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### Global public interest in infectious and non-infectious arthritis: an evaluation using Google Trends

#### Rheumatology key message

- Google Trends indicates regional interest in infectious and non-infectious arthritis is associated with economic status.

SIR, The Internet is used by millions of people daily in order to find health information. The most common search

engine is Google, accounting for 75% of these searches [1]. Google Trends is a service that is able to monitor the popularity of search topics and terms over a specified period of time. Google Trends analyses have been used to study global public interest in various areas of rheumatology, including osteoarthritis [2], fibromyalgia [3] and gout [4]. The service is also able to suggest seasonal variations, and associations with public health interventions, such as screening and awareness campaigns [5].

Google Trends can also compare search results by geographical location. This is of particular importance in communicable disease and infection, including septic arthritis. The incidence of septic arthritis has been reported in regions such as Scandinavia and Australia as 5.7–9 per 100 000 person-years [6], with the incidence in the UK increasing 43%, from 5.5 to 7.8 per 100 000 person-years, between 1998 and 2013 [7]. Yet, epidemiological data on this disease from low-economic regions are relatively lacking. Globally, there is huge regional variation in causative organisms, which requires specific and targeted approaches to diagnostics and therapy, especially in areas where resources such as antimicrobials are limited.

To this end, we conducted a Google Trends search on 12 April 2019 in order to compare global regional variation in popularity of search terms for non-infectious vs infectious arthritis. The terms 'rheumatoid arthritis' and 'osteoarthritis' (as examples of non-infectious arthropathies), and 'bacterial arthritis' and 'septic arthritis' were searched. 'Rheumatoid arthritis' and 'osteoarthritis' were searched as a 'disorder' and 'disease', respectively, to exclude irrelevant search terms (e.g. journal titles containing these terms), and 'bacterial arthritis' was searched as a 'topic.' All three included searches in Latin languages other than English. 'Septic arthritis' was searched in order to account for unspecified causes of joint infection. We applied the following filters to the search strategy: Location (Worldwide), Time Range (2004–present) and Search Type (Web Search).

Google Trends does not display the total number of searches over time, but adjusts data according to the popularity of a search in a given time and region. Therefore larger populations with a greater number of searches will not automatically produce the greatest search interest.

Our two groups of terms (i.e. non-infectious vs infectious arthritis) were compared by country. The five countries in which these search terms were most popular are shown in Table 1, with economic status in accordance with World Bank data indicated [8].

Our results indicate searches for non-infectious arthropathies are more popular in middle-high income countries (90% upper-middle or high income economies), while searches related to infectious arthritis are more popular in low-middle income countries (80% lower-middle or low income economies). There are several possible causes of this. Firstly, the infrastructure of rheumatology services is likely to be more developed in middle-high income countries, leading to more streamlined care and efficiency of diagnosis of diseases such as rheumatoid arthritis. This in

**TABLE 1** Highest-ranked countries by population-adjusted popularity of search terms

Interest by country	Non-infectious arthritis		Infectious arthritis	
	Rheumatoid arthritis	Osteoarthritis	Bacterial arthritis	Septic arthritis
1	Japan <sup>d</sup>	Iraq <sup>c</sup>	Ethiopia <sup>a</sup>	Ethiopia <sup>a</sup>
2	Puerto Rico <sup>d</sup>	Sweden <sup>d</sup>	Nicaragua <sup>b</sup>	Ghana <sup>b</sup>
3	Norway <sup>d</sup>	Germany <sup>d</sup>	Ghana <sup>b</sup>	Malaysia <sup>c</sup>
4	Egypt <sup>b</sup>	Netherlands <sup>d</sup>	Nepal <sup>a</sup>	Kenya <sup>b</sup>
5	USA <sup>d</sup>	Chile <sup>d</sup>	Bolivia <sup>b</sup>	Australia <sup>d</sup>

<sup>a</sup>Low income economy; <sup>b</sup>lower-middle income economy; <sup>c</sup>upper-middle income economy; <sup>d</sup>high income economy – as per World Bank [8].

turn may lead to greater public interest in these diseases, for example, following diagnosis. The greater popularity of these search terms may also be due to more established public awareness campaigns in these countries, such as the EULAR campaign, ‘Don’t Delay, Connect Today’.

A further explanation for these results may be due to a high incidence of diagnosis of infectious arthritis in low-middle income countries, for which there are relatively few consistent or robust epidemiological data. While increased popularity of search terms does not necessarily correlate with increased diagnosis, it does indicate a relatively increased interest in infectious arthritis.

There are several limitations to such analyses using Google Trends. Although Google represents 75% of Internet searches, it does not account for other search engines. Results also do not indicate the demographics of users, and are not reflective of areas where there is limited access to the internet.

In conclusion, we show that exploration of Google Trends can assist in monitoring regional variations in disease interest, and may indicate specific regions for targeted research into certain diseases. Our results suggest a need for further epidemiological research and heightened awareness in low-middle income countries on all types of arthritis. However, they also suggest regions that may benefit from research and monitoring of infectious arthritis, which may subsequently improve infection-related morbidity and antimicrobial stewardship in these areas.

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