

Bibliometric Analysis of IHI and IMI Projects: Key Highlights from the 15th Bibliometrics Report 2024

1 Executive Summary

The Innovative Health Initiative Joint Undertaking (IHI JU) is a public–private partnership in the European Union which funds projects to address public health needs, improve patients' lives, and boost the competitiveness of Europe's health industries. From the initial call for funding in April 2008 through the Innovative Medicines Initiative (IMI), there have been 41 funding calls — 34 for IMI and 7 for IHI JU — for researchers in Europe and across the world.

The funding has resulted in almost 11,400 research publications across the IHI JU and IMI programmes. In 2023, the first six IHI funded publications spanned 16 countries and multiple continents. Since 2010, IMI publications have received more than 390,000 citations, with its field normalized citation impact (1.86) exceeding European research average and other European funding programmes, such as the Seventh Framework Programme (FP7) with 1.45 and Horizon 2020 with 1.42. Research funded by the IMI also performs strongly against global health funding bodies, with only the Medical Research Council and Wellcome Trust having a better citation impact.

IMI funded research is highly collaborative - there are 133 countries that have at least one publication funded by IMI and 67 countries that have ten or more IMI funded publications. In addition, IMI funded research is characterized by cross-sector collaborations, with almost three-quarters (72%) of the research involving co-authorship across sectors such as education/academia, health care, corporate/industry, government and non-profit organizations.

This is the 15th annual report produced for the IHI JU and it has been created by [Nature Research Intelligence](#). It provides a bibliometric analysis of research funded by the IMI and IHI JU programmes, a benchmarking analysis against other global health research funders, and a landscape of the collaboration profiles and networks of the publications. The data used to create this report was exported from the Web of Science and Dimensions indexes on 1 July 2024.

1.1 Key findings

1.1.1 Impact of IHI JU funded research

- The first IHI JU funded publications, of which there are six, were all published in 2023 and are now visible on the Web of Science.
- Four of those publications are peer-reviewed articles and have yielded six citations.
- IHI JU funded research already spans 16 countries in Europe, North America and the Asia-Pacific region.

1.1.2 Collaboration and geographical spread of IHI JU funded research

- All four IHI funded papers (articles and reviews) are the result of collaborative work, with 100% of the published papers to date being cross-sector, cross-institutional and cross-country collaborations.

- Research organizations have co-authored all IHI JU funded papers to date (100%), with high collaboration also noted from health-care organizations and providers (75%).
- Organizations belonging to the biopharmaceutical and medical technology healthcare sectors have contributed to cross-industry sector collaboration research funded by IHI JU.

1.1.3 Impact of IMI funded research

- Since 2010, IMI funded projects have resulted in 11,389 publications
- IMI papers (articles and reviews) have received more than 390,000 citations, averaging 38.1 citations per paper.
- IMI funded research is cited nearly twice as much as the world average (based on its field normalized citation impact of 1.86) and exceeds the citation impact of research from 27 EU countries and the United Kingdom which (EU27 +UK – 1.37) by 36% based on the citations for publications with the same document type, year of publication and subject area.
- By field normalized citation impact, IMI1 (1.75) and IMI2 (2.00) projects outperformed their EU funding counterparts FP7 (1.45) and Horizon 2020 (1.42).
- A total of 133 countries have at least one publication funded by IMI and 67 countries have 10 or more funded publications.

1.1.4 Collaboration and geographic spread of IMI funded research

- The majority of IMI funded papers involve cross-sectoral (72%), cross-institutional (85%) and cross-country (66%) collaborations.
- Collaborations across sectors, institutions and countries yield a higher field normalized citation impact than the IMI average (1.86), with papers resulting from international collaborations recording a field normalized citation impact with more than double the world average (2.04).
- The academia/education (96%) and health-care (72% - including hospitals and private sector) sectors have the greatest share of IMI funded cross-sectoral collaborative papers among all sector types.
- A positive association exists between the number of countries affiliated on an IMI funded paper and the respective field normalized citation impact for that paper (bilateral collaboration at 1.69; 3–5 countries at 1.97; and >5 countries at 3.09).
- The IMI projects connect the EU with research hotspots around the world, strengthening the EU research ecosystem.

1.1.5 Benchmarking analysis comparing IMI funded research with ten international research funders

- IMI research publications rank third when comparing the field normalized citation impact (1.86) with ten international health research funders, only trailing the Medical Research Council (2.34) and the Wellcome Trust (2.30).
- IMI research papers rank fourth compared to the comparator set based on their share of highly cited papers, which account for almost one-quarter (23.9%) of papers in the top 10% most cited in the world.

2 Introduction

2.1 Innovative Health Initiative Joint Undertaking (IHI JU)

'At IHI, we are working to turn health research and innovation into real benefits for patients and society.'

To ensure that Europe remains at the cutting edge of interdisciplinary, patient-centric health research, the Innovative Health Initiative (IHI JU) was launched in November 2021 as a public–private partnership (PPP) between the European Union and European life science industries. With scientific breakthroughs, increasingly involving cross-sectoral discoveries, it is imperative that industrial sectors involved in health research — pharmaceutical, digital, IT, medical devices — work in collaboration.

Pioneering a new, more integrated approach to health research, as well as shifting the focus from disease care to health care, is central to IHI's mission, starting with disease prevention, diagnostics and personalized treatments, and disease management. Using a total budget of €2.4 billion, available from 2021 to 2027, IHI JU projects focus on [precision medicine](#) which uses AI (Artificial Intelligence) to analyze comprehensive patient information, leading to a better understanding of biological indicators that can signal shifts in health and produce better personalized treatments at lower costs.¹

2.2 Purpose and scope of this report

The IHI JU commissioned Nature Research Intelligence to produce the 15th bibliometric evaluation of its funded research under a public procurement procedure (reference: IHI.2023.OF.119).

The purpose of this report is to provide a detailed bibliometric evaluation of the research produced by IHI JU funded projects. This report provides an analysis that allows IHI JU to have an impact measurement for the research that it has funded and to develop strategies to encourage research that benefits the health of the global community.

3 Methodology

3.1 Data sources

Nature Research Intelligence used the Web of Science database as the main data source for this report. Web of Science is a leading curated abstract and citation database, housing more than 21,000 of the highest impact journals – including open access journals – published worldwide in over 250 sciences, social sciences, arts and humanities disciplines. The database also includes conference proceedings, patents and book data. Each research output is curated by the Web of Science with multiple metadata fields – article title, author name, year of publication, journal name and reference list – which allows for a comprehensive analysis of research output, citation networks and collaboration clustering.

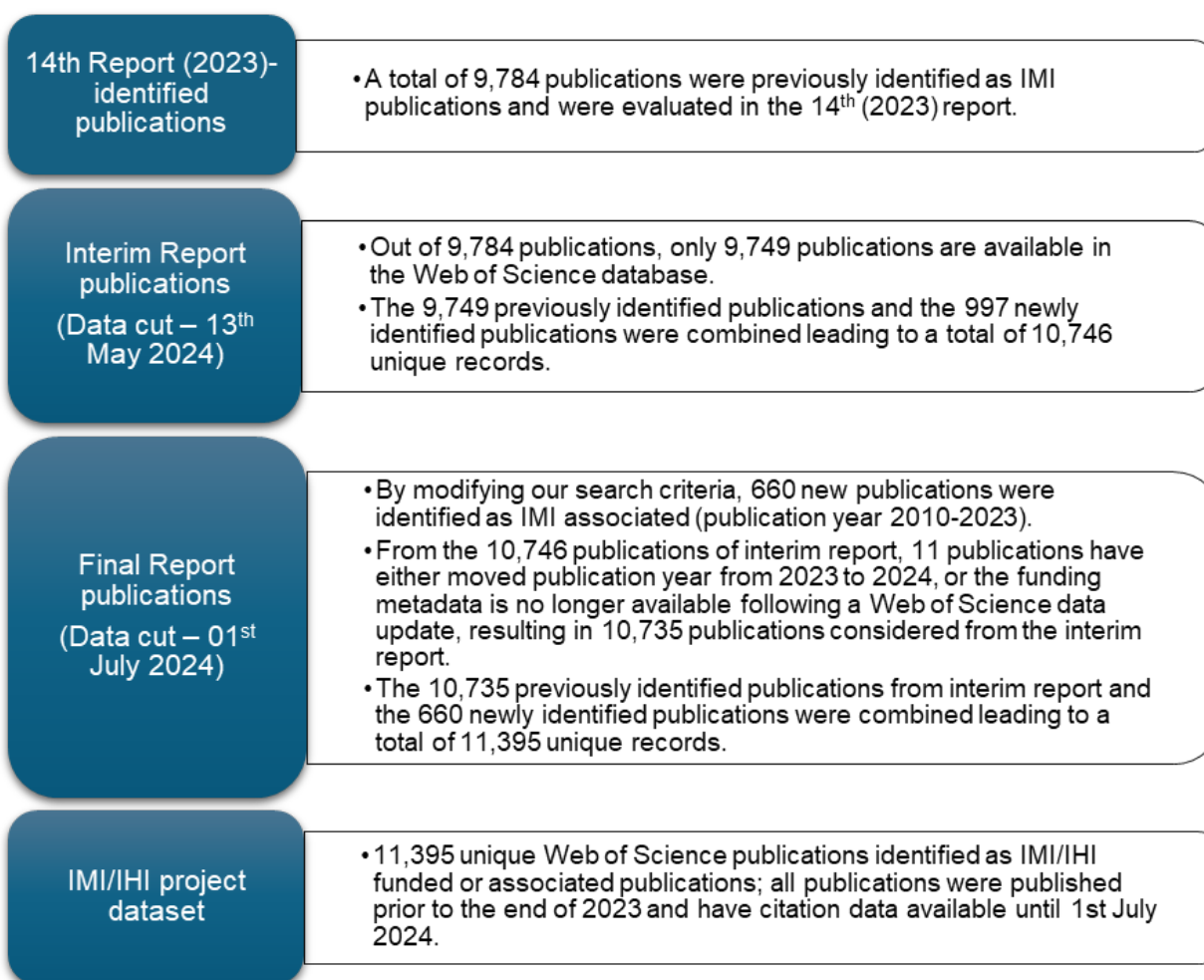
Through Dimensions, Nature Research Intelligence also extracted the respective research outputs for comparator funders used in this report. As Dimensions is a more comprehensive data source in terms of publication volume and metadata, Nature Research Intelligence was able to achieve superior levels of data coverage and linkage to respective documents. Once extracted from Dimensions, the identified data was merged with the Web of Science data for analysis.

¹ Zeeshan Ahmed *et al.*, Artificial intelligence with multi-functional machine learning platform development for better healthcare and precision medicine, *Database* (2020)

3.2 Data extraction

Data extraction took place on 1 July 2024 and encompassed a publication range from 2010 to 2023, meaning that the publications included in the final dataset of this report have a publication date within this range. Publication types included in the dataset consist of articles, reviews, meeting abstracts, editorials, letters, proceedings papers, corrections, news items and data papers.

To maximize the precision, recall and robustness of the analyzed dataset, IMI and IHI funded papers were extracted using a combination of the three search strategies outlined below. This approach ensured that the results of this report track with the historical data points identified in previous reports. Notably, the combined use of these search strategies resulted in additional publications being identified for almost every year from 2010, when compared to the publications identified in previous bibliometric evaluations.



3.3 Data analysis

The primary analytical method in this bibliometric evaluation uses the research outputs derived from IHI JU and IMI projects and explores the associated citations they have received from the academic community - an indication of the influence that the research has had on later publications. Interestingly, in [section 8](#), the research performance from IMI projects is benchmarked against ten international research funders across a series of indicators which measure citation impact. Moreover, collaboration analysis has been incorporated to understand the co-authorships from this funded research.

Normalization of data has been applied to this report where appropriate and the mean field-normalized citation impact has been used. It is calculated by dividing the total citations count by the expected citations

count for publications with the same document type, year of publication and subject area. Values over 1 indicate that publications are cited more than would be expected.

4 Impact of IHI JU funded research

In 2023, the first publications resulting from IHI JU funding were identified in Web of Science. A total of six publications have been identified, including four articles, one meeting abstract and one editorial. Published research covers four of the 16 IHI JU funded projects: PROMINENT, GUIDE.MRD, AD-RIDDLE, AND PREDICTOM.

4.1 Citation analysis for IHI funded research

There have been four articles – which along with reviews are referred to as ‘papers’ in this report – published on IHI JU funded research, which have resulted in a total of six citations to date (Table 4.1.1). One paper is in the top 10% highly cited for 2023. All papers have been published as open access.

Table 4.1.1: Summary of citation analysis for IHI supported research papers, 2023

	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	TOTAL CITATIONS FOR PAPERS	CITATIONS PER PAPER	PAPERS IN TOP 10% CITED	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS
IHI	6	4	6	1.5	1	4	100%

*Mean field normalized citation impact has been omitted from this analysis due to the small sample size for IHI publications. As such, there is also no comparison against EU27+UK and world data.

4.2 IHI JU funded publications by country

Sixteen countries have been affiliated with IHI funded research to date, with Sweden leading the geographical landscape by IHI publication volume (four), followed by the Netherlands, Spain, Germany and the United States (all contributing three). Australia and Japan are the only other countries outside of the EU27+UK who have IHI funded publications attributed to them.

5 Collaboration and geographical spread of IHI funded research

All four IHI JU funded papers are the result of collaborative work, with 100% of the published papers involving cross-sectoral, cross-institutional and international collaborations.

5.1 Collaboration profile of IHI JU funded papers across sectors

IHI funded projects exhibit cross-stakeholder collaboration. Of all the stakeholders involved thus far, research organizations have contributed the most, co-authoring all four (100%) IHI funded papers to date (Table 5.1.1). High collaboration is also noted from health-care organizations and providers (75%) and there has been some contribution (25%) from companies and non-profit and non-governmental organizations.

Table 5.1.1: Cross-stakeholder collaborations for IHI funded papers

SECTOR	NUMBER OF CROSS-SECTORAL COLLABORATED IHI PAPERS	% OF CROSS-SECTORAL COLLABORATED IHI PAPERS (N=4)
Researcher/higher or secondary education organisations	4	100.0%
Healthcare professional organisation / healthcare provider	3	75.0%
Large-scale company	1	25.0%
Small and medium-scale company	1	25.0%
Non-profit / non-governmental organisations	1	25.0%

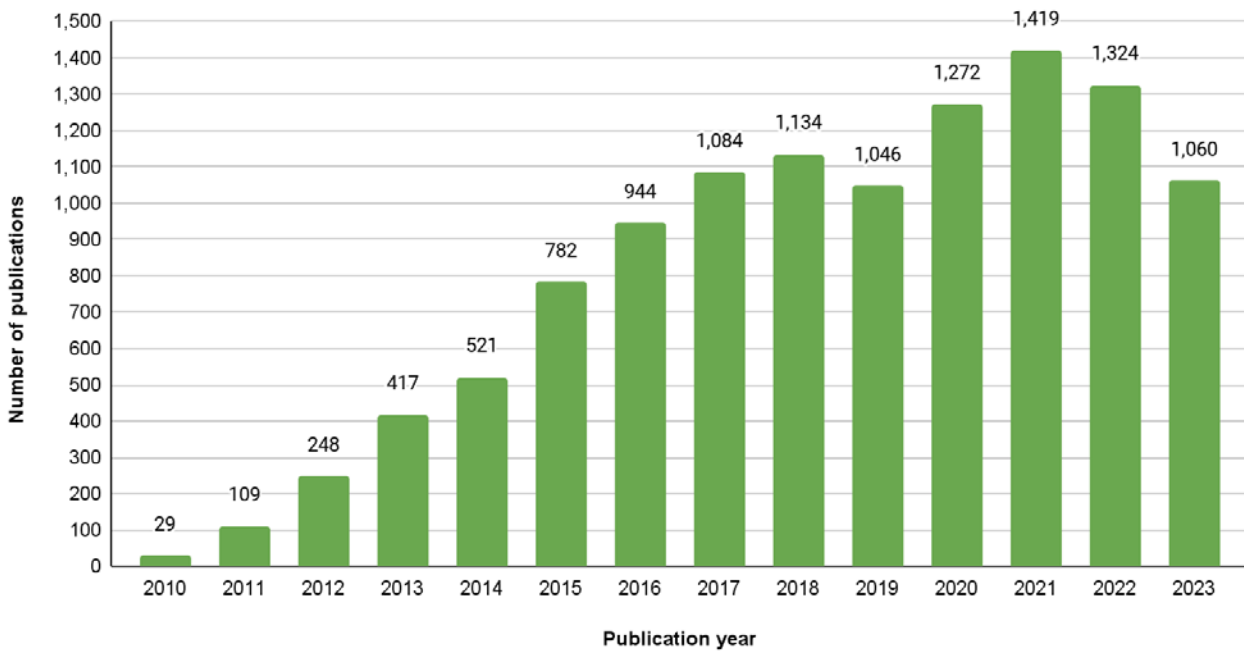
6 Impact of IMI funded research

IMI funded projects are continuing to produce a significant number of publications, reaching 11,389 outputs to date. In 2023, IMI projects generated 1,060 publications, and over the past five years, an average of more than 1,220 publications per year have been produced.

6.1 Trends in IMI funded publications

The publishing growth of IMI funded research between 2010 and 2023 has been impressive, achieving a 31.9% publication compound annual growth rate (CAGR) (Figure 6.1.1). As the IMI funding programmes reach maturity, with the IMI2 programme ending in 2020, outputs began to decrease from the 2021 publication peak, falling 25% over the past two years.

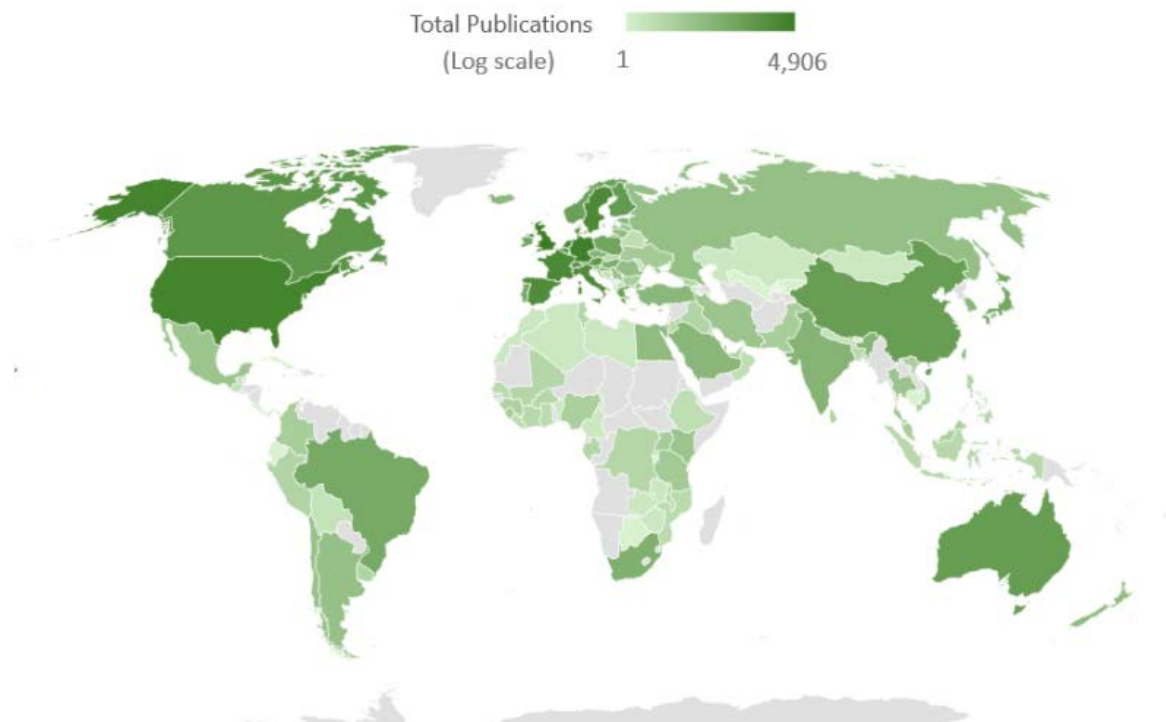
Figure 6.1.1: Number of publications for IMI projects by year, 2010–2023 (total 11,389)



6.2 IMI funded publication output by country

The global reach of IMI’s research activities was also analyzed. In total, **133 countries** have at least one paper funded by IMI (Figure 6.2.1) and there are **67 countries** which have 10 or more IMI funded publications.

Figure 6.2.1: Map of countries with at least one publication for IMI projects 2010–2023*



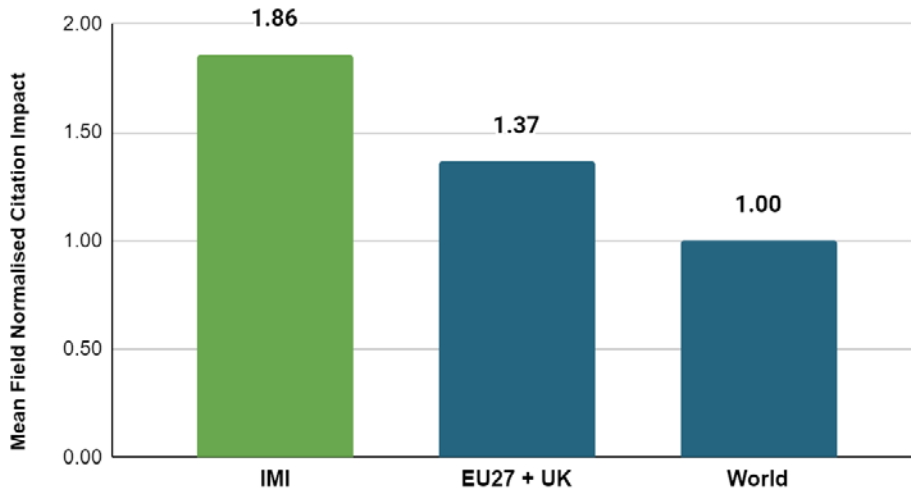
*Publications can be affiliated to multiple countries
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6.3 Citation analysis for IMI funded research

The number of citations a paper receives is at least partly determined by the field to which it relates and the year of publication. Papers published about disciplines such as biomedicine and social sciences typically receive more citations than papers published in engineering, and older publications tend to accumulate higher citation counts than more recent research because they have had more time to accrue them. In this analysis, the field normalized citation impact is used to allow comparison between years and research fields.

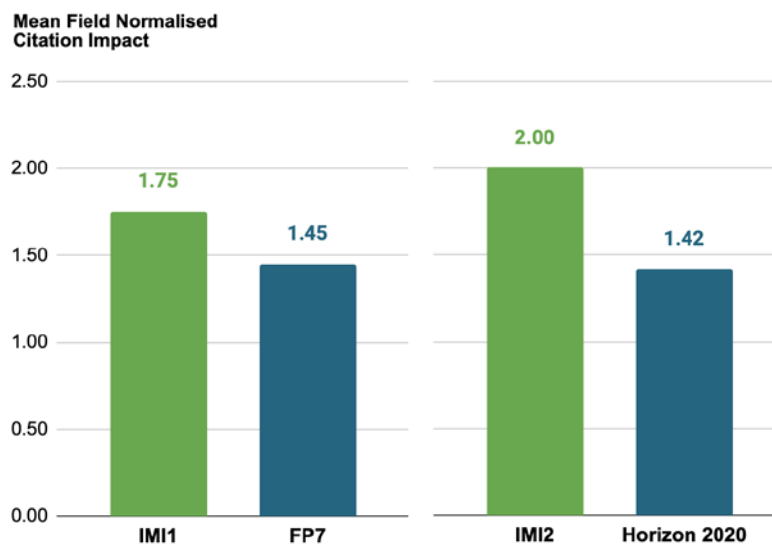
IMI papers had a field normalized citation impact score nearly twice that of the world average (1.86), and 36% greater than the EU27+UK at 1.37 (Figure 6.3.1).

Figure 6.3.1: Field normalized citation impact for IMI supported research papers compared to the average for EU27+UK and world papers 2010–2023



While the total number of publications from IMI projects (IMI1 - 7,004 & IMI2 - 4,351) are considerably smaller than FP7 (171,660) or Horizon 2020 (235,137), the research generated from these projects outperformed their counterparts with EU funding by a measure of field-normalized citation impact (Figure 6.3.2). Horizon 2020 trails IMI2 by a measure of field-normalized citation impact (1.42 vs 2.00). Notably, there has been a 25% increase in the field-normalized citation impact when transitioning from IMI1 to IMI2, while no increased citation impact was observed moving from FP7 to Horizon 2020 funding programmes.

Figure 6.3.2: Field normalized citation impact across funding programmes 2010–2023*



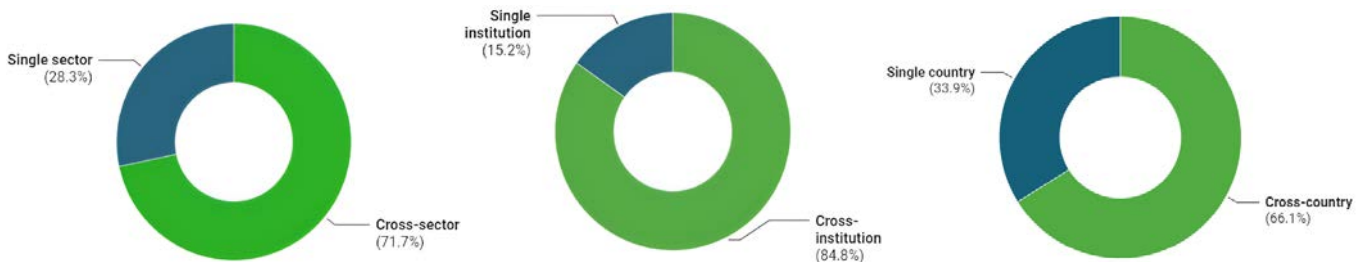
*Heterogeneity exists in the time periods for which these funding programmes operated; therefore direct comparisons of publication volumes generated should be approached with caution. The IMI1 programme ran 2008-2013; FP7 2007-2013; IMI2 2014-2020; and Horizon 2020 was 2014-2020

7 Collaboration and geographical spread of IMI funded research

7.1 Collaboration profile of IMI funded papers

IMI funded papers have a large collaborative footprint, characterized by a high proportion of cross-sectoral partnerships (72%) and cross-institution collaborations (85%). Authorship of IMI funded papers also tends to be geographically diverse, with 66% of research papers affiliated with two or more institutions from different countries collaborating on their research (Figure 7.1.1).

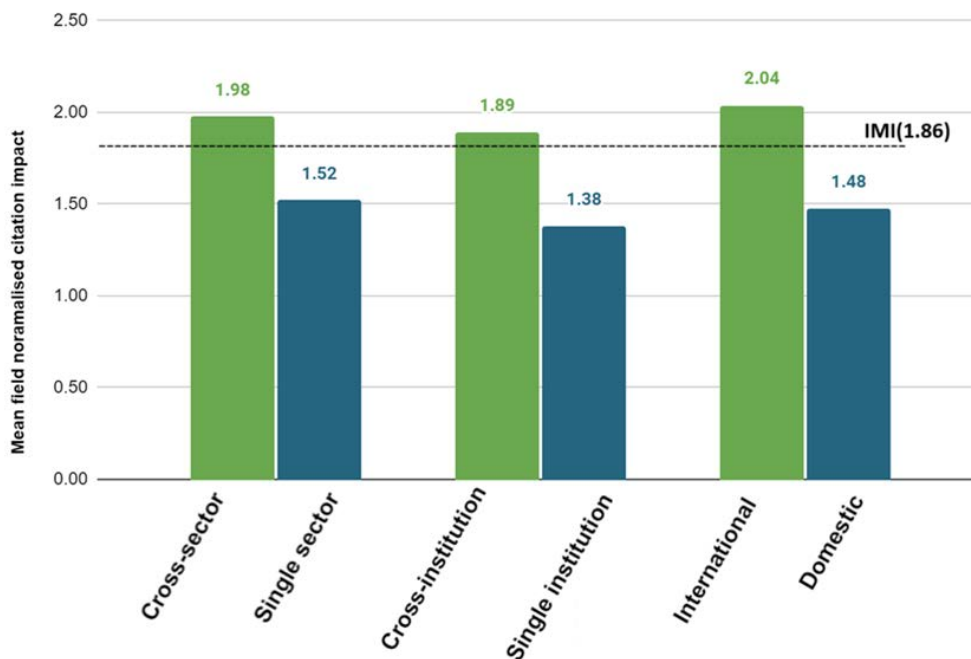
Figure 7.1.1: Collaboration profiles for IMI funded papers 2010–2023



*Created with Datawrapper

Collaborations across sectors, institutions and countries have had a positive effect on citation impact scores for IMI funded papers. Papers produced through cross-sectoral, cross-institutional and cross-country collaboration all yield citation impacts above the IMI average for all papers (Figure 7.1.2). Papers resulting from international collaborations record a field normalized citation impact of 2.04, which is more than twice the global average. Cross-sector and cross-institution collaborations have citation rates close to double the world average, at 1.98 and 1.89 respectively.

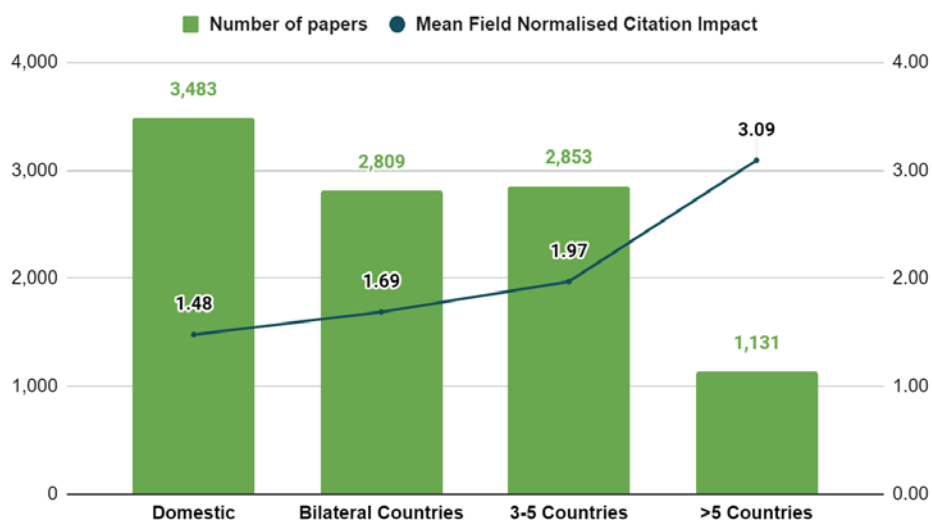
Figure 7.1.2: Citation performance for sectoral, institutional and international collaborations from IMI funded papers 2010–2023



7.2 Impact of domestic and international collaboration of IMI funded papers

A positive relationship exists between the number of countries affiliated to an IMI funded research paper and the field normalized citation impact of that paper, indicating the strength of international collaboration (Figure 7.2.1). IMI funded papers which have five or more affiliated countries have citation rates more than three times the world average (3.09). This citation impact is more than double that of IMI funded papers which only feature domestic collaborators. Bilateral collaborations and those with 3–5 affiliated countries record a higher citation impact than domestic collaborations at 1.69 and 1.97, respectively.

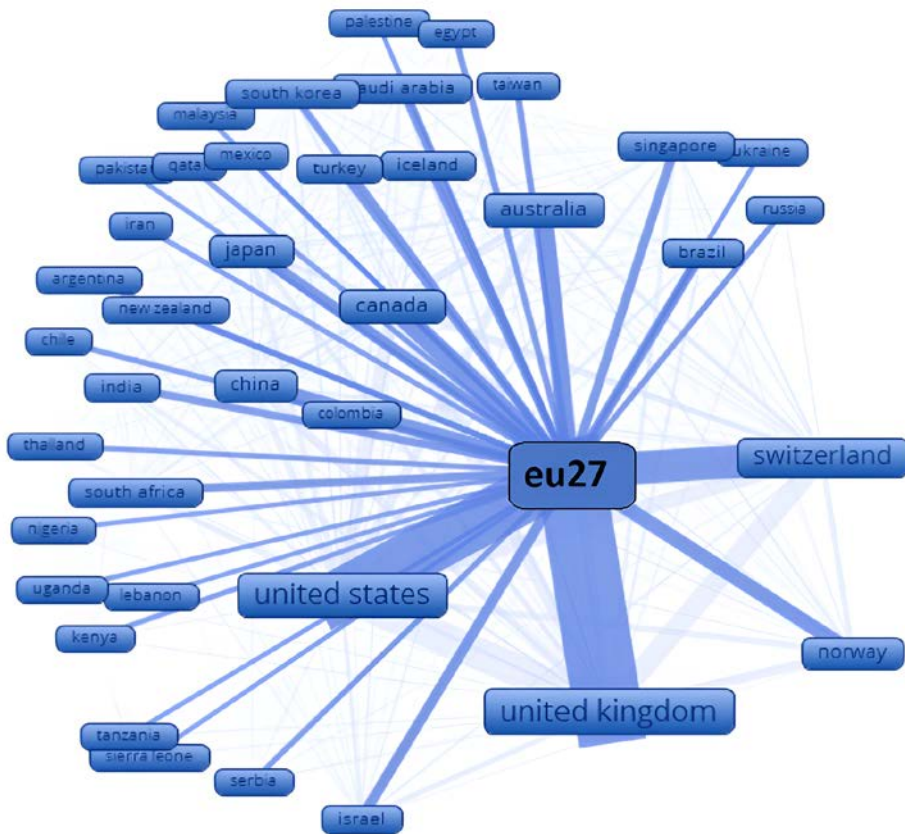
Figure 7.2.1: Collaboration citation performance for IMI funded papers by number of affiliated countries 2010–2023



7.3 Collaborations between EU and non-EU countries for IMI funded publications

IMI projects connect the EU with research hotspots around the world. The United Kingdom (3,329), United States (2,302) and Switzerland (1,128) lead country affiliations from IMI funded publications of all content types involving collaborations between EU and non-EU countries. Canada, Australia, China, Norway, Japan, Israel and Brazil are also in the top ten. Among the top ten non-EU countries, IMI funded publications involving collaborations between Japan and at least one EU country recorded the highest field normalized citation impact at almost five times the world average (4.80), followed by Israel (4.07) and Australia (3.86). Figure 7.3.1 shows the extent of the collaboration network between EU and non-EU countries for collaborations with ten or more publications.

Figure 7.3.1: Collaborations between EU and non-EU countries for IMI funded research where there are 10 or more publications 2010–2023



Created with VoSViewer

*The width of the lines indicates the volume of IMI funded research between EU27 and non-EU countries

**The data on which this figure is based only includes publications with a DOI

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8 Benchmarking analysis comparing IMI funded research with ten international research funders

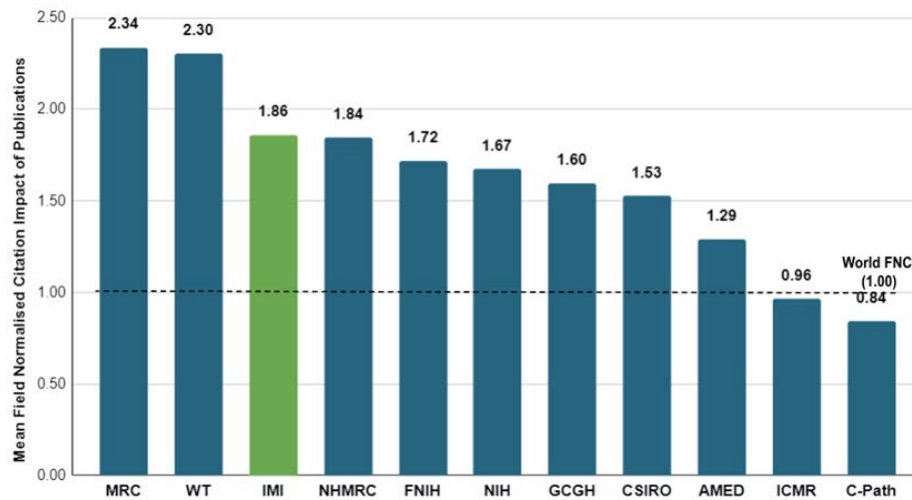
Although IMI has only been funding research for just over a decade, its performance compares well with established funders who have been active for much longer.

The contribution of IMI funded research to the total number of papers supported across the ten comparators included in the benchmarking analysis has grown over the 2010–2023. In 2010 IMI contributed 0.3% of total papers, however, over the last three years (2021, 2022, 2023), IMI funded research contributed 12.4%, 11.4% and 9.2%, respectively. The Japan Agency for Medical Research and Development (AMED), the Foundation for the National Institutes of Health (FNIH) and the Indian Council of Medical Research (ICMR) achieved the most marked increase to their contribution share in 2010–2023.

8.1 Field-normalized citation impact comparing IMI funded publications with selected comparators

A comparison of the total volume of publications from 2010 to 2023 for IMI funded research versus that of the ten comparators indicates that IMI ranks seventh for total volume. The Medical Research Council (MRC), the Wellcome Trust (WT) and the National Health and Medical Research Council (NHMRC) have more than 19 times, 12 times and 10 times the volume of funded publications, respectively. Figure 8.1.1 shows that although IMI funded research has not been produced at the same volume as some of the comparators, the normalized citation impact for IMI funded publications sits third at 1.86, behind the MRC (2.34) and WT (2.30).

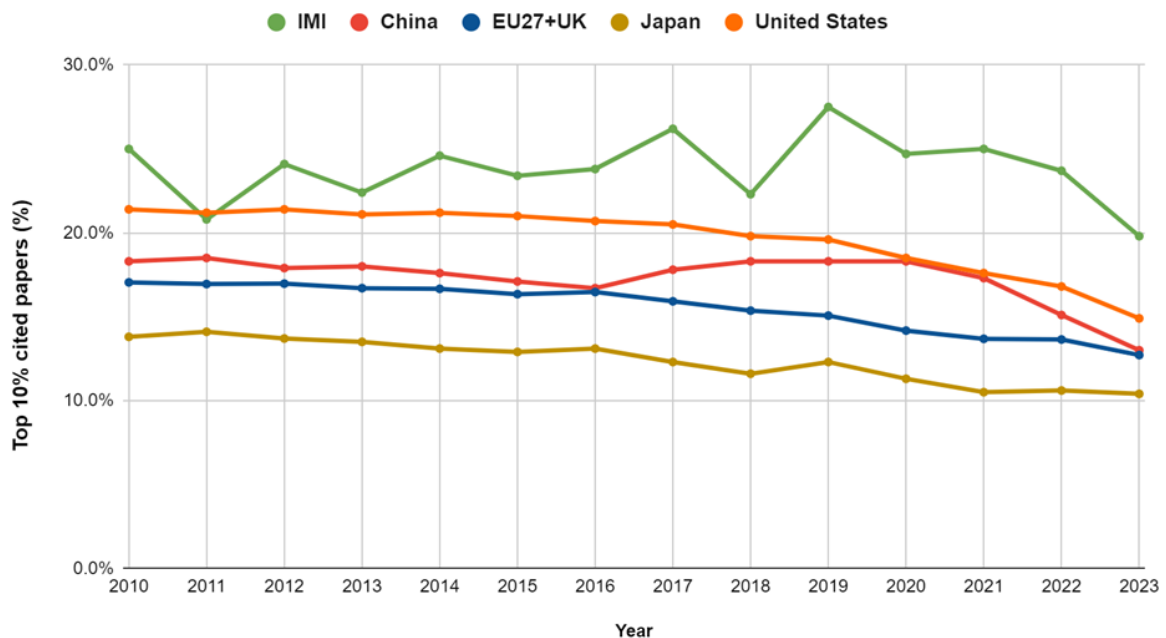
Figure 8.1.1: Mean field normalized citation impact for IMI project research compared with the ten selected comparators, 2010–2023



8.2 Highly cited research (top 10%) comparing IMI funded research with selected regions

IMI has ranked first among the selected comparator regions based on the share of its funded research papers featuring in the top 10% most cited papers globally in their research field throughout the analyzed period (Figure 8.2.1). In 2019, 27.5% of IMI funded papers were in the top 10% highly cited papers.

Figure 8.2.1: Trends in share of highly cited (top 10%) papers from total number of papers per year — IMI funded research compared with selected comparators regions 2010–2023



Data criteria: To compare against the selected comparator regions for highly cited papers (top 1% and 10% most cited), only articles and reviews published in journals housing IMI or IHI papers have been included.