health information systems, hospital registries, and disease surveillance systems globally. This also extends to research where migrant status remains poorly captured. Data disaggregation by migrant flows and categories on COVID-19 testing, hospitalizations, and deaths by migrant status is a poorly described national data set.

There were about seven percent publications (n=141) retrieved from the search that specifically involved migrant workers. On themes, about 77 percent covered impact assessment and policy analysis (n=56, 39.7% out of 141) and public health intervention (n=53, 37.6% out of 141). A closer look found that majority of the publications covered India (n=33, 23.4%), wherein public health measures (n=19) mostly refer to mental health and psychosocial support, travel and social distancing measures.

Most of the publications involving refugees (n=112), asylum seekers (n=44), displaced population (n=32) were mainly on protection support services in the health response against COVID-19. On publications that covered international students, a little over half covered public health interventions (n=24, 53% out of 45), and half of these publications discussed the impact of COVID-19 on the mental health of Chinese students abroad (n=12).

As of the last date of search, this mapping exercise retrieved 36 (1.8%) publications with the keyword ‘ethnic’, referring to ethnic minorities alongside migrants as a high-risk group. However, it should be noted that the methodology of this mapping exercise was not designed to capture ‘ethnic minorities’. Beyond the search results, a relevant systematic review emphasized the importance of gathering robust evidence on the role of ethnicity in COVID-19 [48]. From the said review, several publications in the United Kingdom and the United States indicated the disproportionate risk of having COVID-19 and suffering from more serious clinical outcomes (e.g., hospitalization, intensive care admission, and deaths) among individuals from Black, Asian, and Minority Ethnic (BAME) groups relative to White patients. Although ethnicity is different from migrant status, the disparities in health outcomes of specific ethnic minority groups may provide a better understanding of the intersection between migrant status and ethnicity.

They were eight publications that discussed ‘patient mobility’ which refers to the national and international movement of patients. Five of the publications covered aeromedical transportation of suspected and known COVID-19 patients across international borders [49-53]. Two publications discussed interhospital transportation of patients by land and air [54, 55]. One publication noted concerns on the burden of international travel restrictions for coronary heart disease patients from low- and middle-income countries (LMIC), either subsidized by governments or philanthropic bodies. It stressed that reintroducing health care services during and after the COVID-19 pandemic will have to consider the major backlog of surgical procedures in countries that rely on sending patients abroad [56].

Other than identifying the relevant migrant population groups examined in the extant literature, the scope of the current bibliometric analysis (i.e., ending in the screening of abstracts), precludes providing more insights on the study types, specific variables and outcome measures investigated and the research findings in the publications included in the analysis. Nevertheless, the common constructs covered in the relevant publications to date can be inferred from the network visualization map of the keywords. However, these maps only provide information on the frequently co-occurring keywords in relevant publications and do not represent a formative or reflective construct

of the conceptual relationship between the commonly used terms. As such, the relatedness of keywords described in the main findings of the bibliometric analysis cannot be taken to mean any more than an association of co-occurring keywords. Despite this limitation, the network visualization maps can still provide researchers with a good starting point in developing related research studies in the future.

Implications for migrants and migration and health research

Classifying the clusters of keywords that emerged from the bibliometric analysis into meaningful categories within a migration health context can provide insights into the role of migrant-, and migration-and-health-related concepts in the literature (Tables 11), especially when understood through the lens of the eight research themes. For example, the red cluster highlights concepts on public health measures and disease determinants, whereas the green cluster relates to disease epidemiology. Understanding the keywords through the lens of migration health research themes also addresses the inherent limitations in interpreting the co-occurrence maps.

Fitting the keywords to the research themes provides a rudimentary but clear-cut approach in coding the common keywords in the bibliometric findings, which can provide additional insights on the current state of research productivity on COVID-19 related to migrants and migration health. Noting that travel is the most frequently occurring keyword followed by transmission and China. It is clear from the findings that the current literature largely focuses on mobility as a key factor in understanding disease epidemiology (i.e., transmission) in developing and/or assessing public health interventions.

Table 11. Keyword clusters by relevant research theme on COVID-19 and migration health* (n=1,953)

Cluster	Keywords	Research Theme
Red (n=43)	quarantine, infection control, public health, social distancing, disease control, government, infection prevention, risk assessment, psychology, global health, mental health, social isolation, hand washing, lockdown	PHI (n=14)
	mortality, United States, migration, infection risk, risk factor, viral disease, Italy, India, vulnerable population, Europe, infection rate, United Kingdom, tourism	DEM (n=13)
	health service, health policy, organization and management, health personnel, health care system, health delivery, health care access, international cooperation, legislation and jurisprudence	HSC (n=9)
	economics, socioeconomics, policy	IAPA (n=3)
	migrant, refugee	MST (n=2)
	practice guidelines	CM (n=1)
	isolation	DTS (n=1)
Green (n=25)	adult, female, male, elderly, virology, adolescent, child, prevalence, asymptomatic infection, genetics, demography	DEM (n=11)
	PCR, isolation and purification, tomography, throat culture, thorax radiography, laboratory techniques, comorbidity	DTS (n=7)
	fever, cough, hospitalization, disease severity, dyspnea, clinical feature	CM (n=6)
	intensive care unit	HSC (n=1)
Blue (n=13)	travel, transmission, China, epidemiology, incidence, air travel, reproduction number, travel-related disease	DEM (n=8)
	contact examination, prevention and control, disease surveillance, contact tracing	PHI (4)
	procedures	DTS (n=1)

DEM=Disease epidemiology and management; CM=clinical management; DTS=diagnostics and clinical management; PHI=public health intervention; IAPA=impact assessment and policy analysis; HSC=health system capacity

*This keyword cluster covers all publications on COVID-19 and migration health for the period, 1 January 2020 to 31 December 2020

RECOMMENDATIONS

Findings from the bibliometric analysis demonstrate that studies on diagnostic procedures and COVID-19 tests, and

potential therapeutics and candidate vaccines in the context of migrants, mobility, and migration health are lacking in the current knowledge base. Moreover, the studies involving specific migrant populations were limited to international students, migrant workers, immigrants, migrants, refugees, asylum seekers, displaced populations, and patient mobility. Most of the studies investigated cases of COVID-19 in the context of population movement [53-55], which did not necessarily aim to describe the epidemiology of the disease in the migrant setting.

Although limited to the analysis of relevant publications using the metrics available (i.e., number of publications, co-occurrence of keywords, etc.), the key findings from the analysis can provide a useful starting point that can facilitate ongoing and future research on COVID-19 and migration health in terms of the critical areas that need more attention.

To strengthen the current knowledge base, more studies that examine health-related outcomes in specific migrant groups [19, 26] should be explored, especially when sound historical and epidemiological data become available for the different migrant populations. This need highlights the importance of capturing the important variables that can more widely cover the different populations affected by COVID-19. Viewing COVID-19 through a migration lens should not be limited to the role of movement in the dynamic importation of cases in a pandemic but should aim for a more inclusive research strategy that considers the migrant populations as well as their relevant interests.

CONCLUSION

To strengthen the current knowledge base on COVID-19 and migration health, the scientific and research community should consider examining specific health-related outcomes in specific migrant groups as well as other relevant variables that can impact migrants (i.e., structure and process measures). Investigations on COVID-19 and migration health should not be limited to the role of movement/mobility in the dynamic importation of cases in a pandemic; a more inclusive research strategy integrating the relevant interests of migrant populations is suggested.

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Availability of data and materials

All data presented in this study can be retrieved from Scopus using the search strategy available in Appendix 1.

Author's contributions

KW conceived the idea for the study. SA designed the methodology and prepared the first draft of the paper. All authors critically reviewed, revised, and approved the subsequent and final version. Select MHADRI members contributed to the screening and tagging of publications. SA and JL contributed to the analyses and interpretation of the results. MS reviewed and validated the methodology and provided feedback on the search strategy development.

Conflict of interest

The authors declare that they have no competing interest.

Disclaimer: This paper has not been externally peer-reviewed; it should not replace individual clinical judgement and the sources cited should be checked. The views expressed in this commentary represent the views of the authors and not necessarily those of IOM. The views are not a substitute for professional medical advice.

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APPENDIX 1: SEARCH STRATEGY AND NUMBER OF RETRIEVED PUBLICATIONS

No.	Strategy	Search query (applied in Scopus)	N
1	Applied COVID-19 search query in the publication title (to minimize false positive results)	TITLE (covid* OR "covid-19" OR covid19 OR "SARS-CoV- 2" OR ncov OR "2019-nCov" OR "2019nCov" OR "corona virus" OR coronavirus) OR TITLE (wuhan W/3 *virus* OR corona*) OR TITLE (china W/3 corona* OR *virus*)	98,589
2	Applied migrant, migration, and mobility search query in the publication title, publication source, and keywords (to retrieve larger number of publications)	TITLE-ABS-KEY (international OR overseas OR "cross-border" OR "non-citizen*" OR "non-national*" OR foreign* OR transnational* OR expatriate* OR alien* OR transient*) OR TITLE-ABS-KEY (*migrant* OR *migrat*) OR TITLE-ABS-KEY (refugee* OR "non-asylum") OR TITLE-ABS-KEY (asylum) OR TITLE-ABS-KEY (stateless PRE/2 person* OR population* OR people) OR TITLE-ABS-KEY (mobile OR mobility OR movement* OR displace* OR travel*)	7,473,665
3	Combined strategies 1 and 2	1 AND 2	9,508
4	Limited publication year, 2020	LIMIT-TO (PUBYEAR, 2020)	9,367
5	Excluded irrelevant subject areas	EXCLUDE (SUBJAREA, "VETE")	9,309

6	Excluded irrelevant publications identified by title and abstract screening (using Scopus saved list and MS Excel)		1,953
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N=Number of publications retrieved; Note that search strategy was applied on 16 February 2021.