Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Travel medicine research in the new millennium: A bibliometric analysis of articles published in *Travel Medicine and Infectious Disease*, 2003–2019

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Dear Editor

Evidence-based travel medicine requires that research priorities reflect the wide and expanding knowledge base of this evolving discipline. Bibliometric analysis is an established research tool which provides a quantitative analysis of the academic literature. Bibliometric analyses at the level of a specific topic such as emerging travel-related viral illnesses provide valuable insights into publication trends and areas of unmet research need [1,2]. Specialty and journal-level bibliometric analyses have also been published in tropical medicine [3] and travel medicine [4]. *Travel Medicine and Infectious Disease* (TMAID) is a leading travel medicine journal which has been in existence since 2003. It has multiple affiliations with respected bodies such as the Faculty of Travel Medicine at the Royal College of Physicians and Surgeons, in Glasgow, Scotland. We performed a bibliometric analysis between June 2018 and January 2019, which aimed to relate the research output of TMAID to a recognised international framework in order to identify research trends by mapping articles against the syllabus domains and sub-domains, thus informing the setting of research priorities in this growing area of clinical activity.

All indexed articles, including original research articles, brief communications, correspondence articles, editorials, reviews, case reports, diagnostic challenges and commentary papers, published in TMAID between January 2003 and January 2019, were screened from their titles and abstracts and mapped against the ISTM Body of Knowledge syllabus [5], which comprises 7 domains and 178 sub-domains. The full text versions of articles were examined more closely when their domain was not apparent from their title. Where an individual article reflected more than one sub-domain, it was categorised into each one. A temporal analysis of publication output was also undertaken to monitor for trends in research productivity over time. The two authors (GTF and KEO) followed an identical search protocol independently and reached a consensus on final designations for each article retrieved. Data were entered in a Microsoft Excel 2013 database and summarised as totals and percentages.

Categorical mapping of 1118 eligible articles (Table 1) belonging to ten article categories yielded the following number of articles for each domain: epidemiology (6.25%, n = 86); immunology/vaccinology (6.54%, n = 90); pre-travel assessment/consultation (31.32%,

Table 1
Bibliometric analysis of articles published in *Travel Medicine and Infectious Disease*, 2003–2019.

ISTM Body of Knowledge Domain/Sub-domain		Articles (n)[a]
I	**Epidemiology**	**86 (6.25%)**
	Basic Concepts	16
	Geographic Specificity	70
II	**Immunology/Vaccinology**	**90 (6.54%)**
	Basic Concepts and Principles	7
	Types of Vaccines or Immunisations	**83**
	Cholera	5
	Diphtheria	3
	Encephalitis, Japanese	3
	Hepatitis A and B Combined	6
	Influenza	2
	Measles	2
	Meningococcal	5
	Mumps	1
	Pertussis	3
	Pneumococcal	3
	Poliomyelitis	4
	Rabies	13
	Rubella	1
	Tetanus	1
	Typhoid	1
	Varicella	1
	Yellow Fever	10
	Other combined vaccines	3
	Other (vaccines against dengue, travellers' diarrhea, malaria and filovirus)	6
III	**Pre-travel Assessment/Consultation**	**431 (31.32%)**
	Patient Evaluation	**29**
	Assessment of Fitness/Contraindications to Travel	4
	Evaluation of Travel Itineraries/Risk Assessment	19
	Relevant Medical History	5
	Screening for Good Mental Health and Personal Resilience to Stress in Hostile Environments	1
	Special Populations	**165**
	Athletes	3

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Table 1 (*continued*)

	ISTM Body of Knowledge Domain/Sub-domain	Articles (n)[a]
	Business Travellers	5
	Elderly Travellers	7
	Expatriates/Long Term Travellers	8
	Immigrants	36
	Infants and Children	16
	Missionaries/Volunteers/Health Clinicians	16
	Pregnant Travellers and Nursing Mothers	15
	Teachers, Trainers and Students	5
	Travellers with Chronic Diseases	9
	Travellers with Disabilities	1
	Travellers to Hostile Environments	13
	Travellers Who are Immunocompromised, including AIDS and HIV	19
	VFRs	8
	Other (merchant seafarers, avitourists, US President)	4
	Special Itineraries	**115**
	Armed Conflict Zones	4
	Cruise Ship Travel	9
	Extreme/Wilderness/Remote Regions Travel	15
	High Altitude Travel	7
	Last Minute Travel	1
	Mass Gatherings	57
	Travel for purpose of medical care	5
	Natural Disaster Areas	12
	Sex Tourism	5
	Prevention and Self-Treatment	**73**
	Chemoprophylaxis	62
	Malaria	47
	Travellers' Diarrhea	11
	Other (HIV PrEP, rabies post-exposure prophylaxis, SARS)	4
	Personal Protective Measures	6
	Self-treatment	2
	Diarrhea	1
	Malaria	1
	Travel Health Kits	1
	Risk Communications Regarding:	**49**
	Animal Contact	2
	Close Interpersonal Contact	3
	Food Consumption	1
	Water Consumption and Purification	2
	Antimicrobial resistance	37
	Other (ayahuasca, alcohol-based hand rubs, traveller risk perception)	4
IV	**Diseases Contracted During Travel**	**518 (37.65%)**
	Diseases Associated with Vectors	**266**
	African Tick Bite Fever	3
	Chikungunya	18
	Dengue	32
	Encephalitis, Japanese	1
	Encephalitis, Tick-borne	9
	Filariasis	6
	Leishmaniasis	21
	Lyme, Anaplasma, Babesia	5
	Malaria	83
	Rickettsia	16
	Trypanosomiasis, African	2
	Trypanosomiasis, American (Chagas Disease)	1
	West Nile	4
	Zika	29
	Other Emerging Infections (Lassa, Oropouche, Mayaro, Kyasanur forest disease, Venezuelan equine encephalitis, Borreliosis, Ross River virus, Strongyloidiasis, Babesiosis, Crimean-Congo haemorrhagic fever, Tularaemia, Fascioliasis, Myiasis, Sandfly virus)	36
	Diseases Associated with Person-to-Person Contact	**118**
	Hepatitis B	6
	Hepatitis C	2
	Influenza	17
	Measles	6
	Meningococcal Disease	10
	Mumps	1
	Pertussis	2
	Pneumococcal Disease	2
	Rubella	4
	Sexually Transmitted Diseases	16
	Tuberculosis	23
	Varicella	1
	Other (Nipah virus, poliomyelitis, leprosy, MERS-CoV, Ebola, SARS)	28
	Diseases Associated with Ingestion of Food and Water	**73**
	Amebiasis	3
	Brucellosis	8
	Cholera	6
	Giardiasis	3
	Hepatitis A	3
	Hepatitis E	3
	Poliomyelitis	1
	Travellers' Diarrhea	12
	Typhoid and Paratyphoid Fever	6
	Other (gnathostomiasis, cysticercosis, methanol poisoning, paragonimiasis)	28
	Diseases Associated with Bites and Stings	**15**
	Envenomation	2
	Rabies	11
	Other (bed bugs)	2
	Diseases Associated with Water/Environmental Contact	**46**
	Cutaneous Larva Migrans	9
	Legionella	1
	Leptospirosis	9
	Schistosomiasis	10
	Other (*Naegleria fowleri*, melioidosis, tungiasis, histoplasmosis)	17
V	**Other Clinical Conditions Associated with Travel**	**59 (4.29%)**
	Conditions Occurring During or Immediately Following Travel	**23**
	Barotrauma	3
	Jet Lag	10
	Thrombosis/Embolism	3
	Other (air travel, airport issues)	7
	Conditions Associated with Environmental Factors	**16**
	Altitude Sickness	10
	Respiratory Distress/Failure	1
	Sunburn, Heat Exhaustion and Sun Stroke	2
	Other (burns in wilderness, beach injuries)	3
	Threats to Personal Security	**8**
	Accidents	4
	Violence-Related Injuries	1
	Other (arrests, fire safety aboard cruise ships and in hotels)	3
	Psychological and Psycho-social Issues	**12**
	Acute Stress Reactions, Post-Traumatic Stress Disorder	1
	Psychiatric and Psychological Sequelae of Travel or Living Abroad	6
	Other (fear of flying)	5
VI	**Post-Travel Assessment**	**112 (8.14%)**
	Screening/Assessment of Returned Asymptomatic Travellers	7
	Screening/Assessment of immigrants	2
	Triage of the Ill Traveller	5
	Diagnostic and management implications of the following symptoms:	**98**
	Diarrhea and Other Gastro-Intestinal Complaints	7
	Eosinophilia	7
	Fever	20
	Respiratory Illness	13

(*continued on next page*)

Table 1 (*continued*)

ISTM Body of Knowledge Domain/Sub-domain		Articles (n)[a]
	Skin Problems	18
	Other (headache, arthralgia, visual loss, vertigo, ulcers, diplopia, itch, facial swelling, red eyes)	33
VII.	**Administrative and General Travel Medicine Issues**	**80 (5.81%)**
	Medical Care Abroad	**7**
	Aeromedical Evacuation	2
	Blood Transfusion Guidelines for International Travellers	1
	Procedures and Considerations Regarding Medical and Mental Health Care and Recommendations regarding Access of Medications in Resource-Poor Areas	2
	Other (travel insurance, maritime healthcare)	2
	Travel Clinic Management	**14**
	Documentation and Record-Keeping	2
	Equipment	1
	Infection Control Procedures	4
	Management of Medical Emergencies	5
	Resources for Laboratory Testing	1
	Other (pharmacist-led travel clinic)	1
	Travel Medicine Information/Resources	**59**
	Accessing Health Information for Travellers, including Commercial and Proprietary Sources	33
	International Health Regulations	6
	National/Regional Recommendations, including National/Regional Differences	16
	Principles of Responsible Travel	2
	Other (Faculty of Expedition Medicine, Latin American research output)	2

[a] Where the total number of articles listed by topic does not equate to the total number of articles in the Body of Knowledge sub-domain to which they belong, it may be assumed that some articles are assigned to more than one category. Similarly, articles may be classified into more than one domain. The 33 topics for which no article was published are excluded from Table 1.

n = 431); diseases contracted during travel (37.65%, n = 518); other clinical conditions associated with travel (4.29%, n = 59); post-travel assessment (8.14%, n = 112); and administrative and general travel medicine issues (5.81%, n = 80). The majority of the published articles were full original research articles (39.3%, n = 434), correspondence articles (15%, n = 161), or review articles (18.9%, n = 215). There was a longitudinal trend towards increased research output over time with discernible peaks of activity in 2014 and 2016.

A mapping exercise performed at the level of the ISTM sub-domains found that three articles relating to global health and travel medicine research were uncategorisable against the current ISTM Body of Knowledge. There was a longitudinal trend over time towards higher research output in the pre-travel assessment, diseases contracted during travel and post-travel patient assessment domains. The Body of Knowledge sub-domain topics most frequently reflected in the analysed articles related to malaria (83 articles), chemoprophylaxis (62 articles), mass gatherings (57 articles), antimicrobial resistance (37 articles), immigrants (36 articles), and dengue (32 articles). The most frequently recorded travel vaccine topics discussed rabies (13 articles) and yellow fever (10 articles) vaccines.

This bibliometric analysis of travel medicine research publications in a leading journal in this field provides additional insight into global research activity in travel medicine. In comparison with a previous bibliometric analysis of a travel medicine journal [4], TMAID has published a higher proportion of articles in the pre-travel and post-travel assessment domains. Sub-domain analysis provided further insights. We recommend that travel medicine journal-specific bibliometric analyses be repeated at regular intervals to enable trends to be identified and to inform both editorial policy and researcher priorities in this dynamic specialism.

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Declaration of competing interest

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