Bibliometric Analysis of Ongoing Projects

14th Report - 2023

Co-funded by the European Union

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1 Executive summary

This report presents a bibliometric analysis of the Innovative Medicine Initiative Joint Undertaking's (IMI JU) research published between 2010 and 2022, using citations as an index of academic impact and co-authorship as an index of collaboration. This report is prepared under the tender reference IMI.2018.OP.01 and is the fourteenth report commissioned by IMI/IHI from Clarivate.

The data shows that IMI continues to perform well. To date, IMI projects have produced 9,784 publications which have been matched to the Clarivate Web of Science™ database. This represents a 14% increase from the 8,609 publications matched to the Web of Science in the thirteenth report, which covered IMI project research published between 2010 and 2021.

IMI-funded projects continue to produce a large number of publications, reaching almost 10,000 publications to date. In 2022, IMI projects generated 1,144 publications. In the past 5 years IMI projects have published more than 1,000 publications each year with an average of 1,185 publications per year.

The majority of IMI research (64%) continues to be published in high impact journals, i.e., those journals in the highest quartile (Q1) when ranked by Journal Impact Factor, and the average Journal Impact Factor of all IMI project publications was 7.53. IMI research fields were wide-ranging from basic biological research to clinical practice. IMI project research has been published most frequently in the fields of Neurosciences, Pharmacology & Pharmacy, and Biochemistry & Molecular Biology.

The impact of IMI project research (as indicated by citation impact) remains twice (2.03) that of the world average (1.00), which indicates that the research was internationally influential. Between 2010 and 2022, the field-normalised citation impact of IMI papers was considerably higher (75%) than the European Union's (EU) average citation impact (1.16) in similar biomedical fields (journal subject categories). Around a quarter (24.6%) of IMI project papers were highly cited; that is, the papers were in the world's top 10% of papers (taking journal category and year of publication into account), when ranked by number of citations.

The output of individual IMI projects continued to increase between 2010 and 2022. BTCure (IMI 1, Call 2) has remained the most prolific IMI project, with 727 publications as of this report. While RTCURE and BigData@Heart projects are new to the Top 10 IMI projects by publication output.

Projects funded by IMI are highly collaborative. Similar to last year's report, two-thirds (67%) of all IMI project papers were co-authored by researchers working in different sectors, more than three-quarters (86%) involved collaboration between institutions and more than half (65%) were internationally collaborative. Internationally collaborative IMI project research had an average citation impact (2.68) well over twice the world average (1.00) and higher than domestically collaborative IMI project research (1.82). Similarly, cross-sector and cross-institution collaboration had an average citation impact of 2.69 and 2.56, respectively. IMI's papers that were single sector, institution and domestic also performed above the world average of 1. (Single Sector: 1.74, Single Institution: 1.55 and Domestic: 1.74)

Research in both Europe and North America tends to be clustered in major cities with an existing strong academic research base. The citation impact of IMI papers within these clusters is higher than national averages and rates of international co-authorship are very high (75-100%) compared to the averages for EU-28 biomedical research (35%). The European and North American clusters with the highest proportion of open access papers are Oxford, UK (94.1%) and Seattle (96.6%) respectively.

IMI's field-normalised citation impact (2.03) is two times the world average and is comparable to other well-established funding bodies such as the Medical Research Council (MRC) and the Wellcome Trust (WT) and is higher than all other comparators.

IMI's average field-normalised citation impact remained the same as last year, in comparison five of the comparators saw a slight decrease (1-2%) of their average field-normalised citation impact. Similarly, IMI publications published in 2022, had a higher citation impact (2.10) than those published in 2021 (1.98), a change of 6% indicating an increased impact of IMI papers.

IMI's journal-normalised citation impact (1.18) is the second highest among the comparators and only slightly lower than CSIRO (1.23). IMI's percentage of highly cited papers (24.7%) outperforms all the comparators, except GCGH (25.9%). IMI publishes more open access papers than three out of the seven comparators (CSIRO, C-Path, and ICMR).

A more detailed summary of the key findings of this report (with cross-references to the relevant sections) is provided below.

Summary of key findings

Since its first call for proposals in 2008, IMI has funded 182 projects from a total of 34 funding calls. Of the calls, 11 were from IMI's first phase (IMI 1), which ran from 2008 to 2013, and the rest from its second phase (IMI 2), which was launched in 2014 and ended in 2020. While the IMI 1 and 2 programmes have ended, many of the projects funded by these programmes are still ongoing, with a few having an end date of 2028.

It may take several months for a project to progress from inception to the point where it has generated sufficient data for a publication. It may take further months or years until it has produced its most valuable results. As some of the IMI projects analysed in this report are relatively young, the bibliometric indicators may not fully reflect their eventual impact.

- IMI projects have published a total of 9,784 unique Web of Science publications (Figure 4.1.1) in a total of 1,681 journals with an average journal impact factor of 7.53.
- IMI's publication growth is showing signs of stabilising as the programme matures (Figure 4.3.1) and published 1,144 publications in 2022.
- A quarter (24.6%) of IMI papers were in the world's top 10% of most highly cited papers in the relevant field and year of publication, suggesting very strong performance (Table 4.6.1).
- The field-normalised citation impact of IMI project papers was twice (2.03) the world average (1) and significantly higher than the EU average (1.16) between 2010 and 2022 (Figure 4.6.1).
- IMI's 2022 papers had a larger impact (2.10) than IMI's 2021 papers (1.98) as measured by the field-normalised citation impact, which demonstrates increasing research impact.
- More IMI project publications appeared in *Scientific Reports* (213 publications) and *Annals of the Rheumatic Diseases* (213 publications) than in other journals. Of the 20 journals in which IMI-funded projects published most frequently, more than two-thirds (14 journals) rank in the top quartile by Journal Impact Factor (Table 4.7.1).
- More than a quarter (26.4%) of IMI's papers were published in the world's top 10% journals by Impact Factor. The highest Impact Factor journal in which IMI research was published is the *Lancet* (9 publications), which has a Journal Impact Factor of 202.73.[1] Of the Top 20 journals by Impact Factor, IMI published most frequently in *Nature* (69.50) with 31 publications, followed by *Nature Medicine* (87.24) with 23 publications (Table 4.7.2).

[1] Note: Since this report was delivered in March, last year's JCR (2021) was used in lieu of this year's JCR (2022) which is not due to be released until June 2023.

- Journals with particularly high impact factors that have published IMI research include *Lancet* (202.73) (and other Lancet Journals e.g. *Lancet Respiratory* (102.64), *Lancet Microbe* (86.21) and others), *New England Journal of Medicine* (176.08), *Journal of the American Medical Association (JAMA)* (157.34*), Nature Reviews Molecular Cell Biology* (113.92), *Nature Reviews Drug Discovery* (112.29) , *Nature Reviews Immunology* (108.56) and the *British Medical Journal (BMJ)* (93.33) (Table 4.7.2).
- IMI project research was most frequently published in Neuroscience journals (Figure 4.8.1), similar to the thirteenth report (2022). Of the 977 papers published in Neuroscience, 28.2% were highly cited, 70.9% were open access, and the average citation impact of these papers was 1.97, higher than the world average for the year and field of publication (Table 4.8.2 and Table 4.8.3).
- IMI research in the Clinical Neurology remains the category with the highest percentage of highly cited papers (36.1%) (Table 4.8.3).
- IMI project research had a citation impact well above the European (EU-28) average in all of the 20 journal subject categories to which most IMI publications were assigned, indicating strong performance (Figure 4.9.1 and Table 4.9.1).
- Early IMI 1 calls (1-4) follow a similar pattern of initial growth in publication output for 3 to 6 years followed by a decline as the projects end (Figure 5.1.1). Later IMI 1 calls published very few papers over the time period, normally less than 50 each year. The exception being IMI 1 call 11 which showed exponential growth until 2019 and has since trended downwards which is expected since all but one project is now closed.
- In 2022 the publication output of most IMI 2 calls appears to be on a decline or stabilising as IMI 2 projects begin to close (Figure 5.1.3).
- Papers assigned to IMI 2 call 21 continues to have the highest average field-normalised citation impact (4.65), more than four times the world average. This is likely due to the projects within this call being coronavirus related (Table 5.1.1).
- The largest geographic clusters of research supported by IMI in Europe are London (2,120 publications), Amsterdam (1,802 publications) and Stockholm (965 publications). The largest clusters in North America are Boston (467 publications), Toronto (404 publications) and New York (311 publications) (Table 6.1.1 and Table 6.1.3).
- IMI research in all the European and North American geographic clusters performs well above the national averages in terms of citation impact. The highest citation impact clusters in Europe are Maastricht (4.40) and Helsinki (4.26), both more than 2.5 times their respective national averages which are 1.70 and 1.52 respectively (Table 6.1.2 and Table 6.1.4).
- Around 35% of all EU-28 biomedical research involves international co-authorship while in comparison rates of international collaboration for IMI project research are very high for most clusters, especially in North America where most clusters have around 90% international collaboration which is expected as IMI is a European funding organisation that primarily funds researchers working in EU-28. The European cluster with the highest rate of internationally collaborative papers was Basel, with 95.1% of its research involving international co-authorship. While the European cluster, Rome, was the lowest with 75.9% of its research involving international collaboration (Table 6.1.1 and Table 6.1.3).
- IMI project research is collaborative across sectors, institutions, and countries. Two-thirds (67%) of IMI project papers were co-authored by researchers from different sectors with 27.6% of these collaborations involving both public and private sectors (Table 7.1.1).
- More than three-quarters (86%) of IMI project papers involved collaboration between different institutions. Nearly two-thirds (65%) of all IMI project papers were internationally collaborative (Table 7.1.1).
- IMI's collaborative research for sectors, institutions, and countries continues to have an average field-normalised citation impact that is almost 50% higher than IMI's non-collaborative research (sectors: 2.69 vs 1.74, institutions: 2.56 vs 1.55, and countries: 2.68 vs 1.74) (Figure 7.1.1).

- BTCURE, followed by EU-AIMS, had the largest number of papers with co-authors from more than one institution and sector. While EU-AIMS has the largest number of papers, followed by BTCURE, with co-authors from more than one country. (Table 7.2.1 to Table 7.2.3)
- For those projects with at least 100 papers, U-BIOPRED had the highest percentage of its papers with co-authors from more than one country (77.2%). While BigData@Heart had the highest percentage of its papers with co-authors from more than one sector (90.0%), and institution (97.6%), indicating the highly collaborative nature of these projects (Table 7.2.1-Table 7.2.3).
- King's College London is part of seven out of the ten most productive pairs of collaborating institutions, including the second most productive pair where King's College London collaborated with the University of Cambridge on 159 publications (Figure 7.3.3).
- Karolinska University Hospital and Karolinska Institute were the top collaborating pair, collaborating on 174 publications.
- PROACTIVE has the highest collaboration index score of 2.65 (Table 7.4.1).
- IMI's field-normalised citation impact (2.03) was lower than the Wellcome Trust's (2.07) and the MRC's (2.09) and higher than all the other comparators (Figure 8.2.4).
- IMI's percentage of uncited research in each year has been the lowest of all the comparators since 2020, including the most recent year of 2022 (48.4%) (Figure 8.2.9 and Table 8.2.6). IMI has the fourth highest overall percentage of uncited papers (7.3%) between 2010-2022 (Figure 8.2.10).
- IMI has a higher percentage of highly cited papers (24.7%) than all the comparators except GCGH (25.9%) (Figure 8.2.12).
- More than three-quarters (78.3%) of IMI papers are open access (Table 4.6.2).

2 Introduction

2.1 Overview

The Innovative Medicines Initiative (IMI) Joint Undertaking has commissioned Clarivate to undertake a yearly evaluation of its research portfolio using bibliometric indicators.

The commissioned evaluation comprises a series of reports focusing on research publications produced by IMI funded researchers. This report is the fourteenth evaluation in the series.

2.2 Innovative Medicines Initiative (IMI)

IMI's purpose is to improve health by speeding up the development of, and patient access to, innovative medicines, particularly in areas where there is an unmet medical or social need. It does this by facilitating collaboration between the key players in healthcare research, including universities, pharmaceutical companies and other industries, small and medium-sized enterprises (SMEs), patient organisations, and medicines regulators.

IMI is a partnership between the EU and the European pharmaceutical industry, represented by the European Federation of Pharmaceutical Industries and Associations (EFPIA). IMI, as part of its second phase (IMI 2), has a budget of €3.3 billion for the period of 2014 to 2024. Half of this comes from the EU's research and innovation programme, Horizon 2020. The other half comes from large companies, mostly in the pharmaceutical sector; these organisations do not receive any EU funding, but contribute to the projects 'in kind', for example by donating their researchers' time or providing access to research facilities or resources. The first phase of IMI had a budget of €2 billion equally shared between EU and EFPIA.

To date, IMI has announced 11 calls for proposals under its first phase and a further 23 calls for proposals under its second phase. The first funding call was announced in 2008 and the final calls were launched in June 2020. In February 2021, the Innovative Health Initiative (IHI), a new public-private partnership in health was announced that will run under Horizon Europe, the new European framework programme for research and innovation. This new partnership will build upon the Innovative Medicines Initiative (IMI) but will have a greater focus on cross sectoral collaborations involving biopharmaceutical, medical technology, and biotechnology sectors. This report covers the research output (publications and papers) of a total of 61 projects from IMI phase one and 126 projects from IMI phase two.

2.3 Clarivate

This report was prepared by Clarivate under the public procurement procedure with reference number IMI.2018.OP.01.

2.4 Scope of this report

The analyses and indicators presented in this report have been selected to provide an analysis of IMI research published output for research management purposes:

- To identify excellence in IMI supported research overall and at individual call or project level.
- To benchmark IMI project research performance against other funders research, the EU-28 biomedical research and world averages.
- To show that collaboration, at all levels (researcher, institutional and country), is being encouraged through the projects funded by IMI.

Outline of this report:

- Section 3 describes the data sources and methodology used in this report along with definitions of the indicators and guidelines to interpretation.

Bibliometrics

- Section 4 presents analyses of IMI project publications overall, including trends in publications, frequently used journals, and top research fields. Where possible IMI research is benchmarked to EU-28 biomedical research.[2]
- Section 5 presents citation analyses of IMI publications at the call level, examining the citation impact and outputs of individual project. Where possible the IMI projects are benchmarked to world output and overall IMI output.
- Section 6 presents geographic clusters where IMI research activity occurs, including bibliometric data, the constituent institutions and top five journal subject categories within the clusters.

Collaboration

- Section 7 presents collaboration analyses for IMI publications overall and at the project level, examining collaboration between different sectors, institutions, and countries.

Benchmarking

- Section 8 presents analysis of IMI publications, benchmarked to similar funding organisations. The organisations are: Commonwealth Scientific and Industrial Research Organisation (CSIRO), Critical Path Institute (C-Path), Foundation for the National Institutes of Health (FNIH), Grand Challenges in Global Health (GCGH), Indian Council of Medical Research (ICMR), Medical Research Council (MRC), and the Wellcome Trust (WT).

[2] At time of publication, September 2022, the United Kingdom has left the European Union, however to date there has not been any large changes to the United Kingdom's participation in Horizon 2020 funded research therefore the United Kingdom is still included in the EU-28.

3 Data sources, indicators and interpretation

3.1 Bibliometrics and citation analysis

Research evaluation increasingly uses bibliometric data and analyses to assess performance. Bibliometrics is the analysis of data derived from publications and their citations. Publication of research outcomes is an integral part of the research process and is a universal activity. Consequently, bibliometric data have a currency across subjects, time and location that is found in few other sources of research-relevant data. The use of bibliometric analysis, allied to informed review by experts, increases the objectivity of, and confidence in, evaluation.

Research publications accumulate citation counts when they are referred to by more recent publications. Citations to prior work are a normal part of publication and reflect the value placed on a work by later researchers. Some papers get cited frequently and many remain uncited. Highly cited work is recognised as having a greater impact and Clarivate has shown that high citation rates are correlated with other qualitative evaluations of research performance, such as peer review.[3] This relationship holds across most science and technology areas and, to a limited extent, in social sciences and even in some humanities subjects.

Indicators derived from publication and citation data should always be used with caution. Some fields publish at faster rates than others and citation rates also vary. Citation counts must be carefully normalised to account for such variations by field. Because citation counts naturally grow over time, it is essential to account for growth by year. Normalisation is usually done by reference to the relevant global average for the field and for the year of publication.

Bibliometric indicators have been found to be more informative for core natural sciences, especially for basic science, than they are for applied and professional areas and for social sciences. In professional areas the range of publication modes used by leading researchers is likely to be diverse as they target a diverse, non-academic audience. In social sciences there is also a diversity of publication modes and citation rates are typically much lower than in natural sciences.

Bibliometrics work best with large data samples. As the data are disaggregated, so the relationship weakens. Average indicator values (e.g., of citation impact) for small numbers of publications can be skewed by single outlier values. At a finer scale, when analysing the specific outcome for individual departments, the statistical relationship is rarely a sufficient guide by itself. For this reason, bibliometrics are best used in support of, but not as a substitute for, expert decision processes. Well-founded analyses can enable conclusions to be reached more rapidly and with greater certainty and are therefore an aid to management and to increased confidence among stakeholders, but they cannot substitute for review by well-informed and experienced peers.

3.2 Data source

For the bibliometric analysis, data will be sourced from the databases underlying the Clarivate **Web of Science**, which gives access to conference proceedings, patents, websites, and chemical structures,

[3] *Evidence* Ltd. (2002) Maintaining Research Excellence and Volume: A report by *Evidence* Ltd to the Higher Education Funding Councils for England, Scotland and Wales and to Universities United Kingdom (UK). (*Adams J, et al.)* 48pp.

compounds and reactions in addition to journals. It has a unified structure that integrates all data and search terms together and therefore provides a level of comparability not found in other databases. It is widely acknowledged to be the world's leading source of citation and bibliometric data.

The **Web of Science Core Collection** is part of the Web of Science and focuses on research published in journals and conferences in science, medicine, arts, humanities, and social sciences. The authoritative, multidisciplinary content covers over 21,000 of the highest impact journals worldwide, including open access and over 300,000 conference proceedings. Coverage is both current and retrospective in the sciences, social sciences, arts, and humanities, in some cases back to 1900. Within the research community, these data are often still referred to by the acronym 'ISI'.[4] Clarivate has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national, and institutional research impact.

3.3 Methodology

Publications: Many different document types are indexed in the Web of Science, including editorials, meeting abstracts, book reviews as well as research journal articles and reviews. In this report all documents regardless of type are referred to as 'publications'.

Article: Reports of research on original works. Includes research papers, features, brief communications, case reports, technical notes, chronology, and full papers that were published in a journal and/or presented at a symposium or conference.

Review: A renewed study of material previously studied. Includes review articles and surveys of previously published literature. It usually will not present any new information on a subject.

Papers: The terms 'paper' and 'publication' are often used interchangeably to refer to printed and electronic outputs of many types. However, in this report the term 'paper' is used exclusively to refer to articles and reviews - a subset of 'publications' that excludes all other document types.

Articles and reviews are the main way researchers communicate their results to the wider community and standards in methodology and interpretation are ensured by pre-publication peer-review by experts in the same field. Therefore, citation data for papers is the most informative for bibliometric evaluations and only citations to papers are used in calculations of the citation impact indicators presented in this report.

Citations: Papers mention earlier papers to acknowledge their intellectual contribution to a field of research. A paper receives a citation when it is mentioned or cited by another, usually more recent paper.

Citation count: The number of citations received by a paper since it was published reflects the impact it has had on later research. Not all citations are necessarily recorded as not all the citing papers are indexed in the Web of Science. The material indexed by Clarivate, however, is estimated to attract about 95% of global citations.

Citation impact: Citations per paper is an index of academic or research impact (as compared with economic or social impact). for a single paper, raw citation impact is the same as its citation count. For a set of papers, it is calculated by dividing the sum of citations by the total number of papers in any given dataset.

[4] The origins of citation analysis as a tool that could be applied to research performance can be traced to the mid-1950s, when Eugene Garfield proposed the concept of citation indexing and introduced the Science Citation Index, the Social Sciences Citation Index and the Arts & Humanities Citation Index, produced by the Institute of Scientific Information – ISI (now Clarivate).

Impact can be calculated for papers within a specific research field such as Clinical Neurology, or for a specific institution or group of institutions, or a specific country.

Citation count declines in the most recent years of any time-period as papers have had less time to accumulate citations e.g. papers published in 2007 will typically have more citations than papers published in 2010.

Field-normalised citation impact: Broadly the field-normalised citation impact compares the citation impact of a paper or set of papers to the average citation impact of all similar papers published worldwide in the same field and year.

As citation rates vary between research fields and with time, analyses must take both field and year into account. In addition, the type of publication will influence the citation count. For this reason, only citation counts of papers (as defined above) are used in calculations of citation impact. The standard normalisation factor is the world average citations per paper for the year and journal category in which the paper was published.

As field-normalised citation impact is normalised to global averages the performance of papers in different fields can be directly compared as the world average always equals 1.00. Therefore, a field-normalised citation impact exceeding 1.00 indicates papers have received more citations than the world average, conversely a value below 1.00 suggests papers are underperforming. See page 147 for a worked example of how field-normalised citation impact is calculated.

Highly cited papers: Highly cited papers are papers that are recognized as having a greater impact than other papers published in a similar year and field. For a paper to be considered highly cited they must be in the Top 10% in terms of citation frequency, considering the field and year of publication. High citation rates have shown to be correlated with other qualitative research performance evaluations, such as peer reviews.

Web of Science journal categories or Clarivate InCites: Essential Science Indicators^{SM} fields: Standard bibliometric methodology uses journal category or ESI fields as a proxy for research fields. ESI fields aggregate data at a higher level than the journal categories – there are only 22 ESI research fields compared to 254 journal categories. [5] Journals are assigned to one or more categories, and every article within that journal is subsequently assigned to that category. Papers from prestigious, 'multidisciplinary' and general medical journals such as *Nature, Science*, *The Lancet*, *The BMJ*, *The New England Journal of Medicine* and the *Proceedings of the National Academy of Sciences* (PNAS) are assigned to specific categories based on the journal categories of the references cited in the article. The selection procedures for the journals included in the citation databases are documented here http://mjl.clarivate.com/.

Journal-normalised citation impact: Broadly the journal-normalised citation impact compares a paper or a set of papers citation impact to all the other papers published in the same journal in the same year.

It is another bibliometric indicator which can be very useful in small datasets. This indicator is calculated from the citation impact relative to the specific journal in which the paper is published. For example, a paper published in the journal *Acta Biomaterialia* in 2005 that has been cited 189 times, would have an expected citation rate of 49.57 (the average number of citations per paper for this journal and publication year) and hence a journal-normalised citation impact of 6.3. This paper, therefore, has been cited more than expected for the journal.

[5] Essential Science Indicators are defined by a unique grouping of journals with no journal being assigned to more than one field. These fields are focussed on the science, technology, engineering and medicine subjects and arts & humanities subjects are excluded. Customised analyses, however, can be designed to include these as an additional category.

Like the field-normalised citation impact a value exceeding 1.00 indicates that a paper or set of papers is receiving more citations than other papers in the same journal, and a value less than 1.00 indicates that a paper or set of papers is underperforming, receiving fewer citations that papers in the same journal.

Open access publications: Open access publications are publications that are made available online, at no cost to the reader. The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes.

It is also possible that some publishers make publications available without following a recognised open access route. In these cases, publications will not be indexed as open access in the Web of Science. Additionally, the analysis presented in this report covers all document types and not just papers, and some of these are not indexed as open access in the Web of Science databases.

The Web of Science open access data coverage is summarised at:
clarivate.com/webofsciencegroup/solutions/open-access/

3.4 Data collation

This analysis used a dataset comprising publications arising from IMI supported projects. These publications were identified using grant acknowledgments, title, and abstract text searches, as well as other parameters developed in conjunction with IMI staff. There are currently 187 IMI projects. IMI staff validated the publications identified by this process and the list of projects to be analysed was provided by IMI staff.

4 Citation analysis – IMI supported publications: overview

This section analyses the volume and citation impact of publications arising from IMI supported projects, and where possible, benchmarks this against similar European research funders.

The datasets analysed in this, the fourteenth report, include IMI supported publications identified in Clarivate Web of Science up to 31st December 2022. The census point for inclusion of publications into the thirteenth report was the 31st December 2021. Therefore, this report reflects changes in IMI activity between these points. Citations to these publications were counts up to 31st December 2022. Unless otherwise specified metrics are for all IMI supported documents from all calls in IMI 1 and IMI 2, in aggregate.

When considering the analyses in this section, earlier caveats regarding paper numbers should be borne in mind (Section 3).

4.1 Publications from IMI supported projects

Publications from IMI supported projects were identified using bibliographic data supplied by IMI, and through specific keyword searches using funding acknowledgment data in the Web of Science. The process of identifying publications from IMI supported projects that have Clarivate citation data is outlined in Figure 4.1.1.

The IMI project dataset started with 8,609 publications which were previously identified as IMI publications and used as the IMI publication dataset in the previous report. Separately, 1,329 new publications were identified as IMI-associated through keyword searches of funding acknowledgement text in databases which underlie Clarivate Web of Science. The combination of these two datasets led to a total of 9,938 unique publication records associated with IMI supported projects. Of these 9,938 publications, 154 were eliminated as they were either published in 2023 or could not be distinguished as IMI from a manual review of the dataset. Therefore, 9,784 Web of Science publications remained.

The citation counts for this report were sourced from the citation databases which underlie Clarivate Web of Science and were extracted in March 2023. Normalised bibliometric indicators were calculated using standard methodology and the Clarivate National Science Indicators (NSI) database for 2022.

Figure 4.1.1 Process for identifying publications from IMI supported projects, 2010-2022

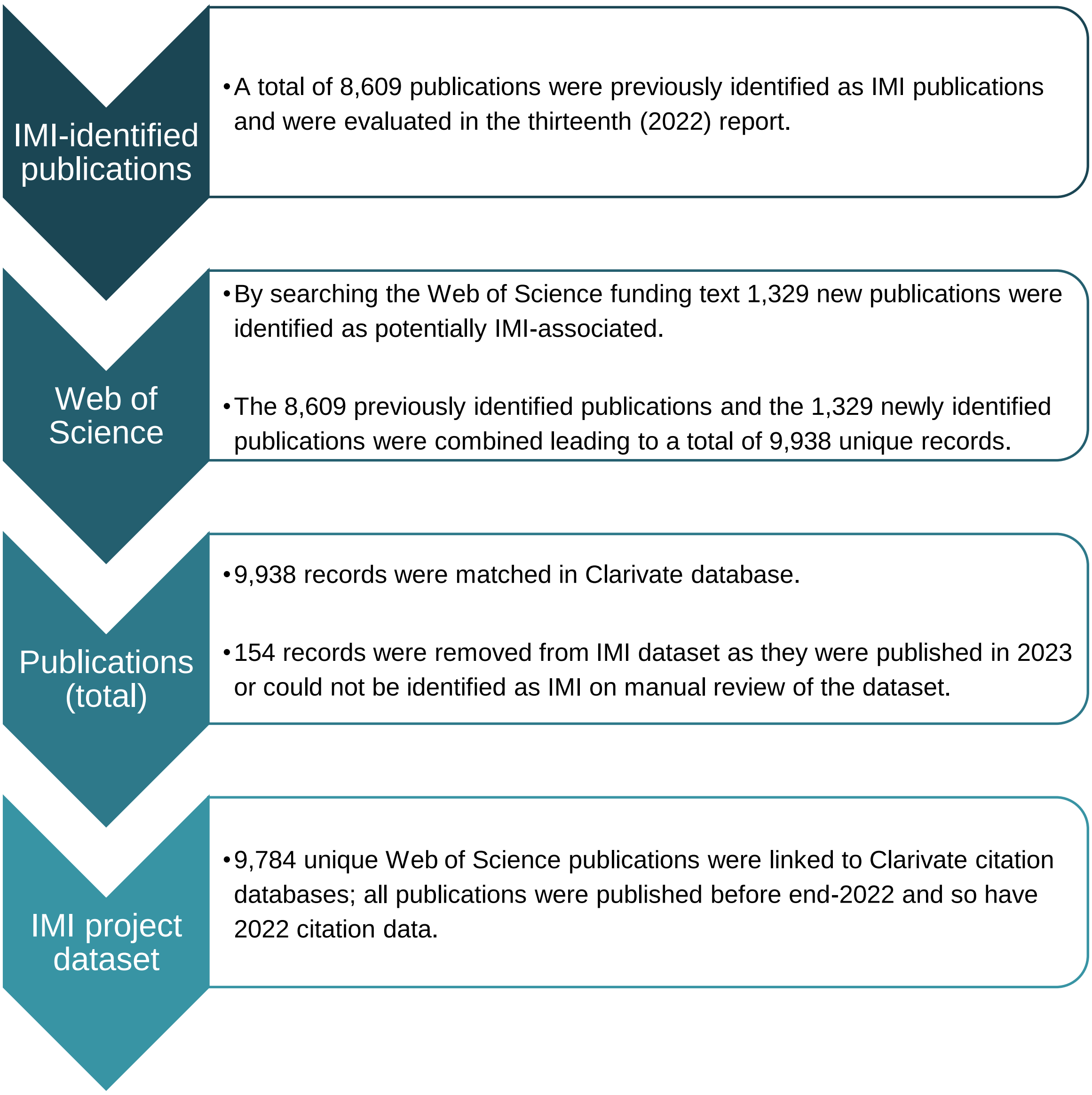


Table 4.1.1 Number of publications from IMI projects, 2010-2022

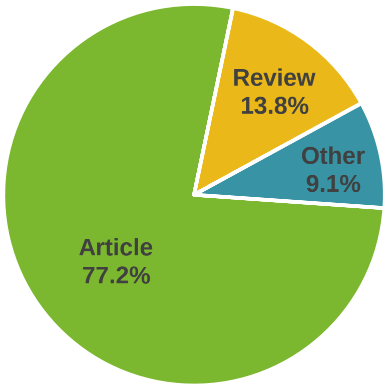
	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS
All IMI	9,784	8,896
IMI 1	6,601	6,157
IMI 2	3,345	2,915

Note that some publications belong to IMI 1 and IMI 2 and therefore the total number of publications shown for All IMI is smaller than the sum of publications shown for IMI 1 and IMI 2.

4.2 Publications from IMI projects by document type

Figure 4.2.1 shows the percentage of publications by document type and the same data is shown in Table 4.2.1.

Figure 4.2.1 Percentage of IMI project publications by document type, 2010-2022



Articles + Reviews = Papers, 90.9%

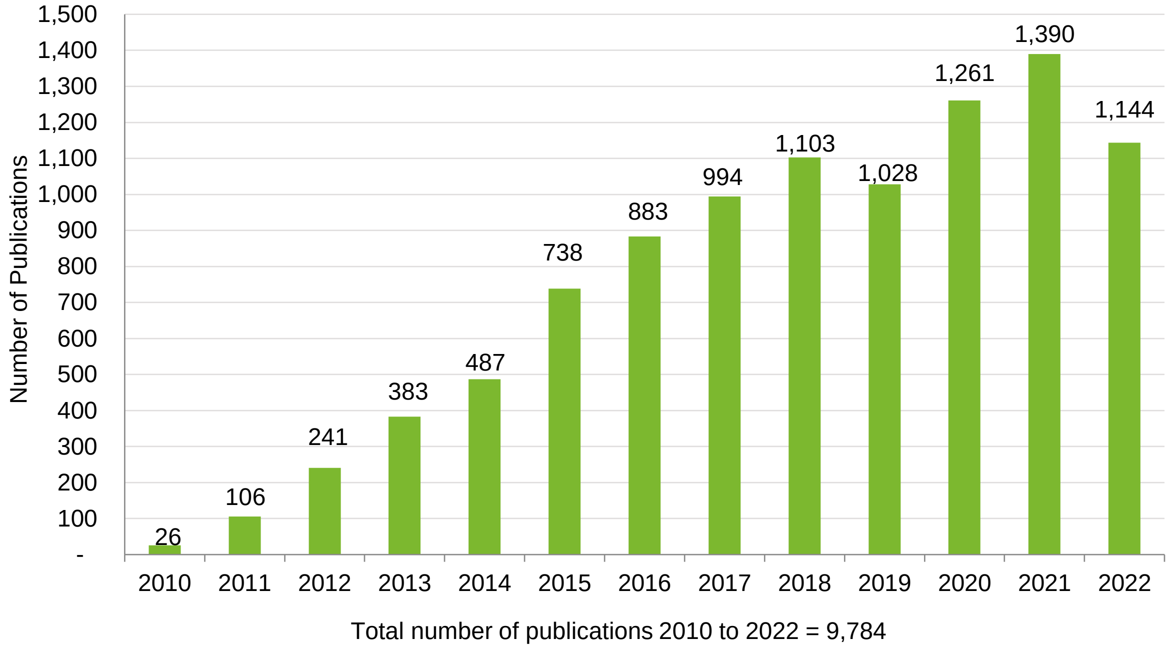
- IMI project research resulted in 9,784 unique Web of Science publications.
- Out of the 9,784 publications, 90.9% were articles (77.2%) and reviews (13.8%) which are collectively referred to as ‘papers’ in this report.
- A further 888 publications (9.1%) were not papers. These ‘other’ publications are composed of 207 editorials, 435 meeting abstracts, 110 proceeding papers, 112 letters, 16 corrections and three news items and five data papers.

Table 4.2.1 Number and percentage of IMI project publications by document type, 2010-2022

	DOCUMENT TYPE	NUMBER OF PUBLICATIONS	% OF IMI PUBLICATIONS
Papers	Article	7,550	77.17%
	Review	1,346	13.76%
Other document types	Meeting Abstract	435	4.45%
	Editorial Material	207	2.12%
	Letter	112	1.14%
	Proceedings Paper	110	1.12%
	Correction	16	0.16%
	Data Paper	5	0.05%
	News Item	3	0.03%

4.3 Trends in publication output

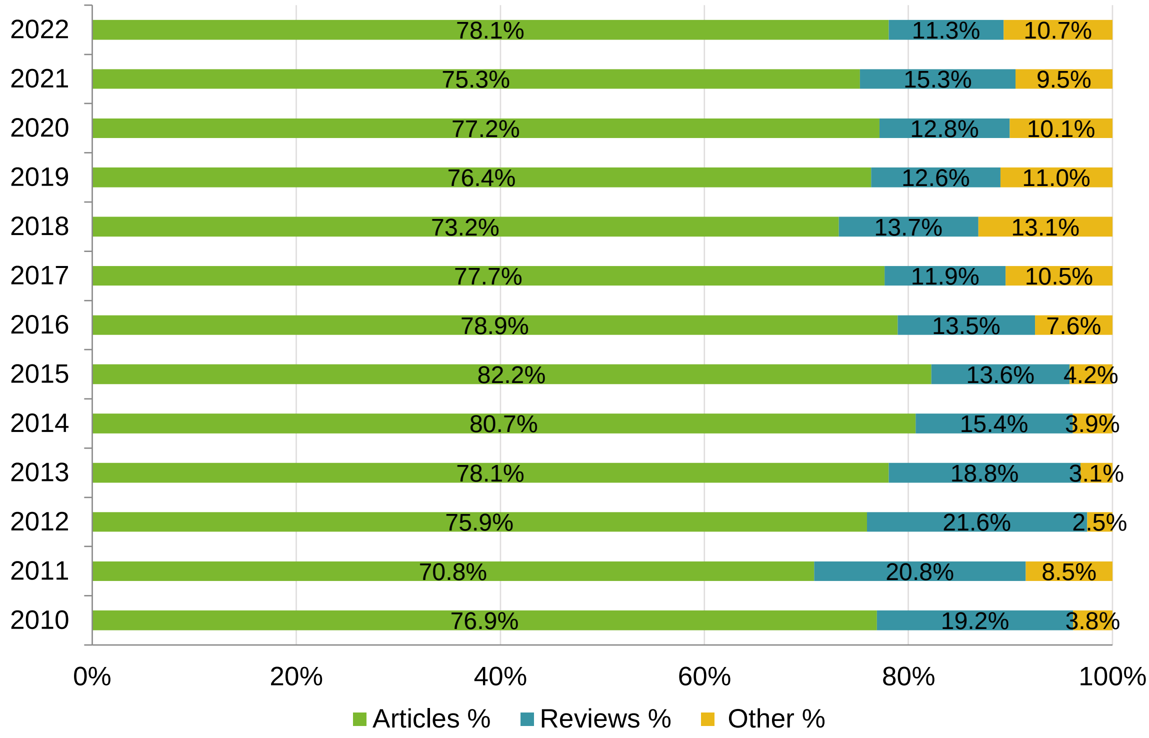
Figure 4.3.1 Number of publications for IMI projects by year, 2010-2022



- IMI-funded projects continue to produce a large number of publications, reaching almost 10,000 publications to date. In 2022, IMI projects generated 1,144 publications. In the past 5 years IMI publications have published more than 1,000 publications each year with an average of 1,185 publications per year.

Figure 4.3.2 shows the proportion of papers (articles and reviews) relative to other document types for IMI project research between 2010 and 2022.

Figure 4.3.2 Percentage of IMI project publications each year by document type, 2010-2022



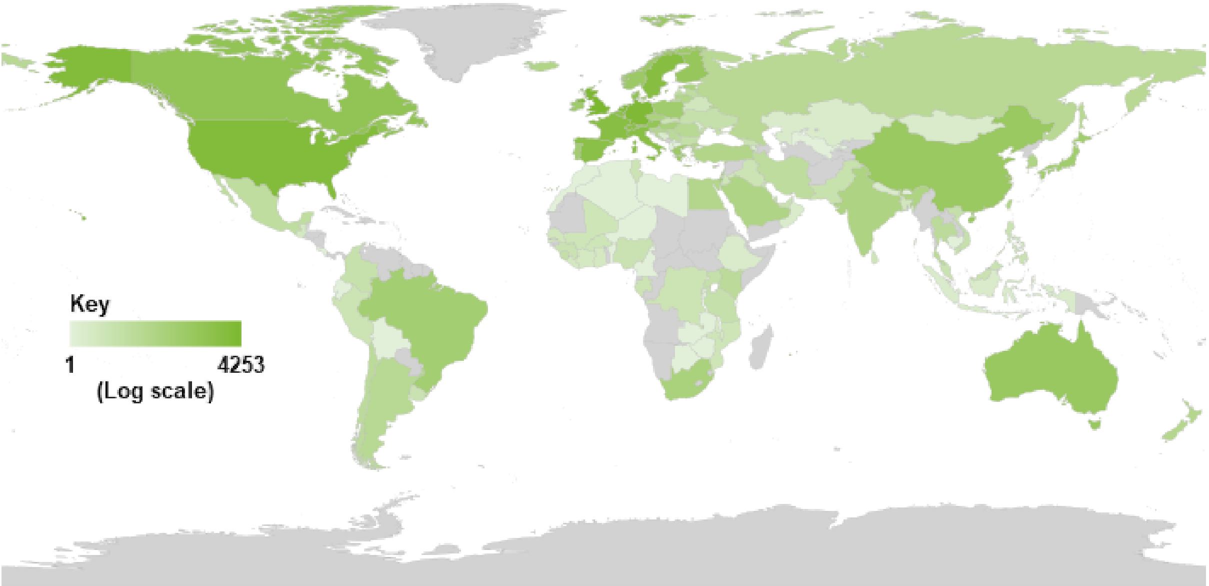
- IMI project research continued to generate a high proportion of papers each year relative to other document types. Articles accounted for around 78.1% of all publications in 2022, consistent with prior years.

4.4 Publication output by country

Figure 4.4.1 shows a map highlighting all countries with one or more publications from IMI projects between 2010 and 2022.

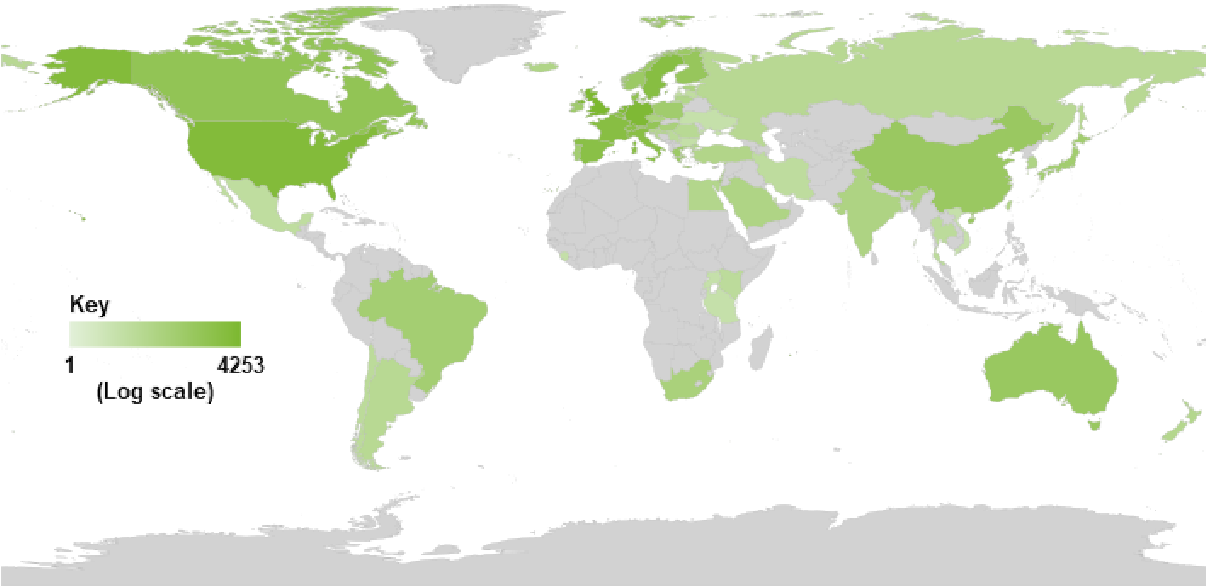
Figure 4.4.2 Map of countries with at least ten publications for IMI projects, 2010-2022shows a map highlighting all countries with at least ten publications from IMI projects between 2010 and 2022. Table 4.4.1 and Figure 4.4.3 shows the corresponding data; the total number of publications for the 20 and 10 countries respectively with the highest number publications from IMI projects between 2010 and 2022. A full list of all countries output of publications is included in Annex 3.

Figure 4.4.1 Map of countries with at least one publication for IMI projects, 2010-2022



- A total of 126 countries have at least one IMI publication

Figure 4.4.2 Map of countries with at least ten publications for IMI projects, 2010-2022



- A total of 61 countries have at least ten IMI publications.

Figure 4.4.3 Ten countries with the most IMI project publications. [Annex 3]() lists all countries with at least one IMI project publication, 2010-2022

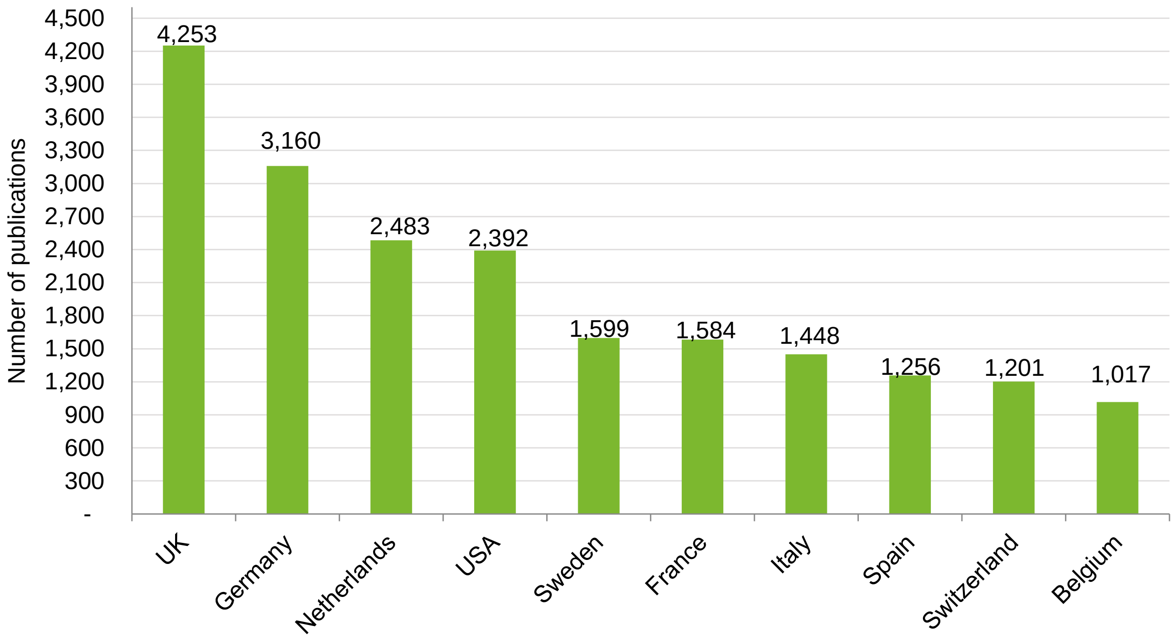


Table 4.4.1 Twenty countries with the most IMI supported publications. Annex 3 lists all countries with at least one IMI project publications, 2010-2022.

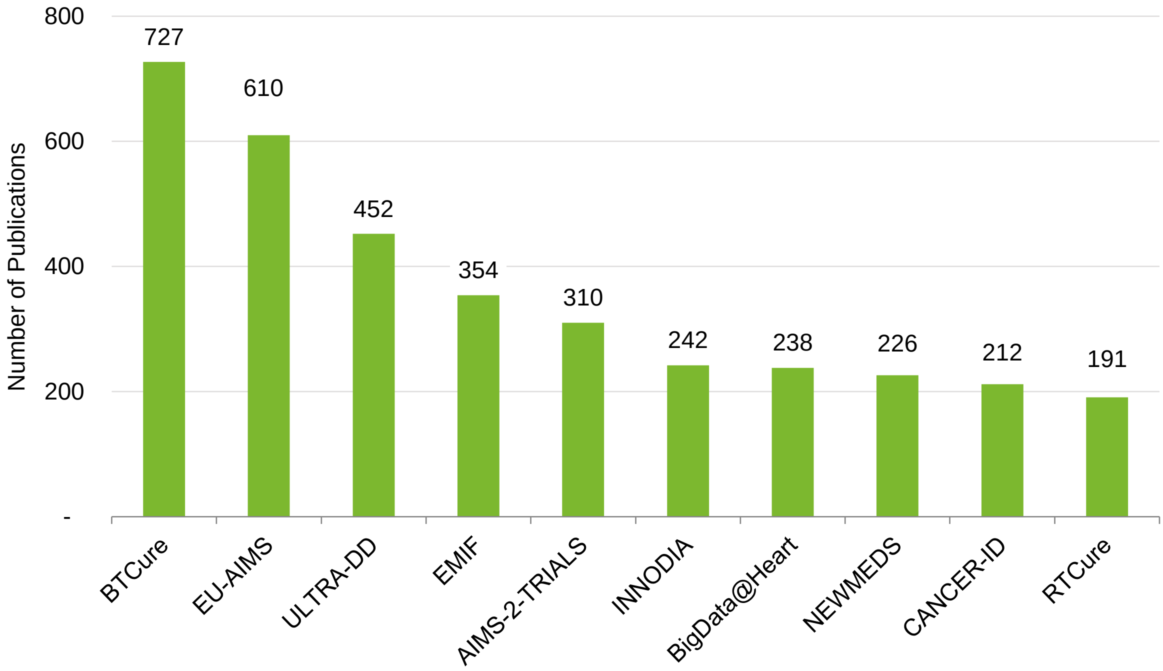
COUNTRY	NUMBER OF PUBLICATIONS
UK	4,253
Germany	3,160
Netherlands	2,483
USA	2,392
Sweden	1,599
France	1,584
Italy	1,448
Spain	1,256
Switzerland	1,201
Belgium	1,017
Denmark	727
Canada	649
Austria	579
Finland	457
Australia	374
Peoples R China	361
Norway	293
Greece	284
Ireland	229
Poland	198

- Researchers affiliated to the United Kingdom authored the most IMI project publications (4,253 publications).
- Other EU-28 countries were among the countries with the highest output. The most productive exceptions are the USA (2,392 publications) and Switzerland (1,201 publications).

4.5 Publication output by IMI project

Figure 4.5.1 shows the ten IMI projects with the highest output of publications between 2010 and 2022. Table 4.5.1 expands upon Figure 4.5.1, listing the 20 IMI projects with the most publications, including the number and percentage of open access papers and the number of papers between 2010 and 2022. A full list of projects and the number of associated publications is presented in Annex 4.

Figure 4.5.1 Number of publications for ten IMI projects with the highest output of publications, 2010-2022.



- BTCure remains the most productive IMI project in terms of number of publications (727 publications) and the second most productive project is still EU-AIMS (610 publications).
- Since the thirteenth (2022) report, two new projects, BigData@Heart (238 publications) and RTCure (191 publications) are now included in the Top 10, which have displaced EUROPAIN (184 publications) and ORBITO (171 Publications).
- As many of the IMI phase 1 projects are now closed, phase two projects are now becoming more prominent in the Top 10 with 4 out of the top 10 projects coming from phase 2.

Table 4.5.1 Twenty IMI projects with the most publications, number of papers, number and percentage of open access papers, 2010-2022

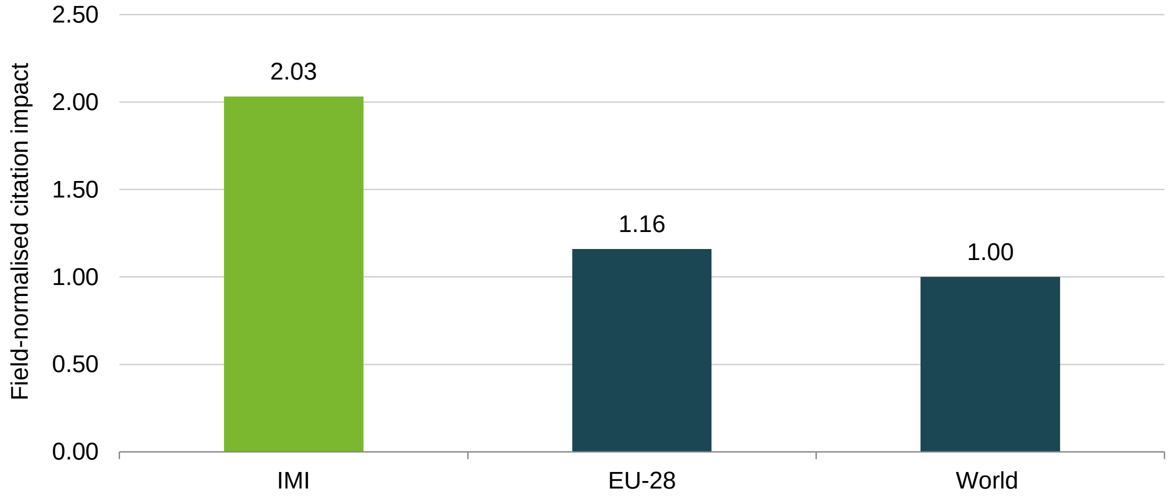
PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD NORMALISED CITATION IMPACT
BTCure	727	679	464	68.3%	1.78
EU-AIMS	610	589	492	83.5%	1.97
ULTRA-DD	452	444	381	85.8%	1.81
EMIF	354	333	284	85.3%	2.42
AIMS-2-TRIALS	310	292	269	92.1%	2.92
INNODIA	242	200	177	88.5%	1.50
BigData@Heart	238	211	202	95.7%	2.61
NEWMEDS	226	220	128	58.2%	2.00
CANCER-ID	212	183	142	77.6%	3.14
RTCure	191	166	135	81.3%	2.58
EUbOPEN	185	179	138	77.1%	1.66
EUROPAIN	184	182	77	42.3%	2.57
ORBITO	171	168	63	37.5%	1.69
TRANSLOCATION	168	168	113	67.3%	1.30
U-BIOPRED	158	101	75	74.3%	2.39
STEMBANCC	155	149	124	83.2%	1.89
IMIDIA	151	141	118	83.7%	1.63
SUMMIT	149	143	109	76.2%	1.39
ELF	141	139	120	86.3%	1.11
RHAPSODY	137	115	107	93.0%	1.92

4.6 Is IMI project research well cited?

The number of citations a paper receives (also known as its raw citation impact) is at least partly determined by the field to which it relates and the year in which it was published. Typically, papers published in disciplines such as biomedical research receive more citations than papers published in subjects such as engineering, and older papers tend to have higher citations counts on average than newer ones because they have had a longer time to accrue them. Therefore, citation impact is usually normalised to the relevant world average to allow comparison between years and fields; the resulting indicator is called the field-normalised citation impact.

Figure 4.6.1 shows the average field-normalised citation impact for all IMI papers compared to the average for EU-28 papers in relevant biomedical journal categories (see Annex 2) and all global papers published between 2010 and 2022. Table 4.6.1 and Table 4.6.2 present average citation impact indicators for all IMI papers.

Figure 4.6.1 Field-normalised citation impact for IMI supported research papers compared to the average for EU-28 and world papers, 2010-2022



- IMI's field-normalised citation impact remains twice that of the world average and is 75% higher than the EU-28.

Table 4.6.1 Summary of citation analysis for IMI supported research papers, 2010-2022

	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
IMI projects	8,896	2.03	1.18	34.9	24.6%
IMI 1	6,157	1.92	1.14	33.2	24.1%
IMI 2	2,915	2.22	1.24	38.9	25.5%

Table 4.6.2 Summary of IMI supported research publications, 2010-2022

	NUMBER OF PUBLICATIONS	% OF OPEN ACCESS PAPERS*	NUMBER OF PAPERS	CITATIONS	RAW CITATION IMPACT
IMI Projects	9,784	78.3%	8,896	315,899	35.51
IMI 1	6,601	73.7%	6,157	266,966	43.36
IMI 2	3,345	89.4%	2,915	48,577	16.66

Summary of key findings

- The field-normalised citation impact of IMI project papers was 2.03 for the thirteen-year period, 2010-2022, double the World average (1).
- The field-normalised citation impact of IMI project papers was 75% higher than the EU's average citation impact (1.16)[6] between 2010 and 2022, in similar biomedical journal categories.
- Nearly a quarter (24.6%) of IMI papers were highly cited, that is they were in the world's top 10% of most highly cited papers in the relevant journal category and year of publication.
- IMI 2 has a higher percentage of open access papers compared with IMI 1. This is likely due to the stipulation that IMI 2 funded research papers should publish open access articles.[7]
- IMI 2 project papers' citations increased by 86% from the 2022 report (26,099). Indicating, a high level of citation activity.

[6] EU-28 grouping of countries: Clarivate National Science Indicators 2022 database; similar research has been defined as biomedical journal categories listed in Annex 2.

[7] Note that IMI 2 funded researchers are contractually obliged to make their scientific articles open access through Green or Gold routes. However, for some of other document types, such as editorials, reviews or conference proceedings open access publication is strongly encouraged but not mandatory.

Nevertheless, it is obvious that fewer than all of IMI's publications are classified as open access in this analysis, and this is likely to be due to ancillary factors (such as challenges relating to definitions and coverage) as well as non-compliance. The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes.

It is also possible that some publishers make publications available without following a recognised open access route. In these cases, publications will not be indexed as open access in the Web of Science or in this report

The Web of Science open access data coverage is summarised at: https://clarivate.com/webofsciencegroup/solutions/open-access/

4.7 In which journals do IMI project publications appear most frequently?

The 20 journals in which IMI project publications appeared most frequently (ranked by number of IMI publications) between 2010 and 2022, are listed in Table 4.7.1. Together, the 20 most frequently used journals account for 1,963 publications, 20% of IMI's publications.

IMI project publications appeared most frequently in *Scientific Reports* in which IMI published 213 publications. This was followed by *Annals of the Rheumatic Diseases* where they also published 213 publications. For most journals, papers (articles and reviews) were the most frequent publication type. However, large collections of meeting abstracts were published in *European Respiratory Journal* (28 meeting abstracts) and *Diabetologia* (81 meeting abstracts). In this year's report the *Journal of Infectious Diseases, Molecular Autism* and *BMJ Open* are new to the list.

IMI had a strong focus within Multidisciplinary Sciences, Rheumatology, and Neurosciences where three of the top 20 journals were assigned to each subject category.

Of the 20 most frequently used journals, more than two-thirds were in the top quartile (Q1) by Journal Impact Factor (JIF) while the rest were in the second quartile (Q2) ranked against other journals in the same category.

Overall, IMI project publications were published in a total of 1,681 journals. The average Journal Impact Factor for all IMI project publications is 7.53[1].

The 20 highest Journal Impact Factor journals in which IMI project research was published are listed in Table 4.7.2. More than a quarter (26.4%) of IMI's papers were published in the world's top 10% journals by Impact Factor. The journal with the highest Impact Factor is *Lancet*, with a Journal Impact Factor of 202.73 where IMI published nine publications, six of which are papers. This is followed by *New England Journal of Medicine* with an Impact Factor of 176.08 where IMI published two publications, one of which is a paper. Of the top 20 journals by Impact Factor, IMI published the most publications (31) in *Nature* which has an Impact Factor of 69.50. IMI published a total of 157 publications in these top ranked journals by journal impact factor. *Lancet Microbe* is new to this list and has a JIF of 86.21.

The 20 open access journals in which IMI projects publish most frequently (ranked by number of publications), are listed in Table 4.7.3. Of the top 20 open access journals, IMI published most frequently in *Scientific Reports* (213 publications) and the Journal with the highest Impact Factor was the *Annals of the Rheumatic* Diseases (27.97). 14 of these journals are ranked in the top quartile in their relevant journal categories.

Table 4.7.1 Top 20 journals in which IMI project publications were published most frequently, ranked by number of IMI publications, 2010-2022

JOURNAL	NUMBER OF IMI PUBLICATIONS	NUMBER OF IMI PAPERS	JOURNAL IMPACT FACTOR (2021)	*WEB OF SCIENCE* JOURNAL CATEGORIES	QUARTILE
Scientific Reports	213	213	5.00	Multidisciplinary Sciences	Q2
Annals of the Rheumatic Diseases	213	134	27.97	Rheumatology	Q1
Plos One	200	200	3.75	Multidisciplinary Sciences	Q2
Diabetologia	169	85	10.46	Endocrinology & Metabolism	Q1
Nature Communications	139	138	17.69	Multidisciplinary Sciences	Q1
Frontiers in Immunology	117	116	8.79	Immunology	Q1
Journal of Medicinal Chemistry	91	91	8.04	Chemistry, Medicinal	Q1
Diabetes	88	58	9.34	Endocrinology & Metabolism	Q1
International Journal of Molecular Sciences	75	75	6.21	Biochemistry & Molecular Biology; Chemistry, Multidisciplinary	Q2
Arthritis & Rheumatology	74	64	15.48	Rheumatology	Q1
Journal of Alzheimer's Disease	74	73	4.16	Neurosciences	Q2
Arthritis Research & Therapy	73	73	5.61	Rheumatology	Q1
European Respiratory Journal	62	22	33.80	Respiratory System	Q1
Pain	62	59	7.93	Anesthesiology; Clinical Neurology; Neurosciences	Q1
Journal of Infectious Diseases	55	54	7.76	Immunology; Infectious Diseases; Microbiology	Q1
Molecular Autism	53	52	6.48	Genetics & Heredity; Neurosciences	Q1
European Journal of Pharmaceutics and Biopharmaceutics	53	53	5.59	Pharmacology & Pharmacy	Q1
Translational Psychiatry	52	52	7.99	Psychiatry	Q1
BMJ Open	50	50	3.01	Medicine, General & Internal	Q2
Journal of Antimicrobial Chemotherapy	50	49	5.76	Infectious Diseases; Microbiology; Pharmacology & Pharmacy	Q2

Table 4.7.2 Top 20 journals in which IMI project publications, were published most frequently, ranked by Journal Impact Factor, 2010-2022

JOURNAL	NUMBER OF IMI PUBLICATIONS	NUMBER OF IMI PAPERS	JOURNAL IMPACT FACTOR (2021)	*WEB OF SCIENCE* JOURNAL CATEGORIES	QUARTILE
Lancet	9	6	202.73	Medicine, General & Internal	Q1
New England Journal of Medicine	2	1	176.08	Medicine, General & Internal	Q1
Jama-Journal of The American Medical Association	9	7	157.34	Medicine, General & Internal	Q1
Nature Reviews Molecular Cell Biology	2	2	113.92	Cell Biology	Q1
Nature Reviews Drug Discovery	17	8	112.29	Biotechnology & Applied Microbiology; Pharmacology & Pharmacy	Q1
Nature Reviews Immunology	4	2	108.56	Immunology	Q1
Lancet Respiratory Medicine	6	5	102.64	Critical Care Medicine; Respiratory System	Q1
BMJ-British Medical Journal	13	12	93.33	Medicine, General & Internal	Q1
Nature Medicine	23	22	87.24	Biochemistry & Molecular Biology; Cell Biology; Medicine, Research & Experimental	Q1
Lancet Microbe	1	1	86.21	Infectious Diseases; Microbiology	Q1
World Psychiatry	1	1	79.68	Psychiatry	Q1
Nature Reviews Microbiology	2	2	78.30	Microbiology	Q1
Lancet Psychiatry	6	4	77.06	Psychiatry	Q1
Nature Reviews Gastroenterology & Hepatology	4	3	73.08	Gastroenterology & Hepatology	Q1
Chemical Reviews	3	3	72.09	Chemistry, Multidisciplinary	Q1
Lancet Infectious Diseases	11	10	71.42	Infectious Diseases	Q1
Nature Reviews Cancer	2	2	69.80	Oncology	Q1
Nature	31	31	69.50	Multidisciplinary Sciences	Q1
Nature Biotechnology	4	2	68.16	Biotechnology & Applied Microbiology	Q1
Cell	7	6	66.85	Biochemistry & Molecular Biology; Cell Biology	Q1

Table 4.7.3 Top 20 open access journals in which IMI project publications were published most frequently, Ranked by number of open access publications, 2010-2022

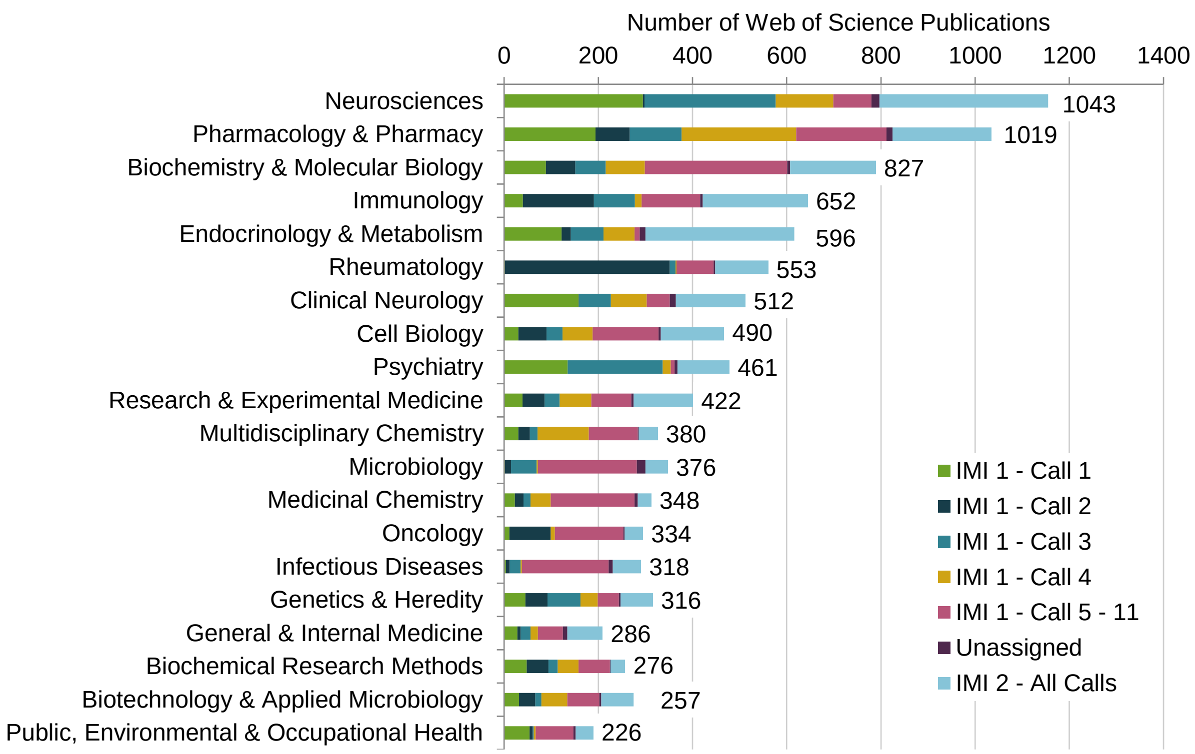
JOURNAL	NUMBER OF IMI PUBLICATIONS	NUMBER OF IMI PAPERS	JOURNAL IMPACT FACTOR (2021)	*WEB OF SCIENCE* JOURNAL CATEGORIES	QUARTILE
Scientific Reports	213	213	5.00	Multidisciplinary Sciences	Q2
Plos One	199	199	3.75	Multidisciplinary Sciences	Q2
Nature Communications	139	138	17.69	Multidisciplinary Sciences	Q1
Annals Of the Rheumatic Diseases	135	80	27.97	Rheumatology	Q1
Frontiers In Immunology	117	116	8.79	Immunology	Q1
Diabetologia	79	76	10.46	Endocrinology & Metabolism	Q1
International Journal of Molecular Sciences	75	75	6.21	Biochemistry & Molecular Biology; Chemistry, Multidisciplinary	Q2
Arthritis Research & Therapy	73	73	5.61	Rheumatology	Q1
Journal Of Medicinal Chemistry	60	60	8.04	Chemistry, Medicinal	Q1
Journal of Alzheimers Disease	55	54	4.16	Neurosciences	Q2
Molecular Autism	53	52	6.48	Genetics & Heredity; Neurosciences	Q1
Diabetes	52	52	9.34	Endocrinology & Metabolism	Q1
Translational Psychiatry	52	52	7.99	Psychiatry	Q1
Journal Of Infectious Diseases	50	49	7.76	Immunology; Infectious Diseases; Microbiology	Q1
BMJ Open	50	50	3.01	Medicine, General & Internal	Q2
Journal Of Antimicrobial Chemotherapy	48	47	5.76	Infectious Diseases; Microbiology; Pharmacology & Pharmacy	Q2
Proceedings Of the National Academy of Sciences Of The United States Of America	47	47	12.78	Multidisciplinary Sciences	Q1
Arthritis & Rheumatology	44	43	15.48	Rheumatology	Q1
Cell Reports	43	43	9.99	Cell Biology	Q1
Antimicrobial Agents and Chemotherapy	43	42	5.94	Microbiology; Pharmacology & Pharmacy	Q1

4.8 Which research fields account for the highest volume of IMI project publications?

Figure 4.8.1 shows the 20 Web of Science journal categories[8] most frequently associated with IMI funded research between 2010 and 2022. IMI 1 calls 5-11 have a lower number of publications relative to calls 1-4 and for clarity of presentation, these publications are shown as one group in Figure 4.8.1. Likewise, IMI 2 has far fewer publication compared to IMI 1 and so all IMI 2 publications are shown as one group in Figure 4.8.1. Publications that acknowledge IMI funding but do not specify a project, phase or call are classed as Unassigned. Note that some bars are longer than the total number of IMI publications in a journal category (indicated by the data labels) due to some papers being associated with multiple calls. Figure 4.8.2 shows the ten Web of Science journal categories most frequently associated with IMI 2 funded research.

Table 4.8.1 shows the same data as Figure 4.8.1 and Figure 4.8.2 for the top 20 journal categories. It provides the number of publications assigned to each of the top 20 Web of Science journal categories in which IMI project research is published by IMI 1 calls and IMI 2 in total.

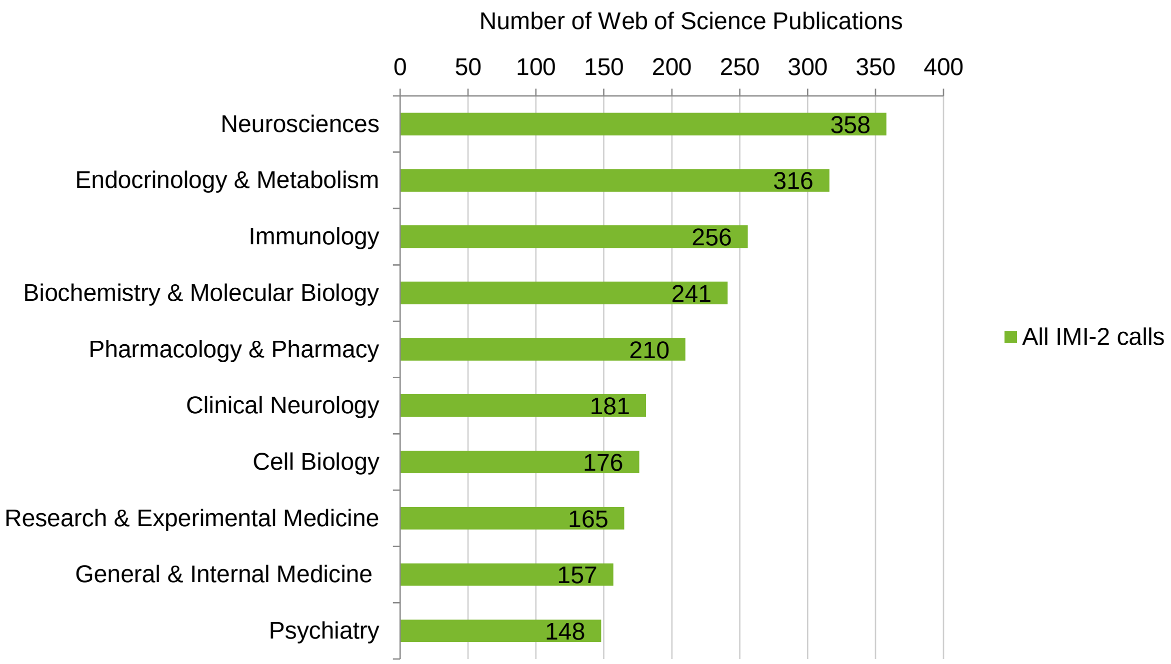
Figure 4.8.1 Top 20 Web of Science journal categories in which IMI project research was published most frequently, 2010-2022. Data labels shows the total number of publications per journal category.



- Neurosciences (1,043) remained the journal category in which IMI published most frequently followed by Pharmacology & Pharmacy (1,019 publications) and Biochemistry & Molecular Biology (827 publications).
- Most publications in IMI 1 calls 5 to 11 belong to call 11.

[8] Journals can be associated with more than one Web of Science category.

Figure 4.8.2 Top ten Web of Science journal categories in which IMI 2 project research (all calls) was published most frequently, 2010-2022. Data labels shows the total number of publications per journal category.



- Neurosciences (358 publications) remains the journal category in which IMI 2 publications were most assigned to. This is followed by Endocrinology & Metabolism (316 publications) and Immunology (256 publications).

Table 4.8.1 Number of publications by IMI 1 Call and IMI 2 for 20 Web of Science Journal Categories in which IMI project research was published most frequently, 2010-2022, ordered by total number of publications.

JOURNAL CATEGORY	NUMBER OF PUBLICATIONS BY IMI 1 CALL												
	1	2	3	4	5	6	7	8	9	10	11	IMI 2	Not assigned
Neurosciences	295	3	279	122	0	0	0	34	3	0	45	358	17
Pharmacology & Pharmacy	194	73	110	243	15	47	10	18	50	0	78	210	13
Biochemistry & Molecular Biology	89	62	65	83	31	44	0	37	16	1	177	241	6
Immunology	40	151	87	14	1	9	17	17	10	43	35	256	6
Endocrinology & Metabolism	122	20	69	66	0	0	0	1	2	0	8	316	12
Rheumatology	2	350	12	2	0	0	1	39	0	0	39	118	3
Clinical Neurology	158	1	68	76	0	0	0	13	0	0	37	181	13
Cell Biology	30	60	34	64	2	7	0	23	11	1	96	176	5
Psychiatry	135	0	202	17	0	0	1	1	1	0	5	148	6
Research & Experimental Medicine	39	47	32	67	0	3	20	4	2	16	40	165	5
Multidisciplinary Chemistry	30	25	16	109	38	15	0	8	5	0	39	97	2
Microbiology	2	13	54	3	2	94	1	13	60	11	88	87	18
Medicinal Chemistry	23	18	15	43	51	10	0	15	1	0	107	70	7
Oncology	11	88	0	9	2	0	2	1	0	0	140	80	3
Infectious Diseases	4	8	23	3	2	67	2	10	65	12	89	99	9
Genetics & Heredity	45	47	70	37	0	2	0	11	1	0	34	104	3
General & Internal Medicine	28	7	21	16	0	7	2	4	27	0	22	157	9
Biochemical Research Methods	48	46	20	44	2	9	0	16	1	1	40	64	1
Biotechnology & Applied Microbiology	32	34	13	55	3	3	0	25	2	6	29	69	4
Public, Environmental & Occupational Health	54	7	2	4	0	14	21	0	29	1	29	80	5

Table 4.8.2 and Table 4.8.3 show the citation impact, percentage of highly cited papers and percentage of open access papers for IMI project research in the top 20 journal categories.

Table 4.8.2 Field-normalised, journal-normalised and raw citation impact of papers for the 20 web of science journal categories in which IMI project research was published most frequently, 2010-2022. Ordered by total number of papers.

		CITATION IMPACT		
JOURNAL CATEGORY	NUMBER OF PAPERS	NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL	RAW CITATION IMPACT
Neurosciences	977	1.97	1.31	35.49
Pharmacology & Pharmacy	955	1.45	1.13	23.69
Biochemistry & Molecular Biology	804	2.14	1.44	42.04
Immunology	621	1.45	1.06	27.74
Endocrinology & Metabolism	464	1.56	1.04	23.55
Rheumatology	443	2.01	0.99	31.43
Clinical Neurology	454	2.32	1.31	43.56
Cell Biology	467	2.11	1.27	42.30
Psychiatry	422	2.11	1.14	34.91
Research & Experimental Medicine	406	2.05	1.06	30.92
Multidisciplinary Chemistry	375	1.32	1.09	36.32
Microbiology	366	1.52	1.01	26.23
Medicinal Chemistry	345	1.40	1.12	18.77
Oncology	299	2.42	1.27	57.14
Infectious Diseases	295	1.82	1.14	25.39
Genetics & Heredity	294	2.37	1.43	43.25
General & Internal Medicine	269	3.22	1.40	43.42
Biochemical Research Methods	270	1.28	1.11	25.98
Biotechnology & Applied Microbiology	234	1.71	1.26	32.63
Public, Environmental & Occupational Health	202	1.49	1.21	16.99

Table 4.8.3 Number of publications, number of papers, percentage of open access and highly cited papers for the top 20 Web of Science journal categories in which IMI project research was published most frequently, 2010-2022. Ordered by total number of publications.

JOURNAL CATEGORY	NUMBER OF PUBLICATIONS	% OF OPEN ACCESS PAPERS	NUMBER OF PAPERS	% OF HIGHLY CITED PAPERS
Neurosciences	1,043	70.9%	977	28.2%
Pharmacology & Pharmacy	1,019	59.8%	955	17.7%
Biochemistry & Molecular Biology	827	76.1%	804	24.3%
Immunology	652	78.8%	621	17.6%
Endocrinology & Metabolism	596	65.8%	464	18.8%
Rheumatology	553	65.8%	443	27.5%
Clinical Neurology	512	60.7%	454	36.1%
Cell Biology	490	82.7%	467	33.8%
Psychiatry	461	71.1%	422	23.9%
Research & Experimental Medicine	422	77.3%	406	27.3%
Multidisciplinary Chemistry	380	75.0%	375	18.4%
Microbiology	376	88.3%	366	22.1%
Medicinal Chemistry	348	67.2%	345	14.5%
Oncology	334	76.0%	299	33.1%
Infectious Diseases	318	88.1%	295	25.4%
Genetics & Heredity	316	83.9%	294	26.9%
General & Internal Medicine	286	90.9%	269	30.5%
Biochemical Research Methods	276	66.3%	270	21.5%
Biotechnology & Applied Microbiology	257	80.5%	234	26.1%
Public, Environmental & Occupational Health	226	68.6%	202	20.3%

- IMI project research was most frequently published in Neurosciences journals. Of the 977 papers published in this category, more than a quarter (28.2%) were highly cited.
- Clinical Neurology (454 papers) remains the category with the highest percentage of highly cited papers (36.1%), followed by Cell Biology with 467 papers of which 33.8% are highly cited.
- The percentage of open access papers is highest in General & Internal Medicine (90.9%), followed by Microbiology (88.3%) and Infectious Diseases (88.1%).

4.9 IMI research fields with the highest volume of publications benchmarked against EU-28 publication within the same field

Figure 4.9.1 shows the field-normalised citation impact of IMI funded research in the 20 Web of Science journal categories in which IMI project research was published most frequently between 2010 and 2022. These data are benchmarked against the average citation impact of all EU-28 research papers in the same journal categories.

Table 4.9.1 expands on the data presented in Figure 4.9.1, showing the percentage of IMI and EU-28 papers in each journal category.

Figure 4.9.1 The field-normalised citation impact of IMI project research in the top 20 Web of Science journal categories which IMI project research was most frequently published, benchmarked against EU-28 papers in the same journal categories, 2010-2022. Ordered by field-normalised citation impact of IMI research.

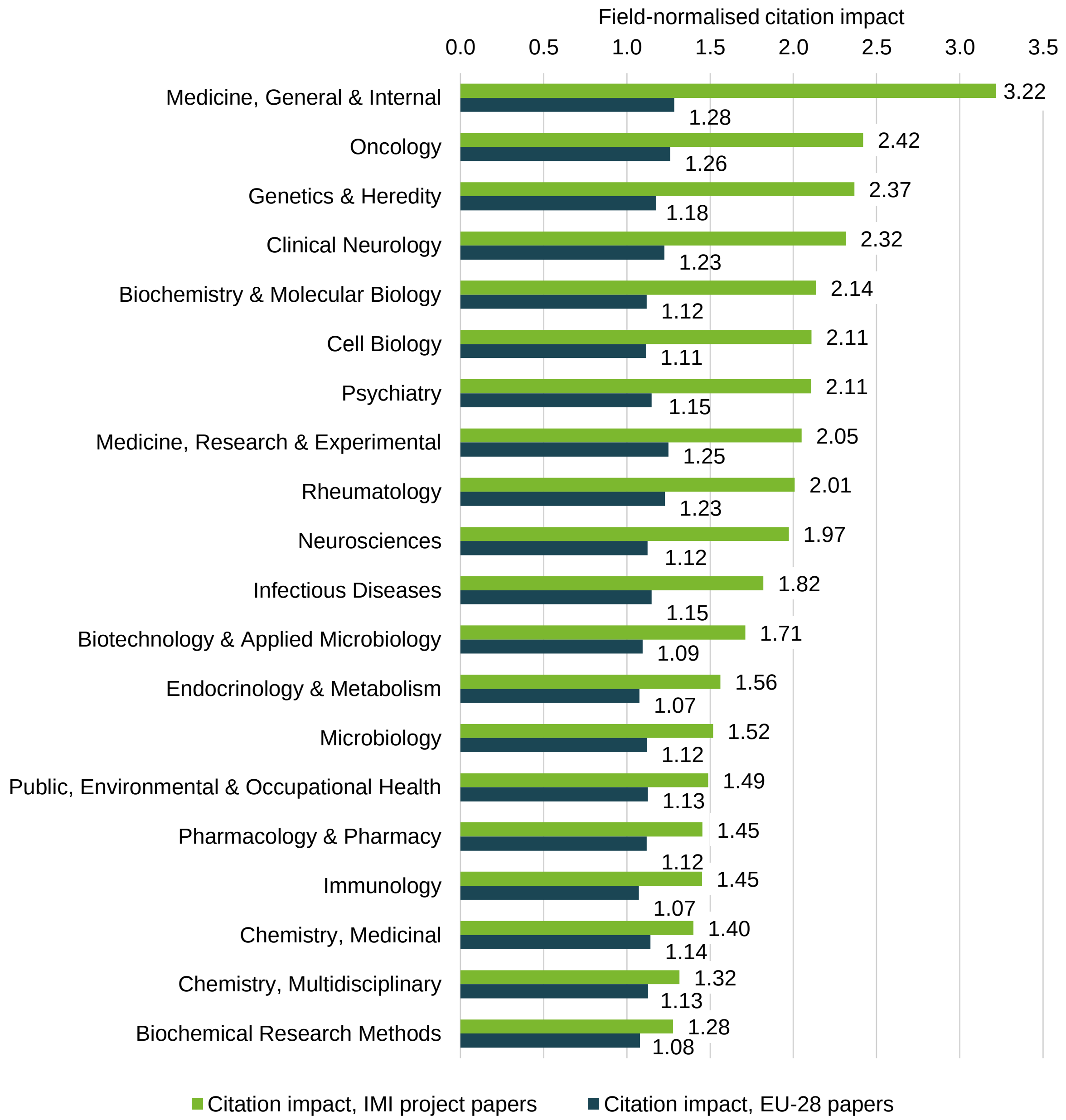


Table 4.9.1 Citation impact and percentage of papers in top 20 Web of Science journal categories in which IMI project research was most frequently published. Benchmarked against EU-28 in the same journal categories, 2010-2022.

JOURNAL CATEGORY	% OF IMI PAPERS	% OF EU-28 PAPERS	CITATION IMPACT NORMALISED AT FIELD LEVEL	
			IMI papers	EU-28
Medicine, General & Internal	3.21%	0.61%	3.22	1.28
Oncology	3.75%	3.21%	2.42	1.26
Genetics & Heredity	3.55%	1.19%	2.37	1.18
Clinical Neurology	5.75%	2.42%	2.32	1.23
Biochemistry & Molecular Biology	9.30%	3.05%	2.14	1.12
Cell Biology	5.51%	1.50%	2.11	1.11
Psychiatry	5.18%	1.66%	2.11	1.15
Medicine, Research & Experimental	4.74%	1.12%	2.05	1.25
Rheumatology	6.22%	0.83%	2.01	1.23
Neurosciences	11.72%	2.76%	1.97	1.12
Infectious Diseases	3.57%	0.98%	1.82	1.15
Biotechnology & Applied Microbiology	2.89%	1.11%	1.71	1.09
Endocrinology & Metabolism	6.70%	1.47%	1.56	1.07
Microbiology	4.23%	1.22%	1.52	1.12
Public, Environmental & Occupational Health	2.54%	1.96%	1.49	1.13
Pharmacology & Pharmacy	11.45%	2.12%	1.45	1.12
Immunology	7.33%	1.69%	1.45	1.07
Chemistry, Medicinal	3.91%	0.53%	1.40	1.14
Chemistry, Multidisciplinary	4.27%	2.61%	1.32	1.13
Biochemical Research Methods	3.10%	0.79%	1.28	1.08

- In all 20 journal categories listed, IMI project research had a higher field-normalised citation impact than EU-28 papers in the same field.
- General & Internal Medicine (3.22) and Oncology (2.42) remain the top two journal categories in which IMI supported research had the highest field-normalised citation impact.
- The average field-normalised citation impact of EU-28 papers was also the highest in the same two categories of General & Internal Medicine (1.28) and Oncology (1.26).

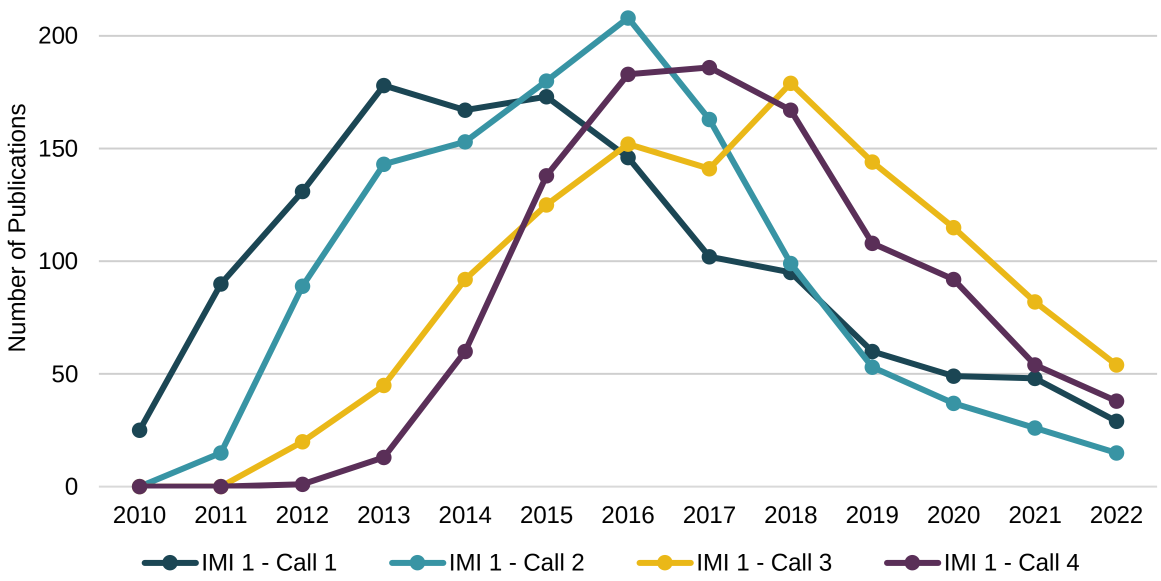
5 Citation analysis – at IMI project level

This section analyses the volume and citation impact of publications arising from different IMI-phases and calls.

5.1 Trends in publication output by IMI funding call

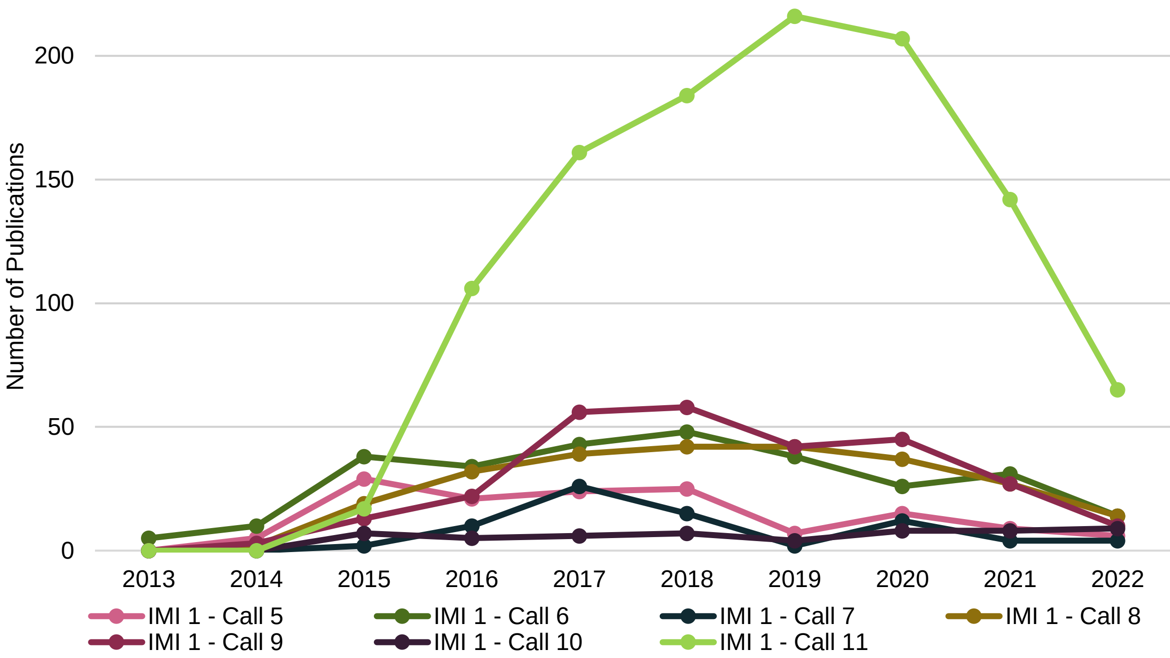
Figure 5.1.1 and Figure 5.1.2 show the number of publications between 2010 and 2022 for IMI project research disaggregated by call. IMI 1 calls 1-4 (Figure 5.1.1) are shown separately from the more recent IMI 1 calls 5-11 (Figure 5.1.2) which tend to have fewer publications. Likewise, IMI 2 calls are shown separately in Figure 5.1.3 and Figure 5.1.4. Table 5.1.1 presents summary bibliometric data for all IMI 1 and IMI 2 calls that have at least one publication, including the number of publications, numbers of papers, and citation impact indicators.

Figure 5.1.1 Number of publications by year and funding call (Calls 1-4) 2010-2022



- Over the five years 2010 to 2014, IMI 1 call 1 had the highest output of publications, reaching a peak output of 178 publications in 2013.
- In 2015 and 2016, IMI 1 call 2 had the highest number of publications (180 and 208, respectively). In 2017 call 2's output fell (163 publications) and call 4 had the highest output of publications (186 publications).
- In 2022 all IMI 1 calls 1-4 continue to trend downward. Which is likely to continue since all the calls are now closed.
- Call 3 remains the call with the highest number of publications.

Figure 5.1.2 Number of publications by year and funding call (calls 5-11), 2010-2022



- Overall, IMI 1 calls 5-11 have not grown as rapidly as IMI 1 calls 1-4, most calls produce fewer than 50 publications a year. Call 11 is the exception, with growth in output akin to IMI 1 calls 1-4. This growth has continued to decline in 2022, declining by more than 50%.
- All but 1 (iABC) of the call 11 projects have closed so it is likely that call 11 will continue to decline.

Figure 5.1.3 Number of publications by year and funding call, 2010-2022. Only showing IMI 2 calls 1-9 which has at least 50 publications in total.

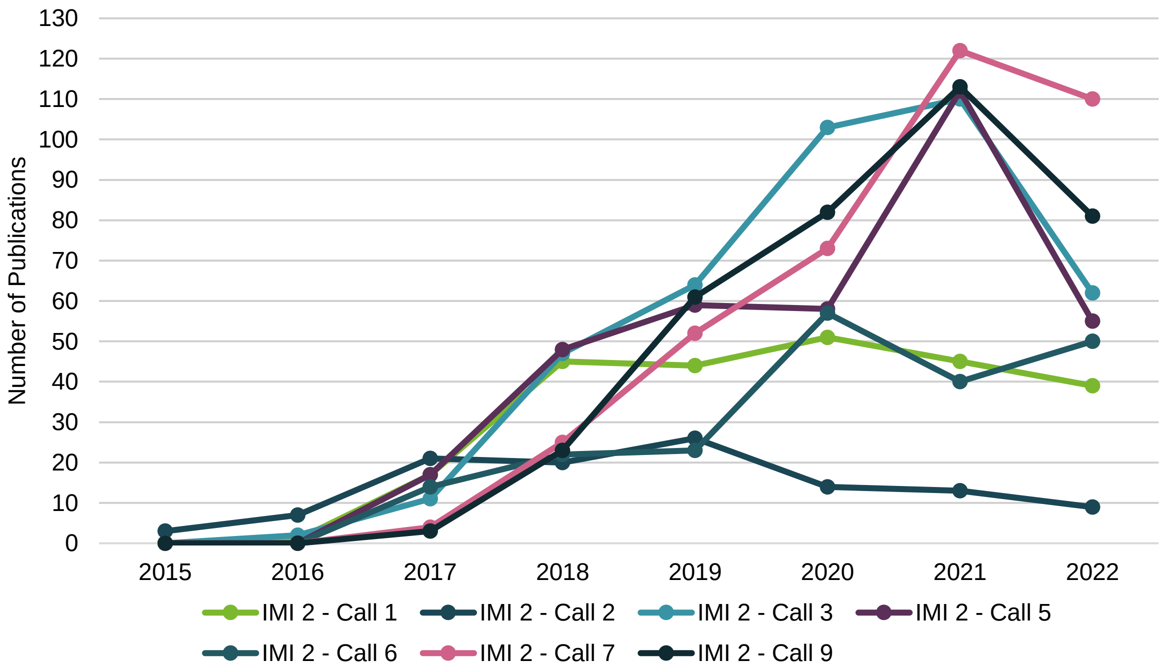
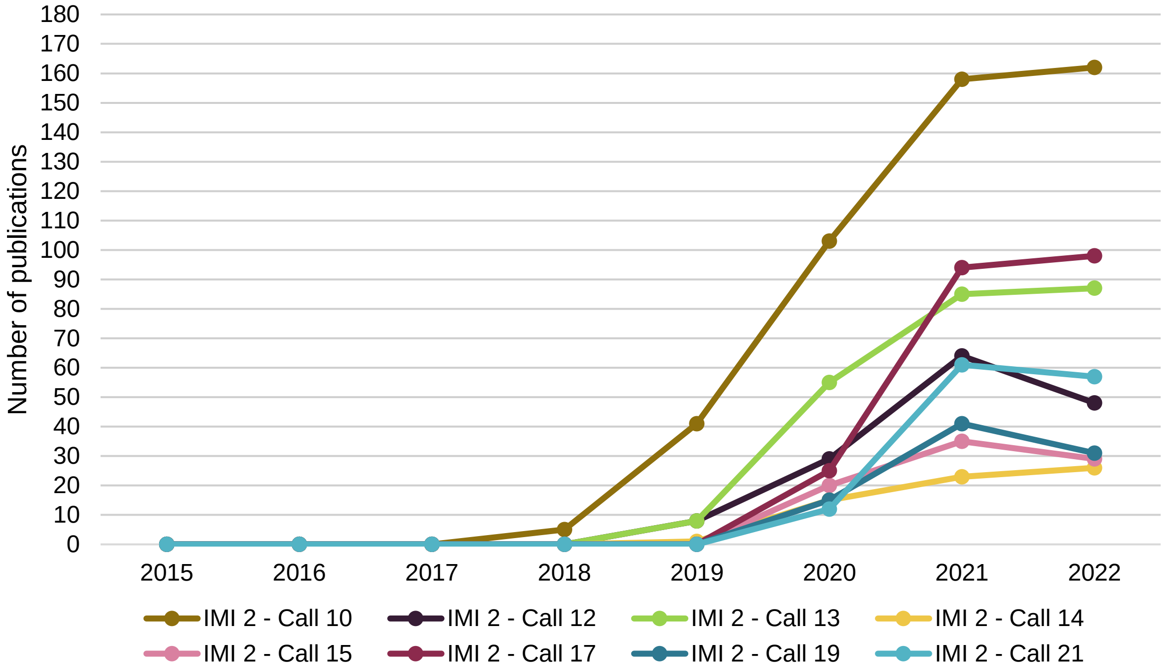


Figure 5.1.4 Number of publications by year and funding call, 2010-2022. Only showing IMI 2 calls 10-21 which has at least 50 publications in total.



- The output of publications from IMI 2 calls 1-9 has had a sharp decline. This is to be expected as many of these projects closed in 2022. IMI2 calls 10-21 also saw a stabilisation of research output.

Table 5.1.1 Summary bibliometric analyses of IMI projects aggregated by funding call, 2010-2022

PHASE	CALL	NUMBER OF PUBLICATIONS[9]	% OF OPEN ACCESS PAPERS	NUMBER OF PAPERS	CITATION IMPACT: RAW CITATION IMPACT	CITATION IMPACT: NORMALISED AT FIELD LEVEL	CITATION IMPACT: NORMALISED AT JOURNAL LEVEL
1	1	1,293	62.4%	1,189	50.02	1.78	1.08
1	2	1,181	72.5%	1,112	58.67	2.17	1.18
1	3	1,149	81.3%	1,062	37.98	1.91	1.03
1	4	1,040	69.2%	994	43.08	1.98	1.25
1	5	141	86.3%	139	22.01	1.11	1.00
1	6	287	74.0%	277	24.82	1.20	0.90
1	7	75	79.4%	68	23.35	1.36	1.06
1	8	254	80.8%	224	37.25	2.03	1.30
1	9	276	71.6%	257	33.15	1.65	1.34

[9] Publications can be associated with more than one call.

PHASE	CALL	NUMBER OF PUBLICATIONS[9]	% OF OPEN ACCESS PAPERS	NUMBER OF PAPERS	CITATION IMPACT		
					RAW CITATION IMPACT	NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL
1	10	54	84.9%	53	18.89	1.57	1.00
1	11	1,098	83.5%	1,010	36.14	2.06	1.16
2	1	242	88.5%	200	19.30	1.50	1.03
2	2	113	89.8%	108	23.70	1.74	1.13
2	3	399	89.4%	330	20.65	2.43	1.15
2	4	4	50.0%	4	9.75	0.57	0.31
2	5	349	93.3%	312	21.59	2.26	1.15
2	6	206	89.7%	174	19.47	2.19	1.18
2	7	386	94.0%	348	23.51	3.04	1.38
2	8	32	93.3%	30	12.37	1.14	1.02
2	9	363	83.4%	307	24.39	2.86	1.35
2	10	469	92.0%	411	12.53	2.39	1.16
2	11	2	0.0%	2	0.00	0.00	0.00
2	12	149	93.5%	123	8.72	1.90	1.31
2	13	235	88.4%	216	12.44	1.94	1.19
2	14	65	85.2%	54	10.94	1.90	1.06
2	15	84	92.2%	64	7.72	1.61	1.61
2	16	3	100.0%	3	18.00	1.77	2.49
2	17	217	78.0%	209	8.67	1.73	1.18
2	18	25	80.0%	20	4.00	1.81	1.32
2	19	87	94.5%	73	7.70	1.35	1.01
2	20	37	80.6%	31	3.35	1.55	0.71
2	21	130	94.7%	114	16.68	4.65	2.79
2	22	3	50.0%	2	0.00	0.00	0.00

PHASE	CALL	NUMBER OF PUBLICATIONS[9]	% OF OPEN ACCESS PAPERS	NUMBER OF PAPERS	CITATION IMPACT RAW CITATION IMPACT	CITATION IMPACT NORMALISED AT FIELD LEVEL	CITATION IMPACT NORMALISED AT JOURNAL LEVEL
2	23	13	100.0%	10	5.30	1.40	1.09

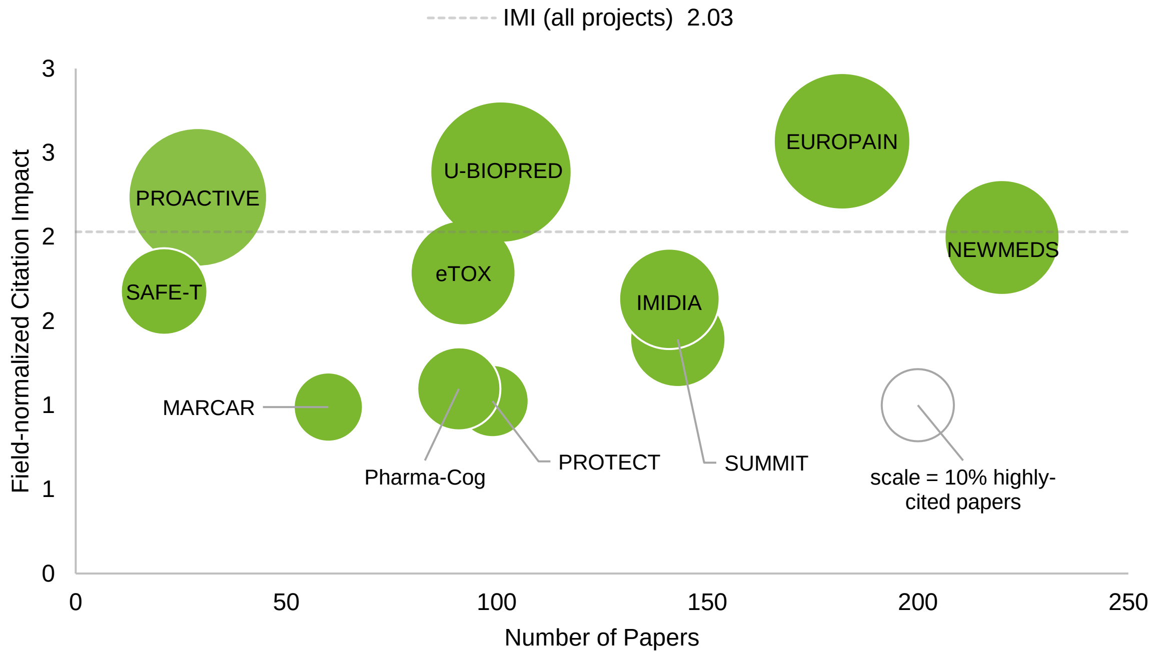
- IMI 1 call 1 remains the funding call that produced the highest number of publications (1,293), and papers (1,189). Although papers from IMI 1 call 2 had the highest raw citation impact (58.7).
- Papers assigned to IMI 2 call 21 had the highest average field-normalised citation impact (4.65)[10], which is four times the world average and is likely driven by the fact that many of the projects in this call are coronavirus related.
- The highest percentage of open access papers belongs to IMI 2 call 16 and 23 where 100% of their publications were open access[10].
- Generally, IMI 2 calls have a higher proportion of open access papers compared to IMI 1 calls likely due to the mandate that papers in IMI 2 be published as open access.
- IMI 2 call 10 with 469 publications is IMI 2's highest output call. A change from the 2022 report where IMI 2 Call 3 (399 publications) was the highest IMI 2 output call.

10 Only calls with at least 10 papers were considered

5.2 Summary bibliometric analyses for IMI 1 projects – call 1

Figure 5.2.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 call 1 projects. Only projects with at least 10 papers and one highly cited paper over the period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.2.1 Number of papers, average field-normalised citation impact and share of highly cited research for IMI 1 projects – Call 1, 2010-2022



The data in Figure 5.2.1 shows that:

- The average field-normalised citation impact of all IMI 1 call 1 projects with at least 10 papers was at or above the world average (1.00). Furthermore, the percentage of highly cited research was also above or in line with the world average (10%) for all projects except for the PROTECT and MARCAR projects where 9.1% and 8.3% of its papers were highly cited respectively. This indicates excellent research performance.
- Research associated with NEWMEDS, EUROPAIN, PROACTIVE and U-BIOPRED was cited more than twice the world average. These projects also have an average citation impact greater than the average citation impact of all IMI project papers (2.03) except for NEWMEDS (2.00).

Table 5.2.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 1 publications. Table 5.2.2 shows the normalised citation impact (normalised against world average values) of IMI 1 call 1 projects and is an expansion of the data shown in Figure 5.2.1.

Table 5.2.1 Bibliometric indicators for IMI 1 projects in call 1, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
NEWMEDS	226	220	58.2%	13,674	62.15
EUROPAIN	184	182	42.3%	13,431	73.80
SUMMIT	149	143	76.2%	4,441	31.06
IMIDIA	151	141	83.7%	7,693	54.56
U-BIOPRED	158	101	74.3%	5,100	50.50
PROTECT	101	99	46.5%	2,596	26.22
eTOX	97	92	69.6%	4,773	51.88
Pharma-Cog	97	91	44.0%	3,598	39.54
MARCAR	61	60	73.3%	1,646	27.43
PROACTIVE	34	29	89.7%	1,733	59.76
SAFE-T	23	21	42.9%	742	35.33

Table 5.2.2 Summary citation indicators for IMI 1 projects in call 1, 2010-2022

PROJECT	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
NEWMEDS	220	2.00	1.08	32.41	25.0%
EUROPAIN	182	2.57	1.36	24.85	35.2%
SUMMIT	143	1.39	0.84	38.24	16.1%
IMIDIA	141	1.63	1.01	31.59	19.1%
U-BIOPRED	101	2.39	1.24	21.85	37.6%
PROTECT	99	1.02	0.91	40.83	9.1%
eTOX	92	1.79	1.21	32.12	19.6%
Pharma-Cog	91	1.10	0.83	44.54	13.2%
MARCAR	60	0.99	0.72	43.14	8.3%
PROACTIVE	29	2.23	1.57	26.14	34.5%
SAFE-T	21	1.68	1.06	31.90	14.3%
Overall (IMI projects)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- Of the projects in call 1, NEWMEDS had the highest number of publications (226) and PROACTIVE had the highest percentage of open access papers (89.7%), while EUROPAIN had the highest field normalised citation impact (2.57).

5.3 Summary bibliometric analyses for IMI 1 projects – call 2

Figure 5.3.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 call 2 projects. Only projects with at least 10 papers and one highly cited paper over the time period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers. The same data is shown in Figure 5.3.1 and Figure 5.3.2, however Figure 5.3.2 has a smaller x-axis range that excludes BTCure so that the other projects are less clustered.

Figure 5.3.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 1 projects – call 2, 2010-2022

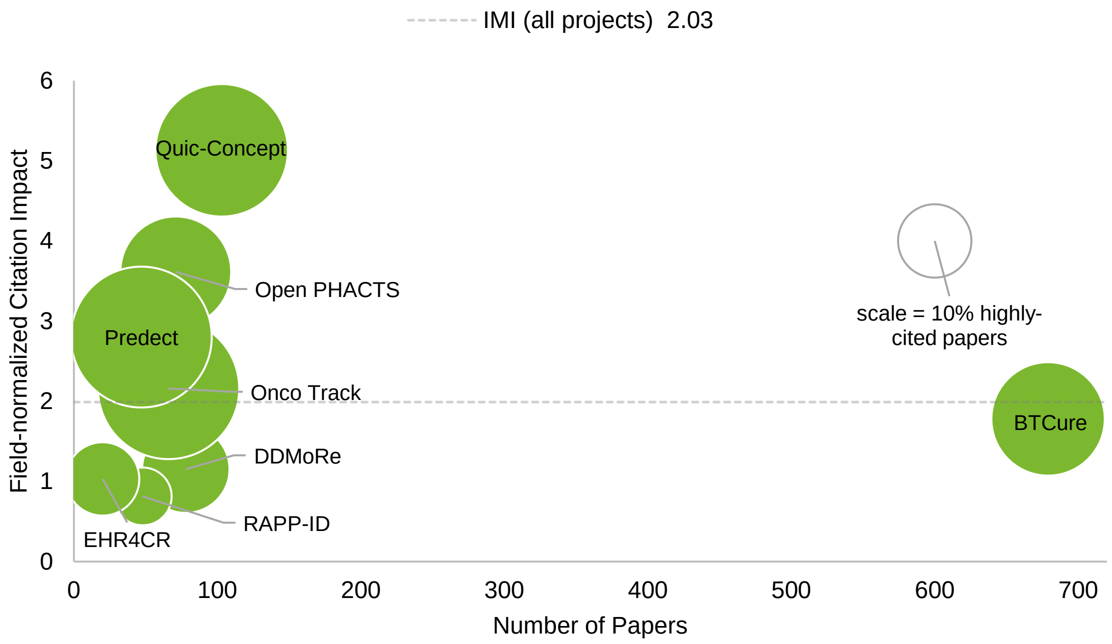
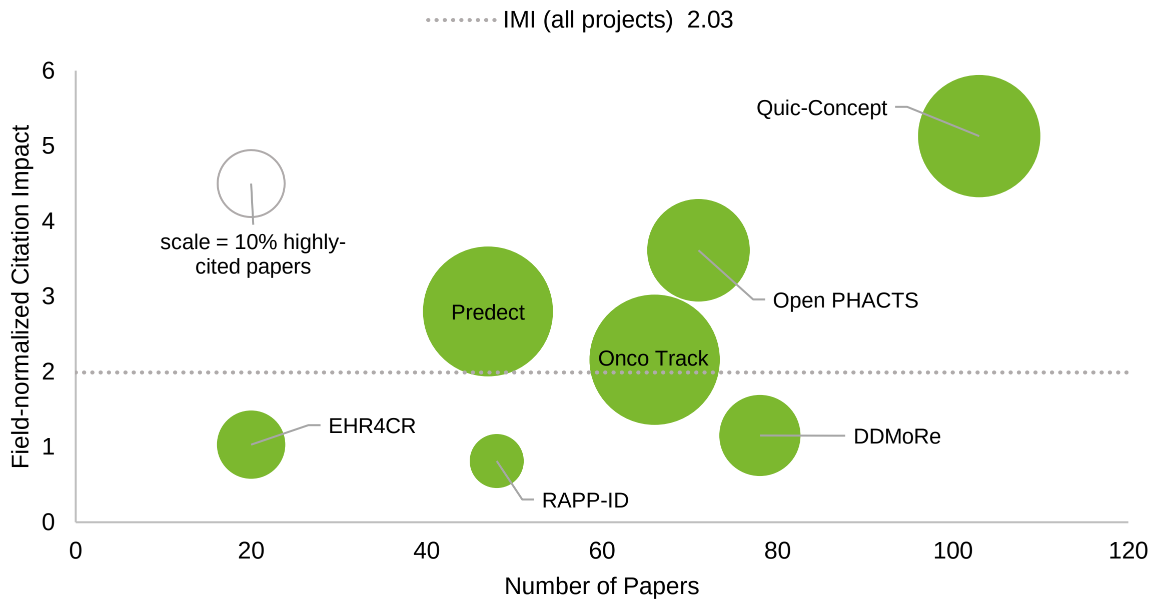


Figure 5.3.2 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 1 projects – call 2, 2010-2022. Same graph as Figure 5.3.1 but with a smaller x-axis range.



The data in Figure 5.3.1 and Figure 5.3.2 shows that:

- The average field-normalised citation impact of most IMI 1 call 2 projects was well above world average apart from EHR4CR (1.03) and RAPP-ID which had the lowest citation impact (0.81). Similarly, all except RAPP-ID (6.3%) had a higher percentage of highly cited papers than the world average (10%).
- BTCURE remains the most prolific IMI 1 call 2 project with 679 papers and a citation impact of 1.78.
- QUIC-CONCEPT remains the project with the largest citation impact which is more than five times the world average (5.13) an increase of over 7% from the 2022 report.
- Open PHACTS, Onco Track and Predect are also well cited with a citation impact of 3.61, 2.16 and 2.80, respectively.
- Half of the projects in this call had an average citation impact greater than the average citation impact of all IMI project papers (2.03).
- Onco Track has the largest percentage of highly cited papers (36.4%).

Table 5.3.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 2 publications. Table 5.3.2 shows the normalised citation impact (normalised against world average values) of IMI 1 call 2 projects and is an expansion of the data shown in Figure 5.3.1 and Figure 5.3.2.

Table 5.3.1 Bibliometric indicators for IMI 1 projects in call 2, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
BTCure	727	679	66.9%	32,996	48.59
Quic-Concept	104	103	85.6%	13,723	133.23
DDMoRe	83	78	68.7%	1,951	25.01
Open PHACTS	74	71	89.2%	6,893	97.08
Onco Track	70	66	67.1%	4,878	73.91
RAPP-ID	49	48	67.3%	1,166	24.29
Predect	51	47	78.4%	3,720	79.15
EHR4CR	23	20	73.9%	492	24.60

Table 5.3.2 Summary citation indicators for IMI 1 projects in call 2, 2010-2022

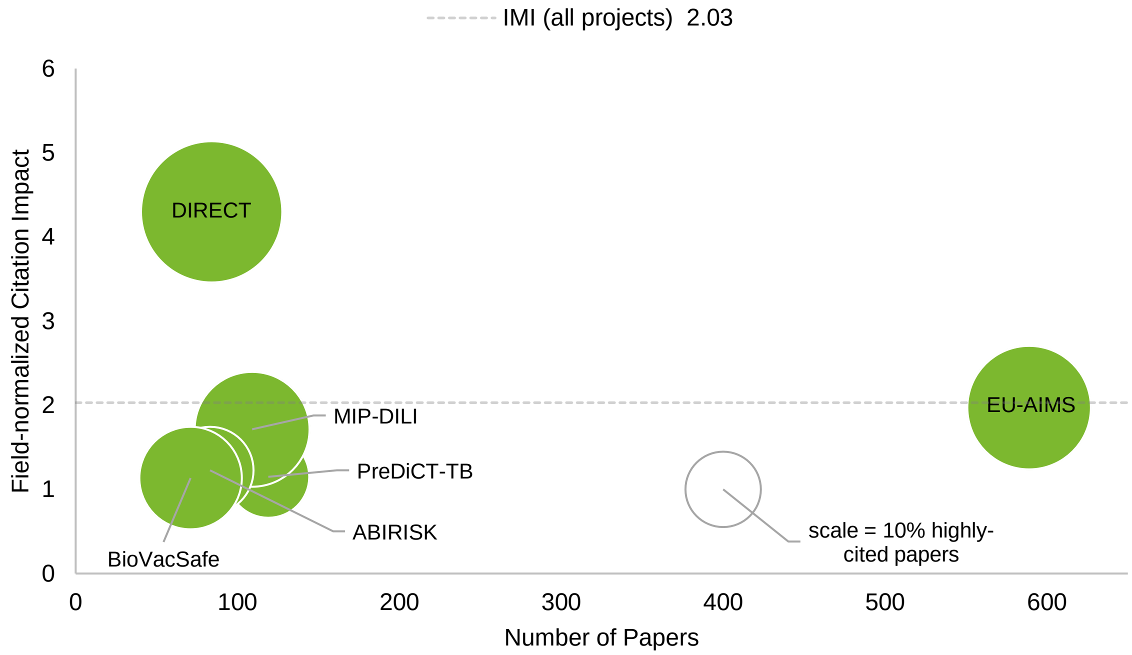
PROJECT	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
BTCure	679	1.78	0.97	30.67	23.6%
Quic-Concept	103	5.13	2.27	32.48	32.0%
DDMoRe	78	1.15	1.01	47.40	14.1%
Open PHACTS	71	3.61	1.88	37.33	22.5%
Onco Track	66	2.16	1.16	28.95	36.4%
RAPP-ID	48	0.81	0.73	43.08	6.3%
Predect	47	2.80	1.54	34.53	36.2%
EHR4CR	20	1.03	0.97	40.64	10.0%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- Among IMI 1 call 2 projects Open PHACTS has the largest percentage of open access papers (89.2%).

5.4 Summary bibliometric analyses for IMI 1 projects – call 3

Figure 5.4.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 call 3 projects. Only projects with at least 10 papers and one highly cited paper over the time period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.4.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 1 projects – call 3, 2010-2022



The data in Figure 5.4.1 shows that:

- The average citation impact and percentage of highly cited papers for all projects in this call was above the world average.
- EU-AIMS was by far the most prolific IMI 1, call 3 project with 589 papers. The field-normalised citation impact of this research was nearly twice the world average (1.97).
- Research associated with DIRECT was very well-cited with a field-normalised citation impact of four times (4.30) the world average and more than a third (34.5%) of its papers were highly cited.

Table 5.4.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 3 publications. Table 5.4.2 shows the normalised citation impact (normalised against world average values) of IMI 1 call 3 projects and is an expansion of the data shown in Figure 5.4.1.

Table 5.4.1 Summary bibliometric indicators for IMI 1 projects in call 3, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
EU-AIMS	610	589	81.5%	23,269	39.51
PreDiCT-TB	125	119	89.6%	3,057	25.69
MIP-DILI	117	109	61.5%	3,808	34.94
DIRECT	111	84	68.5%	5,336	63.52
ABIRISK	104	83	53.8%	2,404	28.96
BioVacSafe	74	71	79.7%	2,525	35.56

Table 5.4.2 Summary citation indicators for IMI 1 projects in Call 3, 2010-2022

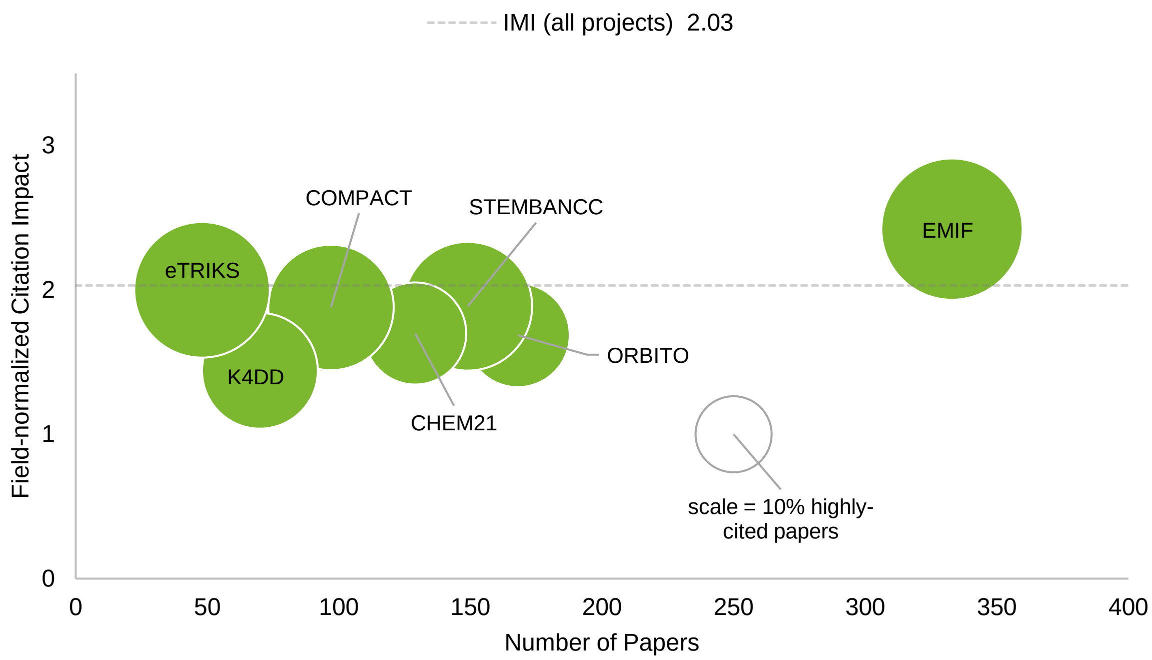
PROJECT	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
EU-AIMS	589	1.97	1.07	30.89	26.5%
PreDiCT-TB	119	1.15	0.80	42.18	11.8%
MIP-DILI	109	1.71	1.33	34.32	22.9%
DIRECT	84	4.30	1.10	31.12	34.5%
ABIRISK	83	1.23	0.84	42.91	13.3%
BioVacSafe	71	1.13	0.84	34.80	18.3%
Overall (IMI projects)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- PreDiCT-TB remains the project with largest percentage of open access papers (89.6%).

5.5 Summary bibliometric analyses for IMI 1 projects – call 4

Figure 5.5.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 call 4 projects. Only projects with at least 10 papers and one highly cited paper over the time period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.5.1 Paper numbers, average field-normalised citation impact and share of highly cited research for select IMI 1 projects – call 4, 2010-2022



The data in Figure 5.5.1 shows that:

- The average field-normalised citation impact of all projects in this call is above world average.
- EMIF produced the highest number of papers in call 4, with 333 papers and has a field-normalised citation impact more than two times the world average (2.42) and larger than the average for all IMI research (2.03). As well as has the largest % of highly cited papers (33.9%)
- All the projects have a percentage of highly cited papers larger than the World average (10%)

Table 5.5.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 4 publications. Table 5.5.2 shows the normalised citation impact (normalised against world average values) of IMI 1 call 4 projects and is an expansion of the data shown in Figure 5.5.1.

Table 5.5.1 Bibliometric indicators for IMI 1 projects in call 4, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
EMIF	354	333	81.6%	15,896	47.74
ORBITO	171	168	36.8%	5,353	31.86
STEMBANCC	155	149	81.9%	6,087	40.85
CHEM21	132	129	50.8%	6,509	50.46
COMPACT	97	97	56.7%	5,070	52.27
K4DD	72	70	72.2%	2,191	31.30
eTRIKS	59	48	88.1%	2,011	41.90

Table 5.5.2 Summary citation indicators for IMI 1 projects in call 4, 2010-2022

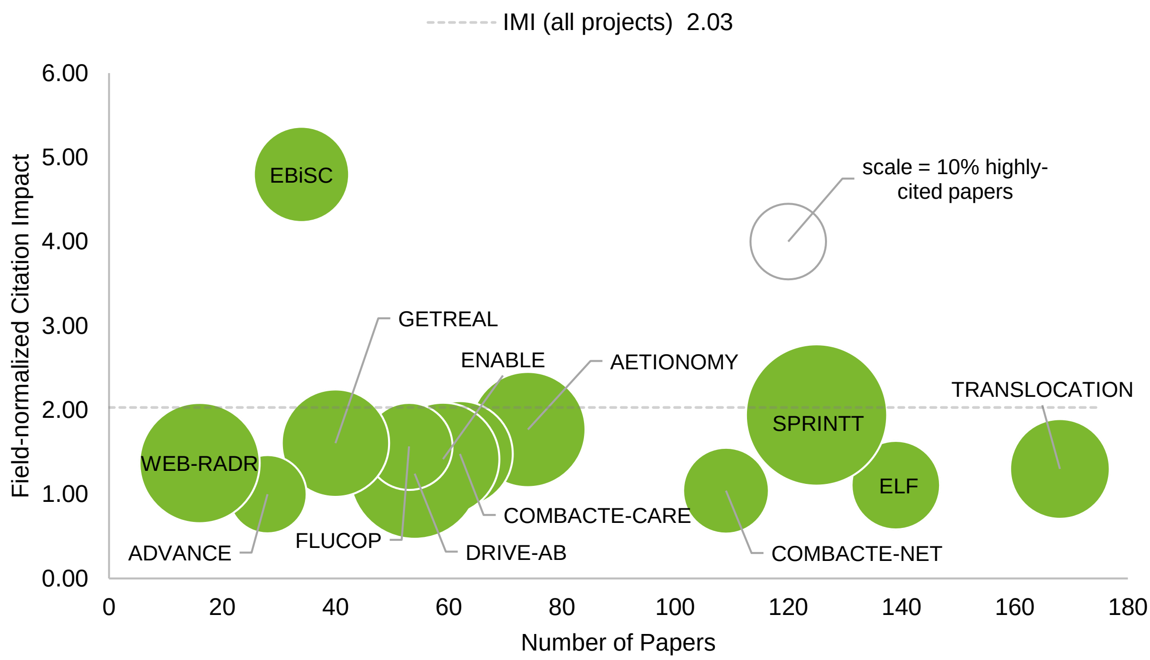
		CITATION IMPACT			
PROJECT	NUMBER OF PAPERS	NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL	AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
EMIF	333	2.42	1.20	29.78	33.9%
ORBITO	168	1.69	1.26	28.93	18.5%
STEMBANCC	149	1.89	1.26	31.94	28.2%
CHEM21	129	1.70	1.28	36.70	17.8%
COMPACT	97	1.88	1.38	31.09	26.8%
K4DD	70	1.44	1.15	34.11	22.9%
eTRIKS	48	2.00	1.22	28.83	31.3%
Overall (IMI projects)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- eTRIKS has the highest percentage of open access papers (88.1%).

5.6 Summary bibliometric analyses for IMI 1 projects – calls 5-10

Figure 5.6.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 calls 5-10 projects. Only projects with at least 10 papers and one highly cited paper over the time period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.6.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 1 projects - calls 5-10, 2010-2022



The data in Figure 5.6.1 shows that:

- Research associated with EBiSC was very well cited with a very large field-normalised citation impact of more than four times the world average (4.80). However, the total number of EBiSC papers is still relatively low (34), so it is possible that only a few highly cited papers has inflated the citation impact.
- SPRINTT has the highest percentage of highly cited papers (34.4%)
- TRANSLOCATION produced the most papers (168) likely due to it being one of the longest running projects from IMI 1 calls 5-10.
- All the projects in calls 5-10 have a field-normalised citation impact greater than the world average but below average for all IMI project research (2.03), apart from EBiSC.

Table 5.6.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 5-10 publications. Table 5.6.2 shows the normalised citation impact (normalised against world average values) of IMI 1 calls 5-10 projects and is an expansion of the data shown in Figure 5.6.1.

Table 5.6.1 Bibliometric indicators for IMI 1 projects in calls 5-10, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
TRANSLOCATION	168	168	67.3%	5,096	30.33
ELF	141	139	85.1%	3,060	22.01
SPRINTT	132	125	56.8%	4,858	38.86
COMBACTE-NET	119	109	83.2%	1,834	16.83
AETIONOMY	77	74	80.5%	2,460	33.24
COMBACTE-CARE	67	62	86.6%	1,836	29.61
ENABLE	61	59	86.9%	1,436	24.34
PRECISESADS	79	57	63.3%	1,338	23.47
DRIVE-AB	60	54	80.0%	1,607	29.76
FLUCOP	54	53	85.2%	1,143	21.57
GETREAL	46	40	67.4%	1,145	28.63
EBiSC	37	34	91.9%	3,166	93.12
ADVANCE	29	28	86.2%	502	17.93
WEB-RADR	17	16	82.4%	348	21.75

Table 5.6.2 Summary citation indicators for IMI 1 projects in calls 5-10, 2010-2022

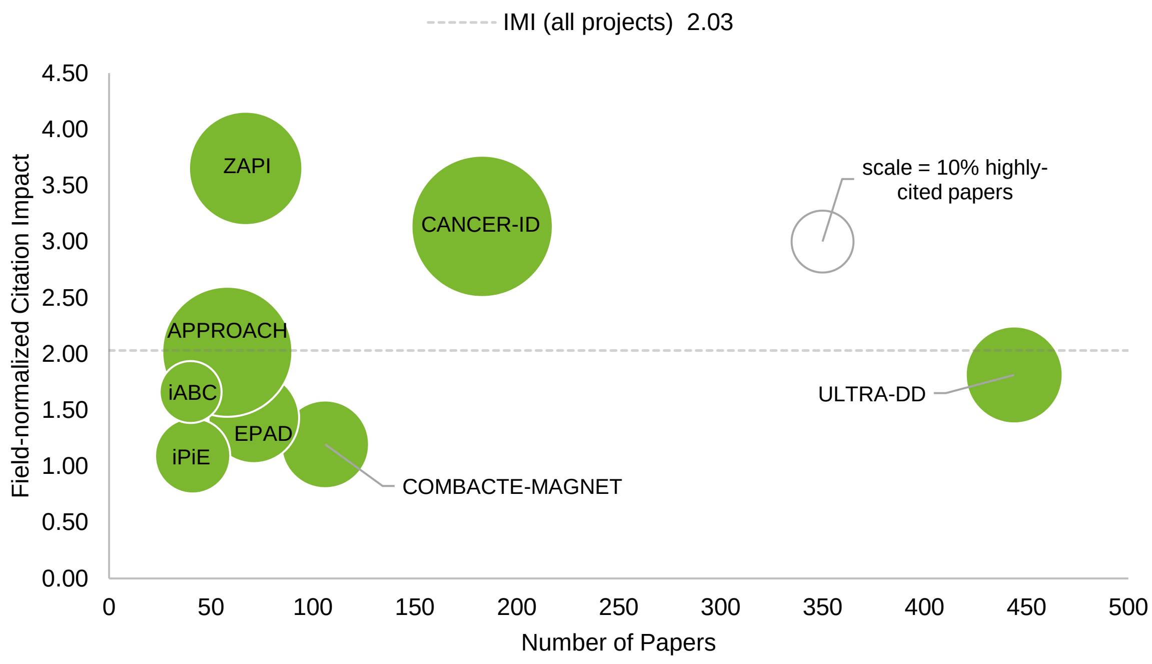
PROJECT	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
TRANSLOCATION	168	1.30	0.94	36.79	17.3%
ELF	139	1.11	1.00	41.42	13.7%
SPRINTT	125	1.94	1.73	27.27	34.4%
COMBACTE-NET	109	1.04	0.84	39.96	12.8%
AETIONOMY	74	1.77	1.29	33.79	23.0%
COMBACTE-CARE	62	1.48	0.90	35.86	19.4%
ENABLE	59	1.42	1.03	31.75	22.0%
PRECISESADS	57	1.36	0.86	34.35	15.8%
DRIVE-AB	54	1.24	0.93	32.27	27.8%
FLUCOP	53	1.57	1.00	44.00	13.2%
GETREAL	40	1.61	1.10	37.81	20.0%
EBiSC	34	4.80	2.55	33.21	14.7%
ADVANCE	28	1.00	1.01	41.54	10.7%
WEB-RADR	16	1.37	1.33	31.64	25.0%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- EBiSC has the highest percentage (91.9%) of open access papers.

5.7 Summary bibliometric analyses for IMI 1 projects – call 11

Figure 5.7.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers for IMI 1 call 11 projects. Only projects with at least 10 papers and one highly cited paper over the time period (2010-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.7.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 1 projects – call 11, 2010-2022



The data in Figure 5.7.1 shows that:

- ULTRA-DD produced by far the most papers (444).
- All the projects performed at or above world average for percentage of highly cited papers and field-normalised citation impact.
- Research papers associated with APPROACH, CANCER-ID and ZAPI were very well-cited with field-normalised citation impacts of two (2.02) and three (3.14, 3.65) times the world average, respectively.
- Half of CANCER-ID papers are highly cited (50.8%).

Table 5.7.1 shows raw citation impact and the percentage of open access papers by project for IMI 1 call 11 publications. Table 5.7.2 shows the normalised citation impact (normalised against world average values) of IMI 1 call 11 projects and is an expansion of the data shown in Figure 5.7.1.

Table 5.7.1 Bibliometric indicators for IMI 1 projects in call 11, 2010-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	CITATIONS	RAW CITATION IMPACT
ULTRA-DD	452	444	85.8%	12,942	29.15
CANCER-ID	212	183	73.6%	12,899	70.49
COMBACTE-MAGNET	117	106	82.1%	2,229	21.03
EPAD	76	71	84.2%	1,267	17.85
ZAPI	70	67	94.3%	3,627	54.13
APPROACH	71	58	76.1%	2,610	45.00
iPiE	42	41	71.4%	981	23.93
iABC	58	40	62.1%	561	14.03

Table 5.7.2 Summary citation indicators for IMI 1 projects in call 11, 2010-2022

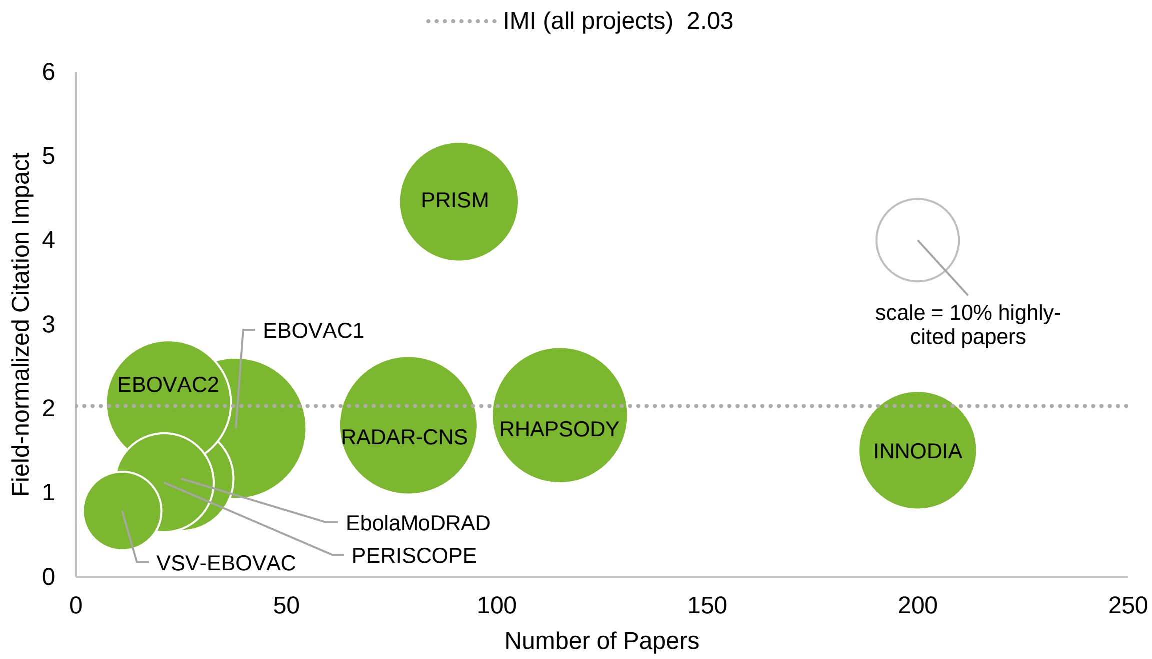
PROJECT	NUMBER OF PAPERS	CITATION IMPACT		AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
		NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL		
ULTRA-DD	444	1.81	1.01	33.14	24.1%
CANCER-ID	183	3.14	1.47	16.58	50.8%
COMBACTE-MAGNET	106	1.19	0.86	39.95	19.8%
EPAD	71	1.43	0.99	38.74	21.1%
ZAPI	67	3.65	2.02	29.64	32.8%
APPROACH	58	2.02	1.48	30.47	43.1%
iPiE	41	1.09	0.87	35.68	14.6%
iABC	40	1.66	0.97	44.97	10.0%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- ZAPI remains the call 11 project with the largest percentage (94.3%) of open access papers.

5.8 Summary bibliometric analyses for IMI 2 calls 1-4 projects

Figure 5.8.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers from IMI 2 projects from calls 1-4. Only projects with at least 10 papers and one highly cited paper over the time period (2015-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers.

Figure 5.8.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 2 projects – calls 1-4, 2015-2022



The data in Figure 5.8.1 shows that:

- INNODIA remains the most productive project, publishing 200 papers.
- PRISM and EBOVAC2 are the most impactful projects with a field-normalized citation impact of more than four and two times the world average, 4.46 and 2.07 respectively. They are also the only two projects which performed above the average field normalised citation impact of all of IMI's papers (2.03).
- PRISM's field normalised citation impact has increased by 65% from the thirteenth report.

Table 5.8.1 shows raw citation impact and percentage of open access papers by project for IMI 2 calls 1-4 publications and Table 5.8.2 shows indicators for IMI 2 calls 1-4 project research where citation impact has been normalised against world average values.

Table 5.8.1 Bibliometric indicators for IMI 2 calls 1-4 projects, 2015-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS[11]	CITATIONS	RAW CITATION IMPACT
INNODIA	242	200	77.7%	4,034	20.17
RHAPSODY	137	115	80.3%	2,592	22.54
RADAR-CNS	112	79	79.5%	1,609	20.37
PRISM	104	91	77.9%	2,843	31.24
EBOVAC1	40	38	100.0%	1,031	27.13
EbolaMoDRAD	26	25	69.2%	435	17.40
VAC2VAC	24	24	91.7%	95	3.96
PERISCOPE	22	21	100.0%	195	9.29
EBOVAC2	22	22	100.0%	535	24.32
VSV-EBOVAC	12	11	75.0%	237	21.55

[11] Note that IMI 2 funded researchers are contractually obliged to make their scientific articles open access through Green or Gold routes. However, for some of other document types, such as editorials, reviews or conference proceedings open access publication is strongly encouraged but not mandatory.

Nevertheless, it is obvious that fewer than all of IMI's papers are classified as open access in this analysis, and this is likely to be due to ancillary factors (such as challenges relating to definitions and coverage) as well as non-compliance. The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes.

It is also possible that some publishers makes publications available without following a recognised open access route. In these cases publications will not be indexed as open access in the Web of Science or in this report. Additionally, the analysis presented in this report covers all document types and not just papers, and some of these are not indexed as open access in the Web of Science databases.

The Web of Science open access data coverage is summarised at: https://clarivate.com/webofsciencegroup/solutions/open-access/

Table 5.8.2 Summary citation indicators for IMI 2 calls 1-4 project, 2015-2022

PROJECT	CITATION IMPACT				
	NUMBER OF PAPERS	NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL	AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
INNODIA	200	1.50	1.03	40.60	20.5%
RHAPSODY	115	1.92	1.07	35.67	27.0%
PRISM	91	4.46	1.16	37.08	20.9%
RADAR-CNS	79	1.80	1.54	36.07	27.8%
EBOVAC1	38	1.76	1.18	36.56	28.9%
EbolaMoDRAD	25	1.17	0.86	41.54	16.0%
VAC2VAC	24	0.42	0.57	65.73	0.0%
EBOVAC2	22	2.07	1.27	32.79	22.7%
PERISCOPE	21	1.12	0.89	43.92	14.3%
VSV-EBOVAC	11	0.78	0.53	30.51	9.1%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- All the EBOVAC1, EBOVAC2, and PERISCOPE project papers are open access.
- EbolaMoDRAD, which was the project with the lowest percentage of open access papers still had more than three-fifths (69.2%) of its papers published as open-access.
- Apart from VAC2VAC and VSV-EBOVAC, all the projects meet or exceed the world average (10%) for highly cited papers.

5.9 Summary bibliometric analyses for IMI 2 calls 5-10 projects

Figure 5.9.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers from IMI 2 projects from calls 5-10. Only projects with at least 10 papers and one highly cited paper over the time period (2017-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers. The same data is shown in Figure 5.9.1 and Figure 5.9.2, however Figure 5.9.2 has a smaller x-axis range in order to get a better view of the clustered projects in the bottom left corner of Figure 5.9.1.

Figure 5.9.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 2 projects – calls 5-10, 2017-2022

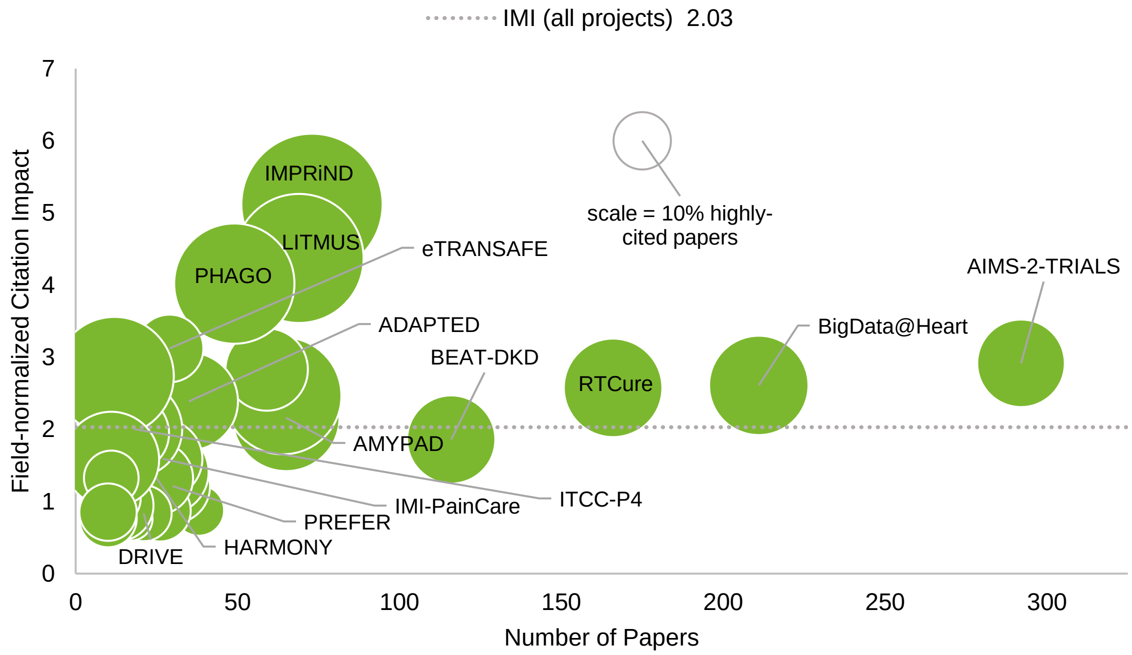
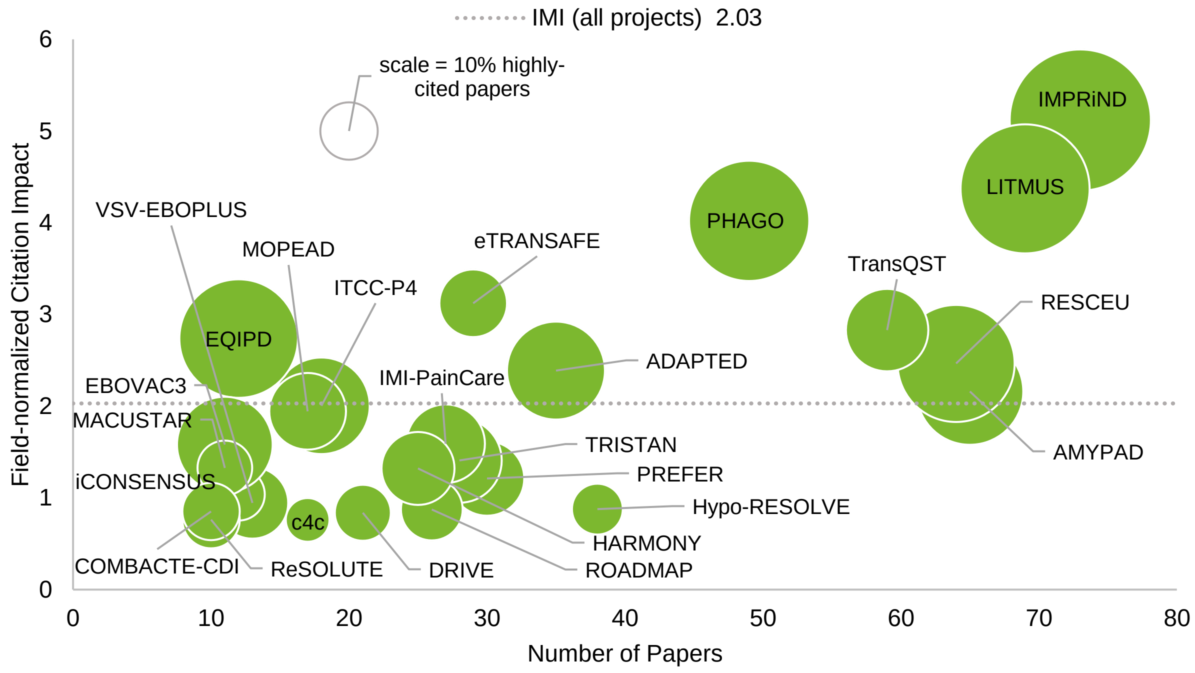


Figure 5.9.2 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 2 projects - calls 5-10, 2017-2022. Smaller axis range.



The data in Figure 5.9.1 and Figure 5.9.2 shows that:

- The AIMS-2-Trials project published the most papers, 292 papers and had a field-normalized citation impact of 2.92, more than 2.5 times higher than the world average (1).
- IMPRIND remains the top project in terms of field-normalized citation impact with a citation impact of more than 5 times (5.12) the world average (1). It also has more than half (58.9%) of its papers that are highly cited.

Table 5.9.1 shows raw citation impact and percentage of open access papers by project for IMI 2 calls 5-10 publications and Table 5.9.2 shows indicators for IMI 2 calls 5-10 project research where citation impact has been normalised against world average values.

Table 5.9.1 Bibliometric indicators for IMI 2 calls 5-10 projects, 2017-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS[11]	CITATIONS	RAW CITATION IMPACT
AIMS-2-TRIALS	310	292	90.3%	4,700	16.10
BigData@Heart	238	211	91.2%	2,759	13.08
RTCure	191	166	81.2%	4,410	26.57
BEAT-DKD	126	116	85.7%	2,139	18.44
LITMUS	81	69	81.5%	1,865	27.03
IMPRiND	76	73	86.8%	4,567	62.56
AMYPAD	73	65	87.7%	1,161	17.86
RESCEU	68	64	94.1%	1,174	18.34
TransQST	67	59	79.1%	1,729	29.31
Hypo-RESOLVE	58	38	63.8%	181	4.76
PHAGO	50	49	98.0%	2,205	45.00
PREFER	46	30	84.8%	415	13.83
HARMONY	39	25	71.8%	399	15.96
IMI-PainCare	38	27	65.8%	245	9.07
eTRANSAFE	38	29	73.7%	991	34.17
ADAPTED	37	35	86.5%	819	23.40
ROADMAP	32	26	90.6%	287	11.04
TRISTAN	29	28	96.6%	519	18.54
DRIVE	22	21	81.8%	180	8.57
c4c	21	17	81.0%	55	3.24

[10] Note that IMI 2 funded researchers are contractually obliged to make their scientific articles open access through Green or Gold routes. However, for some of other document types, such as editorials, reviews or conference proceedings open access publication is strongly encouraged but not mandatory.

Nevertheless, it is obvious that fewer than all of IMI's publications are classified as open access in this analysis, and this is likely to be due to ancillary factors (such as challenges relating to definitions and coverage) as well as non-compliance. The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes.

It is also possible that some publishers makes publications available without following a recognised open access route. In these cases publications will not be indexed as open access in the Web of Science or in this report. Additionally, the analysis presented in this report covers all document types and not just papers, and some of these are not indexed as open access in the Web of Science databases.

The Web of Science open access data coverage is summarised at: https://clarivate.com/webofsciencegroup/solutions/open-access/

EQIPD	19	12	89.5%	425	35.42
ITCC-P4	18	18	88.9%	276	15.33
MACUSTAR	18	11	55.6%	68	6.18
MOPEAD	17	17	94.1%	159	9.35
VSV-EBOPLUS	14	13	85.7%	264	20.31
ReSOLUTE	14	10	92.9%	95	9.50
iCONSENSUS	12	12	91.7%	46	3.83
COMBACTE-CDI	12	10	83.3%	51	5.10
EBOVAC3	11	11	100.0%	70	6.36

Table 5.9.2 Summary citation indicators for IMI 2 calls 5-10 projects, 2017-2022

		CITATION IMPACT			
PROJECT	NUMBER OF PAPERS	NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL	AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
AIMS-2-TRIALS	292	2.92	1.20	381.71	22.9%
BigData@Heart	211	2.61	1.32	37.00	29.4%
RTCure	166	2.58	1.24	34.10	28.9%
BEAT-DKD	116	1.86	0.93	899.97	23.3%
IMPRiND	73	5.12	1.85	17.70	58.9%
LITMUS	69	4.37	1.54	25.83	49.3%
AMYPAD	65	2.16	1.06	27.90	33.8%
RESCEU	64	2.47	1.10	27.37	40.6%
TransQST	59	2.83	1.81	42.43	20.3%
PHAGO	49	4.02	1.87	20.92	42.9%
Hypo-RESOLVE	38	0.88	0.91	50.63	7.9%
ADAPTED	35	2.39	1.10	36.61	28.6%
PREFER	30	1.21	1.22	36.61	16.7%
eTRANSAFE	29	3.12	1.89	44.66	13.8%
TRISTAN	28	1.41	1.15	38.78	21.4%
IMI-PainCare	27	1.59	1.27	38.37	18.5%
ROADMAP	26	0.87	0.50	52.00	11.5%
HARMONY	25	1.32	0.60	45.51	16.0%
DRIVE	21	0.84	0.89	46.39	9.5%
ITCC-P4	18	2.00	0.89	26.18	27.8%
MOPEAD	17	1.94	0.76	42.94	17.6%
c4c	17	0.76	1.04	50.99	5.9%
VSV-EBOPLUS	13	0.95	0.99	29.75	15.4%
EQIPD	12	2.74	1.87	32.72	41.7%

iCONSENSUS	12	1.04	1.20	54.72	8.3%
EBOVAC3	11	1.58	1.17	50.70	27.3%
MACUSTAR	11	1.33	0.89	51.31	9.1%
ReSOLUTE	10	0.76	0.69	54.45	10.0%
COMBACTE-CDI	10	0.85	0.60	51.02	10.0%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- Most of the projects in IMI 2 Calls 5-10 have more than 80% of their papers as open access, except for MACUSTAR, Hypo-Resolve, IMI-PainCare, Harmony, eTRANSAFE, and TransQT.

5.10 Summary bibliometric analyses for IMI 2 calls 11-23 projects

Figure 5.10.1 compares the number of papers, average field-normalised citation impact and share of highly cited papers from IMI 2 projects from calls 11-23. Only projects with at least 10 papers and one highly cited paper over the time period (2019-2022) are shown. The area of the 'bubble' is proportional to the share of highly cited papers. The dotted horizontal line indicates the average field-normalised citation impact for all IMI project papers. The same data is shown in Figure 5.10.2, however Figure 5.10.2 has a smaller x-axis range in order to get a better view of the clustered projects in the bottom left corner of Figure 5.10.1.

Figure 5.10.1 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 2 projects – calls 11-23, 2019-2022

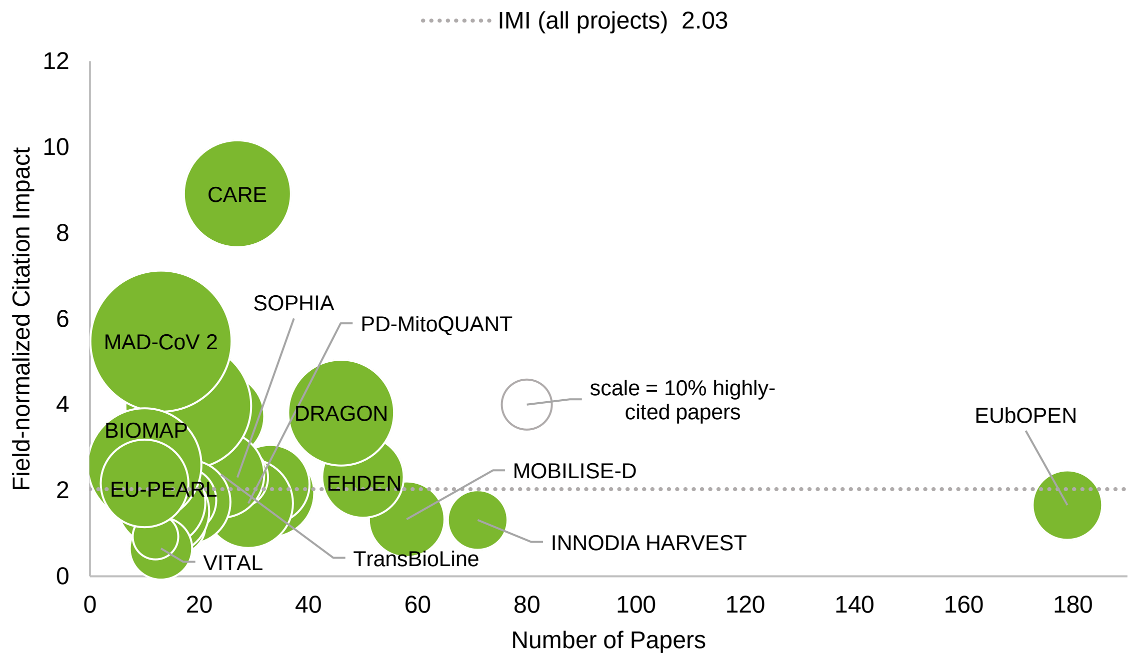
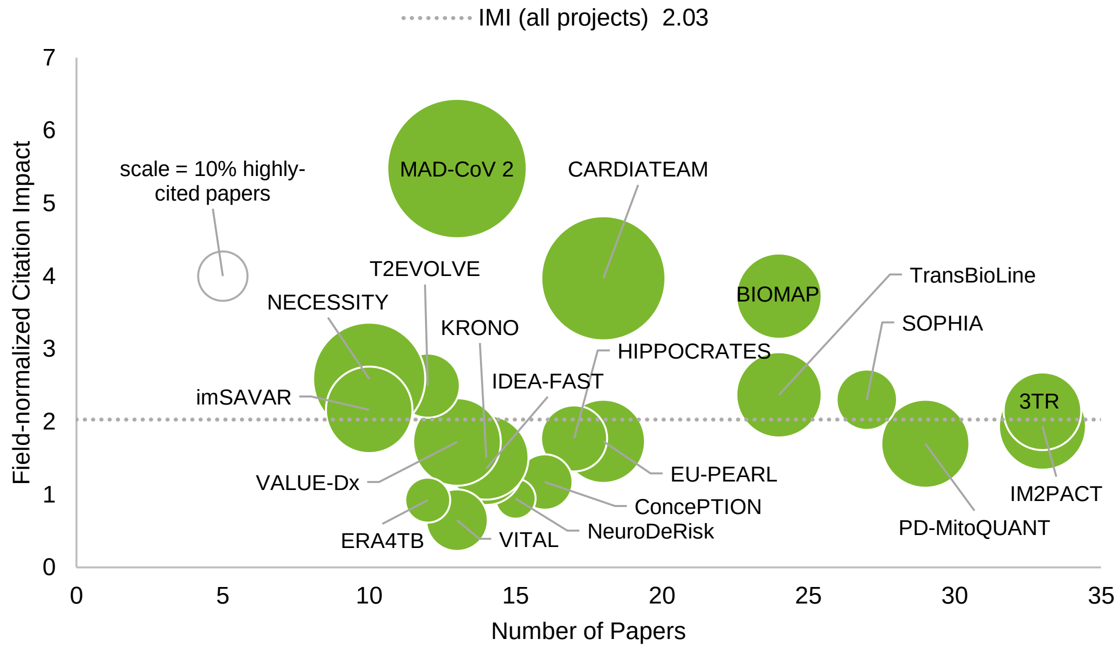


Figure 5.10.2 Paper numbers, average field-normalised citation impact and share of highly cited research for selected IMI 2 projects – calls 11-23, 2019-2022. Smaller x-axis.



The data in Figure 5.10.1 and Figure 5.10.2 shows that:

- EUbOPEN remains the most prolific with 179 papers. Many of these projects are still quite new, and the oldest publication was published in 2019.
- CARE had the highest average field-normalised citation impact which was nearly 9 times (8.91) larger than the world average (1). However, the number of papers (27) is still quite low so the field-normalised citation impact should be considered with caution since one highly cited paper can inflate the indicator.
- More than three-quarters (76.9%) of MAD-COV 2 papers were highly cited making it the project with the highest percentage of highly cited papers.
- It is important to note that both the CARE and MAD-COV 2 projects are related to coronavirus subject matter and therefore this likely contributes to the very high citation rates observed on these projects.

Table 5.10.1 shows raw citation impact and percentage of open access papers by project for IMI 2 calls 11-23 publications and Table 5.10.2 shows indicators for IMI 2 calls 11-23 project research where citation impact has been normalised against world average values.

Table 5.10.1 Bibliometric indicators for IMI 2 calls 11-23 projects, 2019-2022

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS[11]	CITATIONS	RAW CITATION IMPACT
EUbOPEN	185	179	76.8%	1,415	7.91
INNODIA HARVEST	82	71	87.8%	567	7.99
MOBILISE-D	64	58	82.8%	502	8.66
EHDEN	64	50	79.7%	465	9.30
DRAGON	53	46	88.7%	650	14.13
3TR	39	33	79.5%	478	14.48
IM2PACT	33	33	90.9%	228	6.91
CARE	29	27	100.0%	751	27.81
SOPHIA	29	27	82.8%	394	14.59
PD-MitoQUANT	29	29	86.2%	392	13.52
BIOMAP	28	24	85.7%	696	29.00
TransBioLine	26	24	96.2%	120	5.00
IDEA-FAST	25	14	80.0%	164	11.71
EU-PEARL	24	18	79.2%	124	6.89
HIPPOCRATES	22	17	72.7%	86	5.06
CARDIATEAM	20	18	85.0%	643	35.72
ConcePTION	18	16	83.3%	74	4.63
NeuroDeRisk	17	15	64.7%	41	2.73

[10] Note that IMI 2 funded researchers are contractually obliged to make their scientific articles open access through Green or Gold routes. However, for some of other document types, such as editorials, reviews or conference proceedings open access publication is strongly encouraged but not mandatory.

Nevertheless, it is obvious that fewer than all of IMI's publications are classified as open access in this analysis, and this is likely to be due to ancillary factors (such as challenges relating to definitions and coverage) as well as non-compliance. The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes.

It is also possible that some publishers makes publications available without following a recognised open access route. In these cases publications will not be indexed as open access in the Web of Science or in this report. Additionally, the analysis presented in this report covers all document types and not just papers, and some of these are not indexed as open access in the Web of Science databases.

The Web of Science open access data coverage is summarised at: https://clarivate.com/webofsciencegroup/solutions/open-access/

KRONO	17	14	94.1%	146	10.43
RADAR-AD	15	9	66.7%	139	15.44
NECESSITY	14	10	78.6%	107	10.70
MAD-CoV 2	14	13	100.0%	464	35.69
ERA4TB	13	12	84.6%	151	12.58
T2EVOLVE	13	12	76.9%	67	5.58
VALUE-Dx	13	13	100.0%	146	11.23
VITAL	13	13	92.3%	84	6.46
imSAVAR	11	10	90.9%	69	6.90

Table 5.10.2 Summary citation indicators for IMI 2 calls 11-23 projects, 2019-2022

PROJECT	NUMBER OF PAPERS	CITATION IMPACT NORMALISED AT FIELD LEVEL	NORMALISED AT JOURNAL LEVEL	AVERAGE PERCENTILE	% OF HIGHLY CITED PAPERS
EUbOPEN	179	1.66	1.20	43.15	19.0%
INNODIA HARVEST	71	1.31	1.01	49.40	14.1%
MOBILISE-D	58	1.33	1.09	45.84	22.4%
EHDEN	50	2.31	1.53	41.38	26.0%
DRAGON	46	3.81	2.39	35.43	43.5%
IM2PACT	33	1.94	1.66	34.98	30.3%
3TR	33	2.14	1.05	3,071.60	24.2%
PD-MitoQUANT	29	1.70	1.30	50.93	31.0%
CARE	27	8.91	4.25	40.66	44.4%
SOPHIA	27	2.30	1.12	45.68	14.8%
BIOMAP	24	3.73	0.91	42.16	29.2%
TransBioLine	24	2.37	1.52	47.12	29.2%
CARDIATEAM	18	3.97	1.34	20.89	61.1%
EU-PEARL	18	1.73	2.28	40.57	27.8%
HIPPOCRATES	17	1.77	0.83	49.89	17.6%
ConcePTION	16	1.17	0.88	38.72	12.5%
NeuroDeRisk	15	0.94	0.91	54.03	6.7%
IDEA-FAST	14	1.36	1.83	47.79	21.4%
KRONO	14	1.51	2.22	46.34	28.6%
MAD-CoV 2	13	5.48	2.40	12.59	76.9%
VALUE-Dx	13	1.72	1.50	32.17	30.8%
VITAL	13	0.65	0.52	49.37	15.4%
ERA4TB	12	0.92	1.34	66.32	8.3%
T2EVOLVE	12	2.50	1.44	39.82	16.7%
NECESSITY	10	2.59	0.98	17.38	50.0%
imSAVAR	10	2.16	1.38	53.92	30.0%
OVERALL (IMI PROJECTS)	**8,896**	**2.03**	**1.18**	**34.94**	**24.6%**

- More than half of the included projects have at least 80% of their papers as open access.
- CARE, MAD-COV 2 and VALUE-DX have 100% of their papers as open access.
- NeuroDeRisk and HIPPOCRATES have the smallest percentage of open access papers, 64.7% and 72.7% respectively.

6 Geographic clustering analysis

6.1 Locations where IMI-funded research takes place

This section of the report analyses geographic clusters where IMI research occurs, the citation impact of research published by these clusters and the clusters' constituent institutions.

Substantial clusters of research activity were identified in Europe and North America. While IMI project research also involves institutions in other parts of the world, publication rates for other geographies were low. This analysis, therefore, focuses on Europe and North America and we have identified the 34 and 17 geographic clusters respectively with the highest output.

Clusters have a 20km radius and the clusters in Europe and North America tend to focus on major cities with an existing strong academic research base. The largest European clusters are London (2,120 publications), Amsterdam (1,802 publications), Stockholm (965 publications), Paris (876 publications) and Oxford (864 publications). The largest clusters in North America are Boston (467 publications), Toronto (404 publications), New York (311 publications), Bethesda (192 publications), and Montreal (167 publications).

IMI research performs well above the national averages for citation impact for all the European and North American clusters. The highest European clusters for citation impact are Maastricht (4.40) and Helsinki (4.26) both more than four times their national averages of 1.70 and 1.52, respectively.

A relatively large percentage of IMI research is open access, with the Oxford, UK cluster being among the highest with 94.1% of its IMI project research as open access papers and Rome being the lowest with over two-thirds (70.1%) of its publications being open access. The USA cluster with the highest percentage of IMI research was Seattle with 96.6% of its publications being open access.

Around 35% of all EU-28 biomedical research involves international co-authorship while in comparison rates of international collaboration for IMI project research are very high for most clusters, especially in North America where most clusters have around 90% international collaboration which is expected as IMI is a European funding organisation that primarily funds researchers working in EU-28. The European cluster with the highest rate of internationally collaborative papers was Basel with 95.1% of its research involving international co-authorship. While the European cluster, Rome, had the lowest at 75.9% international collaboration.

The clusters are visualised on maps in Figure 6.1.1 and Figure 6.1.2. Both maps are scaled separately so that the most intensive areas of output are shaded red and the areas of lowest output are blue. This means that the same colour shading is not comparable between maps. Table 6.1.1 to Table 6.1.4 show the research publication outputs of the individual clusters along with bibliometric indicators of their research performance. The citation metrics in Table 6.1.2 and Table 6.1.4 are shaded green when the performance of a cluster of IMI supported research outperforms the national average performance for biomedical research.[14]

The institutions that constitute the top five clusters within the European and North American regions are shown in Table 6.1.5 and Table 6.1.6 respectively. The five journal subject categories in which the top five clusters published most frequently within the European and North American regions are shown in Table 6.1.7 and Table 6.1.8, respectively.

[14] Web of Science journal categories which capture biomedically related publications used to calculate the national baselines are listed in Annex 2.

Figure 6.1.1 Map showing European geographic clusters of IMI project research, 2010-2022

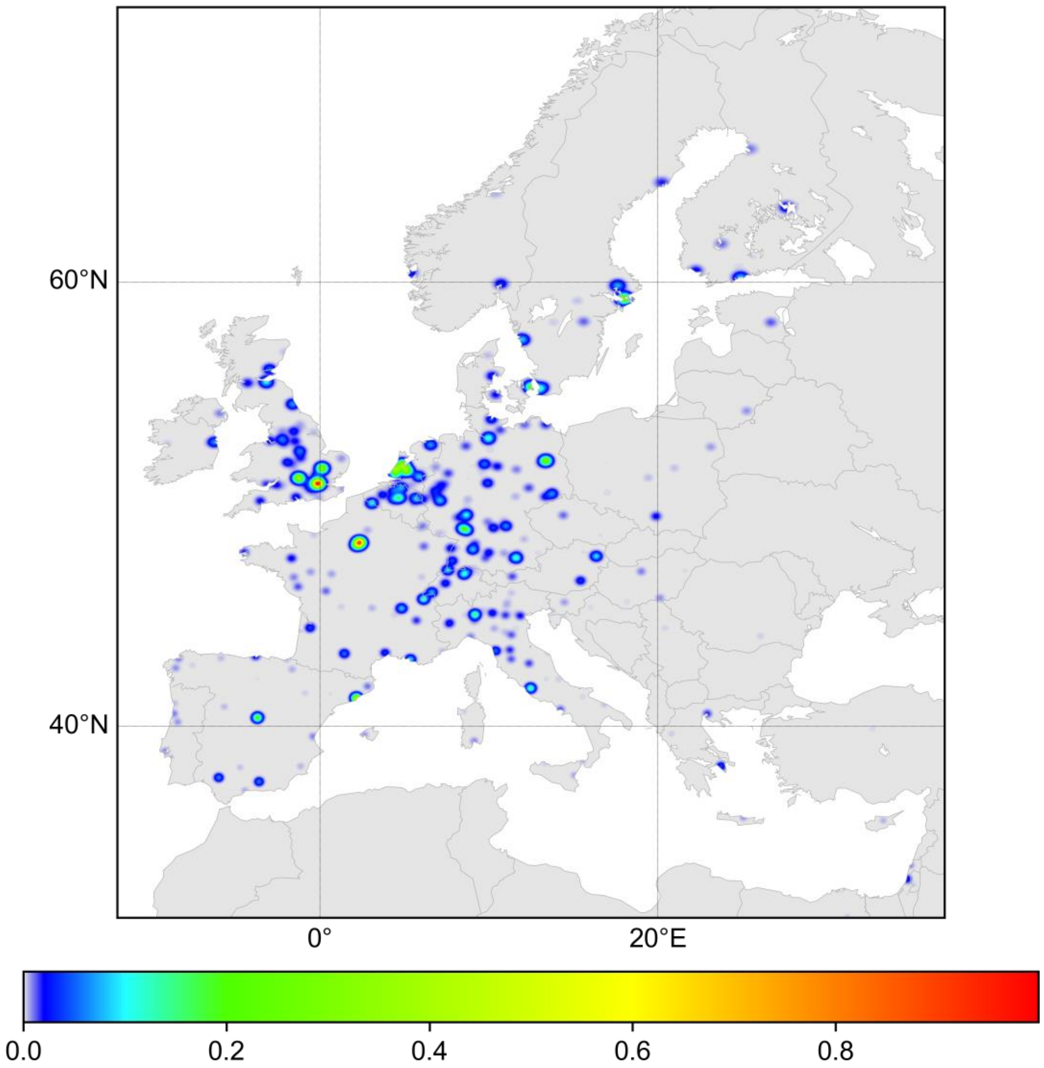


Figure 6.1.2 Map showing North American geographic clusters of IMI project research, 2010-2022

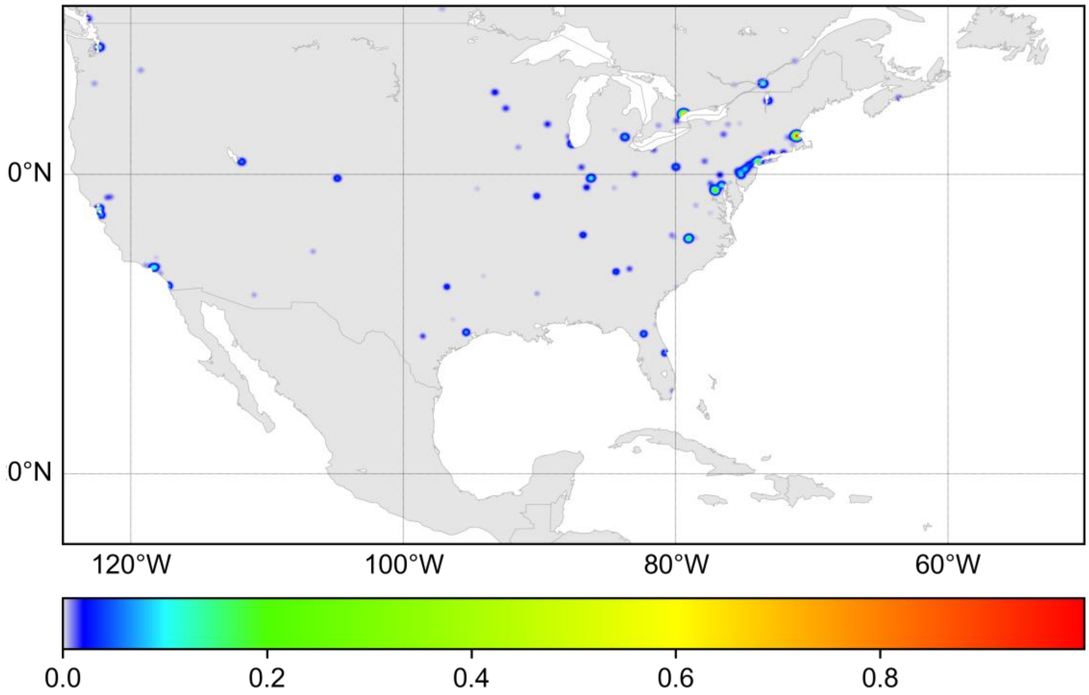


Table 6.1.1 Output and research performance of European geographic clusters of IMI project research, 2010-2022

CLUSTER	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	RAW CITATION IMPACT	% OF INTERNATIONALLY COLLABORATIVE PUBLICATIONS
London (UK)	2,120	1,919	88.2%	39.65	83.9%
Amsterdam (Netherlands)	1,802	1,636	82.9%	38.63	82.9%
Stockholm (Sweden)	965	894	80.2%	40.35	82.1%
Paris (France)	876	821	81.9%	47.00	85.7%
Oxford (UK)	864	827	94.1%	38.48	84.9%
Cambridge (UK)	796	742	90.4%	48.70	81.0%
Copenhagen (Denmark)	737	681	77.1%	35.80	85.5%
Barcelona (Spain)	629	575	86.3%	39.38	82.4%
Berlin (Germany)	491	460	85.2%	42.62	83.5%
Leuven (Belgium)	488	440	89.1%	38.51	90.9%
Mannheim (Germany)	484	466	81.1%	50.66	87.3%
Madrid (Spain)	470	430	86.0%	32.38	80.2%
Basel (Switzerland)	404	365	80.0%	35.78	95.1%
Nijmegen (Netherlands)	399	372	86.0%	39.02	84.9%
Frankfurt (Germany)	377	357	75.1%	26.71	83.2%
Uppsala (Sweden)	375	356	81.2%	30.22	77.2%
Rome (Italy)	362	328	70.1%	44.19	75.9%
Vienna (Austria)	356	324	82.4%	30.56	84.3%
Milan (Italy)	352	304	78.3%	44.34	84.5%
Munich (Germany)	331	300	77.0%	41.77	82.7%
Gothenburg (Sweden)	329	308	82.5%	44.40	91.6%
Maastricht (Netherlands)	328	312	93.3%	73.12	93.9%
Hamburg (Germany)	321	293	83.6%	42.98	81.6%
Geneva (Switzerland)	306	283	86.9%	51.17	88.3%
Edinburgh (UK)	277	249	92.0%	44.38	80.7%
Zurich (Switzerland)	251	232	87.1%	51.75	89.7%
Helsinki (Finland)	222	214	87.9%	50.18	89.3%
Bonn (Germany)	207	194	89.7%	35.52	78.9%
Lausanne (Switzerland)	203	186	90.9%	40.78	87.6%
Tubingen (Germany)	190	179	78.8%	38.38	79.9%
Beerse (Belgium)	187	175	78.9%	29.26	93.1%
Marseille (France)	148	135	77.8%	42.59	84.4%
Lyon (France)	138	123	90.2%	41.54	92.7%

CLUSTER	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	RAW CITATION IMPACT	% OF INTERNATIONALLY COLLABORATIVE PUBLICATIONS
Lille (France)	100	93	74.2%	33.63	89.2%

Table 6.1.2 Research performance of European geographic clusters of IMI project research compared to national average, 2010-2022

	FIELD-NORMALISED CITATION IMPACT		JOURNAL-NORMALISED CITATION IMPACT		% OF HIGHLY CITED PAPERS	
CLUSTER	CLUSTER	NATIONAL	CLUSTER	NATIONAL	CLUSTER	NATIONAL
London (UK)	2.63	1.52	1.29	1.19	31.4%	14.5%
Amsterdam (Netherlands)	2.41	1.70	1.23	1.24	27.9%	16.7%
Stockholm (Sweden)	2.47	1.62	1.22	1.20	28.1%	16.0%
Paris (France)	3.06	1.60	1.27	1.24	31.7%	14.0%
Oxford (UK)	2.69	1.52	1.30	1.19	33.5%	14.5%
Cambridge (UK)	3.16	1.52	1.39	1.19	33.6%	14.5%
Copenhagen (Denmark)	2.56	1.69	1.15	1.25	26.4%	16.1%
Barcelona (Spain)	3.26	1.36	1.38	1.13	30.3%	12.1%
Berlin (Germany)	3.20	1.35	1.33	1.19	28.0%	12.7%
Leuven (Belgium)	3.14	1.90	1.52	1.41	31.8%	17.4%
Mannheim (Germany)	3.26	1.35	1.26	1.19	31.8%	12.7%
Madrid (Spain)	2.94	1.36	1.34	1.13	26.5%	12.1%
Basel (Switzerland)	2.53	1.75	1.32	1.33	28.8%	16.5%
Nijmegen (Netherlands)	2.35	1.70	1.25	1.24	29.8%	16.7%
Frankfurt (Germany)	2.00	1.35	1.17	1.19	25.8%	12.7%
Uppsala (Sweden)	2.12	1.62	1.19	1.20	23.6%	16.0%
Rome (Italy)	3.14	1.44	1.62	1.24	31.1%	13.6%
Vienna (Austria)	2.98	1.50	1.28	1.24	27.2%	14.1%
Milan (Italy)	2.87	1.44	1.28	1.24	34.9%	13.6%
Munich (Germany)	3.57	1.35	1.31	1.19	32.3%	12.7%
Gothenburg (Sweden)	2.82	1.62	1.49	1.20	36.0%	16.0%
Maastricht (Netherlands)	4.40	1.70	1.75	1.24	34.9%	16.7%
Hamburg (Germany)	2.81	1.35	1.17	1.19	31.1%	12.7%
Geneva (Switzerland)	3.08	1.75	1.12	1.33	31.8%	16.5%
Edinburgh (UK)	3.68	1.52	1.45	1.19	37.3%	14.5%
Zurich (Switzerland)	3.42	1.75	1.38	1.33	38.4%	16.5%
Helsinki (Finland)	4.26	1.52	1.46	1.10	42.1%	15.2%
Bonn (Germany)	3.14	1.35	1.29	1.19	24.2%	12.7%
Lausanne (Switzerland)	2.78	1.75	1.14	1.33	26.9%	16.5%

CLUSTER	FIELD-NORMALISED CITATION IMPACT		JOURNAL-NORMALISED CITATION IMPACT		% OF HIGHLY CITED PAPERS	
	CLUSTER	NATIONAL	CLUSTER	NATIONAL	CLUSTER	NATIONAL
Tubingen (Germany)	3.09	1.35	1.22	1.19	32.4%	12.7%
Beerse (Belgium)	1.97	1.90	1.33	1.41	24.6%	17.4%
Marseille (France)	2.56	1.60	1.35	1.24	36.3%	14.0%
Lyon (France)	2.67	1.60	1.22	1.24	32.5%	14.0%
Lille (France)	1.92	1.60	0.99	1.24	28.0%	14.0%

Table 6.1.3 Output and research performance of North American geographic clusters of IMI project research, 2010-2022

CLUSTER	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	% OF OPEN ACCESS PAPERS	RAW CITATION IMPACT	% OF INTERNATIONALLY COLLABORATIVE PAPERS
Boston (USA)	467	444	87.4%	63.86	98.4%
Toronto (Canada)	404	395	86.6%	52.14	89.6%
New York (USA)	311	302	86.4%	64.96	99.7%
Bethesda (USA)	192	184	83.7%	64.78	97.8%
Montreal (Canada)	167	165	87.9%	51.83	98.2%
Chapel Hill (USA)	164	158	94.9%	43.75	87.3%
Indianapolis (USA)	149	134	79.9%	49.94	97.0%
San Francisco (USA)	131	124	87.1%	95.31	100.0%
Los Angeles (USA)	111	108	88.9%	69.20	98.1%
Baltimore (USA)	106	102	91.2%	93.08	99.0%
Stanford (USA)	94	94	93.6%	78.99	95.7%
Titusville (USA)	94	86	80.2%	20.63	97.7%
Seattle (USA)	88	87	96.6%	72.67	96.6%
La Jolla (USA)	84	83	89.2%	75.90	100.0%
Philadelphia (USA)	81	77	90.9%	73.87	98.7%
Ann Arbor (USA)	71	69	88.4%	95.26	97.1%
Houston (USA)	65	61	91.8%	67.51	100.0%

Table 6.1.4 Research performance of North American geographic clusters of IMI project research compared to the national average, 2010-2022

CLUSTER	FIELD-NORMALISED CITATION IMPACT		JOURNAL-NORMALISED CITATION IMPACT		% OF HIGHLY CITED PAPERS	
	CLUSTER	NATIONAL	CLUSTER	NATIONAL	CLUSTER	NATIONAL
Boston (USA)	4.33	1.34	1.43	1.06	38.8%	13.1%
Toronto (Canada)	3.37	1.56	1.42	1.19	34.2%	14.5%
New York (USA)	4.97	1.34	1.50	1.06	34.9%	13.1%

CLUSTER	FIELD-NORMALISED CITATION IMPACT		JOURNAL-NORMALISED CITATION IMPACT		% OF HIGHLY CITED PAPERS	
	CLUSTER	NATIONAL	CLUSTER	NATIONAL	CLUSTER	NATIONAL
Bethesda (USA)	4.59	1.34	1.51	1.06	45.2%	13.1%
Montreal (Canada)	4.22	1.56	1.17	1.19	33.6%	14.5%
Chapel Hill (USA)	4.35	1.34	1.26	1.06	31.9%	13.1%
Indianapolis (USA)	3.24	1.34	1.44	1.06	33.6%	13.1%
San Francisco (USA)	7.37	1.34	2.00	1.06	52.4%	13.1%
Los Angeles (USA)	6.71	1.34	0.79	1.06	21.3%	13.1%
Baltimore (USA)	7.78	1.34	1.60	1.06	50.6%	13.1%
Stanford (USA)	8.23	1.34	1.63	1.06	44.7%	13.1%
Titusville (USA)	6.77	1.34	2.00	1.06	46.5%	13.1%
Seattle (USA)	4.15	1.34	1.30	1.06	27.5%	13.1%
La Jolla (USA)	7.26	1.34	2.00	1.06	43.1%	13.1%
Philadelphia (USA)	8.99	1.34	1.45	1.06	50.0%	13.1%
Ann Arbor (USA)	7.05	1.34	2.13	1.06	58.1%	13.1%
Houston (USA)	4.51	1.34	1.91	1.06	55.6%	13.1%

Table 6.1.5 Institutions constituting the top-five European geographic clusters (by number of publications) of IMI project research, 2010-2022

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
London	UK	King's College London	864
		Imperial College London	585
		University College London	558
		GlaxoSmithKline	125
		South London & Maudsley NHS Trust	112
		Birkbeck University London	100
		London School of Hygiene & Tropical Medicine	93
		Royal Brompton Hospital	90
		Guy's & St Thomas' NHS Foundation Trust	89
		University College London Hospitals NHS Foundation Trust	73
		Queen Mary University London	68
		St Georges University London	53
		Royal Brompton & Harefield NHS Foundation Trust	43
		Alan Turing Inst	29
		Royal Marsden NHS Foundation Trust	29
		Francis Crick Institute	27
		The Medicines & Healthcare Products Regulatory Agency	27

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Institute of Cancer Research - UK	26
		Medical Research Council UK (MRC)	26
		UK Research and Innovation, India	26
		Hlth Data Res UK	23
		UCB Pharma SA	22
		National Institute for Health & Care Excellence	19
		King's College Hospital	18
		European Med Agcy	18
		London School Economics & Political Science	17
		UCL Medical School	14
		University of Westminster	14
		Moorfields Eye Hospital NHS Foundation Trust	13
		National Institute for Biological Standards & Control	13
		King's College Hospital NHS Foundation Trust	13
		Royal London Hospital	12
		Heptares Therapeut Ltd	11
		City University London	11
		University of London School of Pharmacy	11
		Public Health England	9
		University of London Royal Veterinary College	9
		Cancer Research UK	9
		Takeda Dev Ctr Europe Ltd	9
		Royal Coll Gen Practitioners	9
		Takeda Pharmaceutical Company Ltd	9
		Barts Health NHS Trust	9
		St Georges Univ Hosp NHS Fdn Trust	9
		Amgen LTD	8
		MRC Social Genet & Dev Psychiat SGDP Ctr	8
		UK Dementia Res Inst	8
		Celltech Grp	8
		Aladdin Healthcare Technol Ltd	7
		Inst Psychiat Psychol & Neurosci	7
		Pfizer	7
		Royal Brompton NIHR Biomed Res Unit	7
		University of London	7
		University of Greenwich	6

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Genet Alliance UK	5
		UK Research & Innovation (UKRI)	3
Amsterdam	Netherlands	Leiden University	462
		Utrecht University Medical Center	433
		Vrije Universiteit Amsterdam	391
		Erasmus MC	332
		University of Amsterdam	268
		Academic Medical Center Amsterdam	254
		Utrecht University	167
		VU UNIVERSITY MEDICAL CENTER	114
		Netherlands National Institute for Public Health & the Environment	71
		Erasmus University Rotterdam	40
		Wilhelmina Kinderziekenhuis	23
		Delft University of Technology	20
		Emma Children's Hospital	18
		Netherlands Cancer Institute	16
		Netherlands Heart Inst	14
		Janssen Vaccines & Prevent	12
		Netherlands Institute for Health Services Research	12
		ReSViNET Fdn	11
		Leiden Univ Med Ctr	10
		Julius Clin	10
		Lygature	9
		Med Evaluat Board	9
		GGz inGeest	9
		Erasmus MC Cancer Institute	8
		St. Antonius Hospital Utrecht	8
		Amsterdam Univ Med Ctr	8
		Sanquin Res	8
		Jan van Breemen Res Inst Reade	6
		Groene Hart Ziekenhuis	6
		European Med Agcy	6
		Dutch Med Evaluat Board	6
		Weibel Consulting	5
		UMC Utrecht Brain Ctr	5

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Erasmus MC - Sophia Children's Hospital	2
Stockholm	**Sweden**	Karolinska Institutet	740
		Karolinska University Hospital	331
		Royal Institute of Technology	90
		Stockholm University	60
		Stockholm County Council	57
		Stockholm Hlth Care Serv	20
		Danderyds Hospital	11
		Publ Hlth Agcy Sweden	9
		SciLifeLab	9
		AstraZeneca	8
		Quantify Res	7
		Sci Life Lab	7
		Acad Specialist Ctr	6
Paris	**France**	Institut National de la Sante et de la Recherche Medicale (Inserm)	461
		UDICE French Res Univ	369
		Sorbonne Universite	232
		CEA	159
		Hopital Universitaire Cochin - APHP	129
		CNRS - National Institute for Biology (INSB)	116
		Hopital Universitaire Pitie-Salpetriere - APHP	113
		Centre National de la Recherche Scientifique (CNRS)	110
		Institut Pasteur Paris	88
		Sanofi France	71
		Univ Paris Cite	41
		Institut de Recherches Internationales Servier	40
		Hopital Universitaire Bichat-Claude Bernard - APHP	34
		Hopital Universitaire Bicetre - APHP	33
		Assistance Publique Hopitaux Paris (APHP)	31
		Hopital Universitaire Saint-Louis - APHP	28
		Institut Curie	28
		Gustave Roussy	24
		Hopital Universitaire Necker-Enfants Malades - APHP	22
		Orsay Hosp	21
		Hopital Universitaire Henri-Mondor - APHP	19

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Hopital Universitaire Europeen Georges-Pompidou - APHP	19
		Hopital Universitaire Beaujon - APHP	18
		Hopital Universitaire Saint-Antoine - APHP	17
		Assistance Publique-Hopitaux de Marseille	17
		CNRS - Institute of Chemistry (INC)	15
		Universite Grenoble Alpes (UGA)	14
		Hopital Universitaire Paul-Brousse - APHP	14
		Hopital Universitaire Robert-Debre - APHP	13
		Univ Paris Est ComUE	11
		Museum National d'Histoire Naturelle (MNHN)	10
		CNRS - Institute of Ecology & Environment (INEE)	9
		Ecole Normale Superieure (ENS)	8
		SOLEIL Synchrotron	6
		EURORDIS Rare Dis Europe	6
		Hopital Universitaire Ambroise-Pare - APHP	6
		GHU PARIS Psychiat Neurosci	5
		Vaccine Res Inst	5
		Universite Paris 13	5
		Universite Paris Saclay	4
		Inst Polytech Paris	1
		Aix-Marseille Universite	1
Oxford	UK	University of Oxford	793
		Wellcome Centre for Human Genetics	105
		Oxford University Hospitals NHS Foundation Trust	36
		Diamond Light Source	29
		Ludwig Institute for Cancer Research	14
		Novo Nordisk Res Ctr Oxford	12
		JENNER INST	10
		P1vital Ltd	9
		UK Research and Innovation, India	8
		Res Complex Harwell	6
		Medical Research Council UK (MRC)	5
		UK Research & Innovation (UKRI)	1

Table 6.1.6 Institutions constituting the top-five North American geographic clusters (by number of publications) of IMI project research, 2010-2022

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
Boston	USA	Harvard Medical School	192
		Harvard University	130
		Harvard Univ Medical Affiliates	95
		Marathwada Institute of Technology	91
		Brigham & Women's Hospital	82
		Harvard T.H. Chan School of Public Health	79
		Broad Institute	72
		Pfizer	62
		Boston University	46
		Boston Children's Hospital	37
		Beth Israel Deaconess Medical Center	24
		Biogen	24
		Dana-Farber Cancer Institute	21
		Massachusetts General Hospital	18
		Framingham Heart Study	16
		Massachusetts Institute of Technology (MIT)	15
		IQVIA	12
		Novartis	12
		AstraZeneca	9
		NIH National Heart Lung & Blood Institute (NHLBI)	9
		Merck & Company	7
		Sanofi-Aventis	6
		CARB X	6
		Northeastern University	6
		Tufts University	6
Toronto	Canada	University of Toronto	228
		Structural Genomics Consortium	180
		Hospital for Sick Children (SickKids)	91
		Princess Margaret Cancer Centre	90
		Baycrest	67
		Centre for Addiction & Mental Health - Canada	34
		Ontario Institute for Cancer Research	29
		Holland Bloorview Kids Rehabilitation Hospital	21
		University Health Network Toronto	21

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Lunenfeld Tanenbaum Research Institute	18
		Sunnybrook Health Science Center	8
		Sunnybrook Research Institute	8
		Toronto General Hospital	8
		Saint Michaels Hospital Toronto	6
New York	USA	Icahn School of Medicine at Mount Sinai	96
		Columbia University	74
		Pfizer	49
		New York University	33
		Weill Cornell Med	24
		Northwell Health	22
		Memorial Sloan Kettering Cancer Center	21
		Albert Einstein College of Medicine	21
Bethesda	USA	AstraZeneca	28
		NIH National Heart Lung & Blood Institute (NHLBI)	23
		National Institutes of Health (NIH) - USA	22
		NewYork-Presbyterian Hospital	20
		NIH National Institute of Mental Health (NIMH)	19
		NIH National Cancer Institute (NCI)	16
		US Food & Drug Administration (FDA)	16
		NIH National Institute of Allergy & Infectious Diseases (NIAID)	16
		NIH National Institute on Aging (NIA)	12
		NIH National Human Genome Research Institute (NHGRI)	11
		Medimmune	10
		NYU Langone Medical Center	8
		George Washington University	8
		NIH National Institute of Arthritis & Musculoskeletal & Skin Diseases (NIAMS)	8
		NIH National Institute of Neurological Disorders & Stroke (NINDS)	8
		Rutgers State University Newark	7
		Yeshiva University	7
		NIH National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK)	7
		GlaxoSmithKline	6
		State University of New York (SUNY) Downstate Medical Center	5

CLUSTER	COUNTRY	INSTITUTION	NUMBER OF PUBLICATIONS
		Naval Research Laboratory	5
		Rutgers State University New Brunswick	4
Montreal	Canada	University of Montreal	111
		McGill University	91
		CHU St Justine	18
		Genome Quebec Innovat Ctr	7

Table 6.1.7 Five journal subject categories in which the top-five European geographic clusters (by number of publications) of IMI project research published most frequently in, 2010-2022

CLUSTER	COUNTRY	JOURNAL SUBJECT CATEGORY	NUMBER OF PUBLICATIONS
London	**United Kingdom**	Neurosciences	416
		Psychiatry	238
		Clinical Neurology	212
		Pharmacology & Pharmacy	180
		Immunology	150
Amsterdam	**Netherlands**	Pharmacology & Pharmacy	216
		Immunology	202
		Neurosciences	199
		Rheumatology	195
		Clinical Neurology	128
Stockholm	**Sweden**	Rheumatology	142
		Neurosciences	115
		Immunology	111
		Clinical Neurology	94
		Biochemistry & Molecular Biology	77
Paris	**France**	Neurosciences	155
		Psychiatry	75
		Pharmacology & Pharmacy	70
		Biochemistry & Molecular Biology	64
		Endocrinology & Metabolism	64
Oxford	**UK**	Biochemistry & Molecular Biology	157
		Neurosciences	114
		Endocrinology & Metabolism	75
		Cell Biology	71
		Chemistry, Medicinal	70

Table 6.1.8 Five journal subject categories in which top-five north American geographic clusters (by number of publications) of IMI project research published most frequently in, 2010-2022

CLUSTER	COUNTRY	JOURNAL SUBJECT CATEGORY	NUMBER OF PUBLICATIONS
Boston	**USA**	Neurosciences	63
		Genetics & Heredity	53
		Endocrinology & Metabolism	48
		Biochemistry & Molecular Biology	43

CLUSTER	COUNTRY	JOURNAL SUBJECT CATEGORY	NUMBER OF PUBLICATIONS
		Clinical Neurology	41
Toronto	Canada	Biochemistry & Molecular Biology	113
		Neurosciences	78
		Psychiatry	68
		Chemistry, Medicinal	43
		Cell Biology	40
New York	USA	Pharmacology & Pharmacy	47
		Neurosciences	47
		Psychiatry	44
		Genetics & Heredity	29
		Immunology	28
Bethesda	USA	Pharmacology & Pharmacy	33
		Immunology	27
		Psychiatry	24
		Neurosciences	24
		Public, Environmental & Occupational Health	21
Montreal	Canada	Neurosciences	50
		Psychiatry	46
		Biochemistry & Molecular Biology	25
		Genetics & Heredity	15
		Psychology, Developmental	14

7 Collaboration analysis for IMI research

7.1 Collaboration analysis for IMI research

International research collaboration is increasing[15] and although the reasons for this have not been fully clarified they are likely to include increasing access to facilities, resources, knowledge, people and expertise. In addition, international collaboration has been shown to be associated with an increase in the number of citations received by research papers, although this does depend upon the partner countries involved.[16] Co-authorship is likely to be a good indicator of collaboration, although there will be research collaborations that do not result in co-authored papers, and co-authored papers which may have required limited collaboration. Alternative data-based approaches, for example using information about co-funding or international exchanges, have limitations in terms of both comprehensiveness and validity.

In this report, co-authorship of papers[17] is used as an indicator of collaboration between different sectors, institutions and countries.

In this analysis, different institutions/organisations are assigned to sectors with the following definitions:

- **Medical:** Organisations with the primary function of providing patient care. Typically, these are public, private and university hospitals, though we have included in this sector Chinese medicine hospitals and umbrella organisations such as hospital systems (e.g., Mt Sinai) or UK National Health Services Healthcare Trusts.
- **Corporate:** Private or public companies or enterprises that operate for-profit. For IMI projects most corporate organisations are within pharmaceuticals, others manufacture medical devices or provide information technology services. Included in this sector are any organisation with a suffix indicating limited liability (e.g., AB, LTD, GmBH, SA, LLC, INC and AG). Other organisations were identified as corporate from their website. It can be challenging to assign smaller organisations, potential small and medium sized enterprises (SMEs) to this category as they may have a limited online presence and if a SME has spun out from a university it can be difficult to ascertain the current relationship between the spin out and academic institution.
- **Academic:** Public and private universities and university departments. This includes research institutes, that may not have a teaching remit but have a clear affiliation to one or more universities and programs of research spanning multiple academic institutions.
- **Government:** Includes state, regional or federally funded research institutions, laboratories and facilities such as NIH or the World Health Organization (WHO); country or regional funders that disperse public money to research (e.g., BBSRC in the UK); government departments and agencies.
- **Other:** Organisations that do not fit in any other sector but have a role in the healthcare or research infrastructure. For example, research institutions not attached to a government, university or hospital; non-governmental organisations like patient groups, advocacy groups, not-for profits and charities; professional associations for healthcare professionals; non-governmental funders; regulators and tissue sample banks.

[15] Adams J (2013) Collaborations: the fourth age of research. *Nature*, **497**, 557-560.

[16] Adams, J., Gurney, K., & Marshall, S. (2007). Patterns of international collaboration for the UK and leading partners. A report by *Evidence* Ltd to the UK Office of Science and Innovation. 27pp.

[17] In the collaboration analysis papers rather than publications are analysed as some publications, such as editorials do not communicate novel research finding so cannot be considered a product of research collaboration.

- **Unknown:** If an organisation cannot be identified as belonging to any of the other sectors, then it is assigned as unknown.

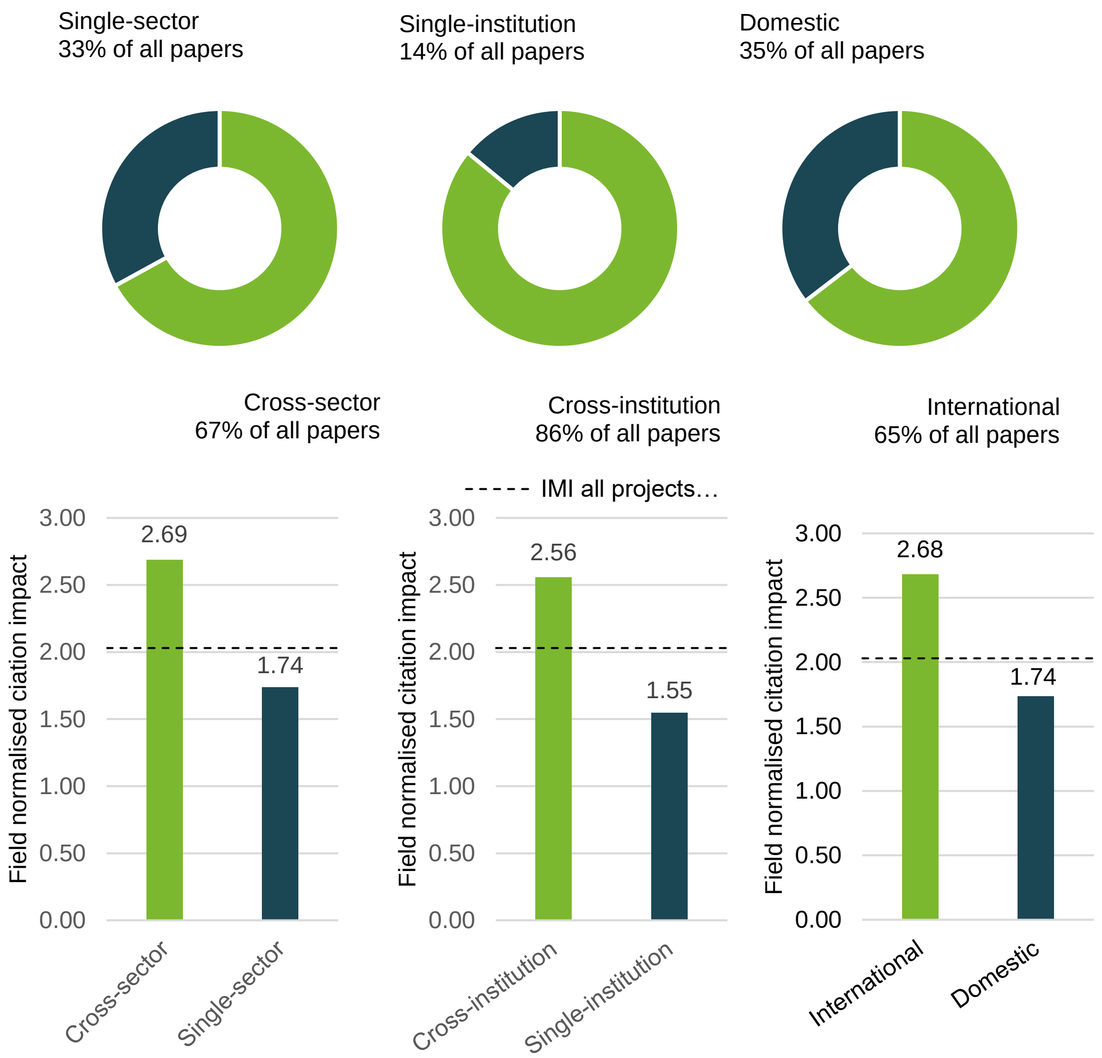
A paper is defined as cross-sector if the co-authors are affiliated to organisations that are assigned to different sectors. For example, if a paper has author addresses corresponding to the University of Copenhagen (academic) and the company Novartis (corporate), it would be classified as cross-sector. If a paper only has author addresses corresponding to the University of Cambridge (academic) and Utrecht University (academic), it would be classified as single-sector since both addresses are academic institutions, but it would be defined as cross-institution as more than one institution is listed in the addresses. A paper is defined as international if more than one country is listed in the addresses, or domestic if only a single country is listed.

The data in Table 7.1.1 compares the output and field-normalised citation impact of collaborative IMI project research with its non-collaborative research. Figure 7.1.1 presents the same data visually.

Table 7.1.1 Cross-sector, cross-institution, and international output and field-normalised citation impact of IMI project research, 2010-2022

	NUMBER OF PAPERS	% OF PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
Cross-sector	5,993	67%	2.69
Single-sector	2,874	33%	1.74
Cross-institution	7,710	86%	2.56
Single-institution	1,177	14%	1.55
International	5,807	65%	2.68
Domestic	3,080	35%	1.74

Figure 7.1.1 Field-normalised citation impact and percentage of cross-sector, cross-institution and international collaborative papers from IMI project research 2010-2022



- Two-thirds (67%) of all IMI project papers were published by co-authors working in different sectors with 27.6% of these collaborations involving both public and private sectors.
- Of the 5,993 cross-sector papers 2,167 were published in IMI 2 while 3,979 were published in IMI 1.[18]
- The majority (86%) of IMI project papers involved collaboration between different institutions.
- More than half (65%) of all IMI project papers involved international collaboration.
- Collaborative IMI project research was internationally influential with field-normalised citation impacts over 2.5-times the world average (1), regardless of the type of collaborations.
- IMI's collaborative research has an average field-normalised citation impact that is almost 50% higher than IMI's non-collaborative research. Additionally, the non-collaborative research field-normalised citation impact was below average for IMI project research (2.03).

[18] Some publications are assigned to both IMI 1 and IMI 2 projects so therefore these numbers will sum to a number higher than the total.

7.2 Collaboration analysis by IMI project

This section analyses the collaboration of IMI research at the individual project level.

Table 7.2.1 shows the number, percentage, and field-normalised citation impact of IMI research papers with co-authors from more than one country. Table 7.2.2 shows number, percentage, and field-normalised citation impact of IMI research papers with co-authors from more than one institution. Table 7.2.3 shows number, percentage, and field-normalised citation impact of IMI research papers with co-authors from more than one sector.

Figure 7.2.1 to Figure 7.2.5 are maps showing international collaboration for the five IMI projects with the highest number of papers: BTCURE, EU-AIMS, ULTRA-DD, EMIF, and for the first time in the top 5 AIMS-2-TRIALS. The countries with the most frequent collaboration are the darkest shade of green and gradually gets lighter the less collaboration there is.

It should be noted that the last column in Table 7.2.1 to Table 7.2.3 shows the field-normalised citation impact of those papers involving collaboration of the type being analysed, rather than for all papers belonging to a project. Therefore, in Table 7.2.1, the last column contains the field-normalised citation impact of only the internationally collaborative papers for each project. Similarly, the last column in Table 7.2.2 contains only the field-normalised citation impact of the papers with co-authors from more than one institution, and in Table 7.2.3, the last column contains only the field-normalised citation impact of cross-sector papers.

The key findings of Section 7.2 are:

- EU-AIMS had the largest number of papers with co-authors from more than one country which is a change from the thirteenth report where BTCURE had the largest (Table 7.2.1).
- BTCURE remains the project with the largest number of papers with co-authors from more than one institution and sector (Table 7.2.2 and Table 7.2.3). This may be due to BTCURE having the largest overall number of papers.
- EU-AIMS had the second highest number of papers with authors from more than one institution and sector (Table 7.2.2 and Table 7.2.3). Again, this also may be due to EU-AIMS having the second largest overall number of papers.
- For those projects with at least 100 papers, BigData@Heart remains the project with the largest percentage of its papers that are co-authors from more than one institution (97.6%) and sector (90%).
- U-BIOPRED has the largest number of papers that are co-authored from more than one country (77.2%), followed by EMIF (76.9%) and BEAT-DKD (75.9%).
- The majority of collaborative papers from the top five projects were co-authored with researchers from the United States (USA), Netherlands and the UK (Figure 7.2.1 to Figure 7.2.5)
- In general, there is a high level of collaboration within Europe for all the top five projects. The most frequently collaborating European countries were Sweden, the Netherlands, France and Germany.
- EU-AIMS and ULTRA-DD had substantial input from Canadian researchers and also had a noteworthy amount of collaboration with Chinese researchers (Figure 7.2.3 and Figure 7.2.4).

Table 7.2.1 Number, percentage and citation impact[19] of IMI supported research papers with authors from more than one country, 2010-2022

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
BTCure	679	403	59.4%	2.06
EU-AIMS	589	422	71.6%	2.28
ULTRA-DD	444	334	75.2%	2.05
EMIF	333	256	76.9%	2.84
AIMS-2-TRIALS	292	208	71.2%	4.61
NEWMEDS	220	143	65.0%	2.30
BigData@Heart	211	159	75.4%	3.50
INNODIA	200	141	70.5%	2.03
CANCER-ID	183	95	51.9%	3.97
EUROPAIN	182	78	42.9%	3.48
EUbOPEN	179	116	64.8%	2.26
TRANSLOCATION	168	97	57.7%	1.54
ORBITO	168	94	56.0%	1.71
RTCure	166	90	54.2%	3.41
STEMBANCC	149	85	57.0%	2.16
SUMMIT	143	99	69.2%	1.65
IMIDIA	141	81	57.4%	1.93
ELF	139	79	56.8%	1.08
CHEM21	129	46	35.7%	2.34
SPRINTT	125	78	62.4%	2.20
PreDiCT-TB	119	69	58.0%	1.38
BEAT-DKD	116	88	75.9%	1.62
RHAPSODY	115	85	73.9%	2.58
MIP-DILI	109	58	53.2%	2.18
COMBACTE-NET	109	68	62.4%	1.19
COMBACTE-MAGNET	106	71	67.0%	1.27
Quic-Concept	103	68	66.0%	7.23
U-BIOPRED	101	78	77.2%	2.88
PROTECT	99	71	71.7%	1.20

[19] The last column is the citation impact of only the internationally collaborative papers for each project.

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
COMPACT	97	53	54.6%	2.47
eTOX	92	38	41.3%	2.07
Pharma-Cog	91	73	80.2%	1.29
PRISM	91	72	79.1%	6.39
DIRECT	84	66	78.6%	4.94
ABIRISK	83	45	54.2%	1.32
RADAR-CNS	79	63	79.7%	2.13
DDMoRe	78	52	66.7%	1.12
AETIONOMY	74	37	50.0%	2.13
IMPRiND	73	49	67.1%	6.72
EPAD	71	51	71.8%	1.81
INNODIA HARVEST	71	50	70.4%	2.07
Open PHACTS	71	44	62.0%	3.72
BioVacSafe	71	39	54.9%	1.31
K4DD	70	40	57.1%	1.85
LITMUS	69	50	72.5%	5.80
ZAPI	67	48	71.6%	5.06
Onco Track	66	33	50.0%	2.94
AMYPAD	65	53	81.5%	2.55
RESCEU	64	49	76.6%	2.87
COMBACTE-CARE	62	44	71.0%	1.56
MARCAR	60	30	50.0%	1.12
ENABLE	59	32	54.2%	1.22
TransQST	59	42	71.2%	2.60
MOBILISE-D	58	40	69.0%	1.93
APPROACH	58	50	86.2%	2.42
PRECISESADS	57	48	84.2%	1.48
DRIVE-AB	54	38	70.4%	1.30
FLUCOP	53	31	58.5%	1.11
EHDEN	50	45	90.0%	2.70
PHAGO	49	34	69.4%	3.31
eTRIKS	48	45	93.8%	2.21
RAPP-ID	48	26	54.2%	0.82
Predect	47	35	74.5%	1.94

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
DRAGON	46	39	84.8%	5.03
none	88	64	72.7%	3.87
iPiE	41	13	31.7%	1.38
GETREAL	40	32	80.0%	1.51
iABC	40	29	72.5%	2.31
EBOVAC1	38	26	68.4%	2.24
Hypo-RESOLVE	38	31	81.6%	1.16
ADAPTED	35	23	65.7%	3.10
EBiSC	34	25	73.5%	1.66
IM2PACT	33	17	51.5%	2.46
3TR	33	20	60.6%	3.51
PREFER	30	28	93.3%	1.35
PROACTIVE	29	25	86.2%	2.56
eTRANSAFE	29	15	51.7%	0.92
PD-MitoQUANT	29	18	62.1%	2.83
ADVANCE	28	24	85.7%	0.98
TRISTAN	28	16	57.1%	1.58
SOPHIA	27	20	74.1%	3.94
IMI-PainCare	27	18	66.7%	1.80
CARE	27	20	74.1%	6.02
ROADMAP	26	21	80.8%	0.69
HARMONY	25	15	60.0%	1.66
EbolaMoDRAD	25	15	60.0%	1.24
BIOMAP	24	18	75.0%	5.95
VAC2VAC	24	15	62.5%	0.40
TransBioLine	24	13	54.2%	4.16
EBOVAC2	22	14	63.6%	3.19
SAFE-T	21	12	57.1%	1.83
DRIVE	21	8	38.1%	1.06
PERISCOPE	21	10	47.6%	1.19
EHR4CR	20	13	65.0%	1.21
EU-PEARL	18	14	77.8%	1.38
ITCC-P4	18	14	77.8%	2.11
CARDIATEAM	18	18	100.0%	4.18

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
c4c	17	17	100.0%	0.92
HIPPOCRATES	17	6	35.3%	2.06
MOPEAD	17	13	76.5%	1.95
COMBACTE	16	2	12.5%	15.05
ConcePTION	16	14	87.5%	1.28
WEB-RADR	16	13	81.3%	1.47
NeuroDeRisk	15	5	33.3%	0.94
IDEA-FAST	14	14	100.0%	1.58
KRONO	14	2	14.3%	0.33
VSV-EBOPLUS	13	11	84.6%	1.04
VALUE-Dx	13	12	92.3%	1.92
VITAL	13	7	53.8%	0.44
MAD-CoV 2	13	12	92.3%	5.93
T2EVOLVE	12	5	41.7%	2.86
iCONSENSUS	12	4	33.3%	1.93
ERA4TB	12	8	66.7%	1.29
EQIPD	12	8	66.7%	2.74
EBOVAC3	11	9	81.8%	1.69
MACUSTAR	11	9	81.8%	1.92
VSV-EBOVAC	11	8	72.7%	0.86
imSAVAR	10	6	60.0%	2.66
ReSOLUTE	10	6	60.0%	0.97
COMBACTE-CDI	10	10	100.0%	0.85
NECESSITY	10	8	80.0%	2.77
RADAR-AD	9	4	44.4%	1.47
ImmUniverse	9	7	77.8%	3.32
Immune-Image	9	6	66.7%	1.55
EBiSC2	8	8	100.0%	1.67
EBODAC	8	7	87.5%	2.58
Trials@Home	8	4	50.0%	2.54
PARADIGM	8	7	87.5%	1.40
FAIRplus	8	3	37.5%	2.08
EUPATI	7	7	100.0%	0.70
DECISION	7	0	0.0%	n/a

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
OPTIMA	7	6	85.7%	3.11
PIONEER	7	7	100.0%	1.40
IMMUCAN	6	5	83.3%	0.33
DO->IT	5	5	100.0%	8.18
PERSIST-SEQ	5	1	20.0%	2.01
MELLODDY	4	3	75.0%	0.99
Inno4Vac	4	3	75.0%	1.31
Eu2P	4	3	75.0%	3.21
SafeSciMET	4	4	100.0%	0.83
EBOMAN	4	4	100.0%	4.20
COVID-RED	4	4	100.0%	1.23
ARDAT	4	0	0.0%	n/a
VHFMoDRAD	4	1	25.0%	0.36
ADAPT-SMART	4	2	50.0%	1.11
STOPFOP	3	3	100.0%	1.18
Impentri	3	2	66.7%	0.42
ND4BB	3	2	66.7%	1.48
PREMIER	3	3	100.0%	1.01
BIGPICTURE	3	3	100.0%	1.53
PROTECT-trial	2	1	50.0%	0.00
Screen4Care	2	1	50.0%	0.88
GetReal Initiative	2	2	100.0%	0.00
NGN-PET	2	1	50.0%	0.48
HARMONY PLUS	2	2	100.0%	2.76
UNITE4TB	2	2	100.0%	2.12
NEURONET	2	1	50.0%	0.00
PEVIA	2	2	100.0%	0.73
RespiriNTM	2	1	50.0%	0.00
RealHOPE	1	1	100.0%	0.00
COMBINE	1	0	0.0%	n/a
Pharmatrain	1	1	100.0%	0.13
EMTRAIN	1	1	100.0%	0.09
REsolution	1	0	0.0%	n/a
FACILITATE	1	1	100.0%	1.10

PROJECT	NUMBER OF PAPERS	NUMBER OF INTERNATIONALLY COLLABORATIVE PAPERS	% OF INTERNATIONALLY COLLABORATIVE PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
PRISM 2	1	1	100.0%	0.00
EBOVAC	1	1	100.0%	3.03
RespiriTB	1	0	0.0%	n/a
Gravitate-Health	1	1	100.0%	0.00

Table 7.2.2 Number percentage and citation impact[20] of IMI supported research papers with authors from more than one institution, 2010-2022

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
BTCure	679	556	81.9%	1.93
EU-AIMS	589	552	93.7%	2.20
ULTRA-DD	444	402	90.5%	1.94
EMIF	333	315	94.6%	2.64
AIMS-2-TRIALS	292	273	93.5%	4.03
NEWMEDS	220	183	83.2%	2.23
BigData@Heart	211	206	97.6%	3.55
INNODIA	200	184	92.0%	1.86
CANCER-ID	183	157	85.8%	3.38
EUROPAIN	182	126	69.2%	2.94
EUbOPEN	179	155	86.6%	2.12
ORBITO	168	132	78.6%	1.77
TRANSLOCATION	168	121	72.0%	1.51
RTCure	166	155	93.4%	3.18
STEMBANCC	149	120	80.5%	2.11
SUMMIT	143	127	88.8%	1.50
IMIDIA	141	118	83.7%	1.75
ELF	139	103	74.1%	1.13
CHEM21	129	68	52.7%	2.04
SPRINTT	125	109	87.2%	2.05
PreDiCT-TB	119	100	84.0%	1.15
BEAT-DKD	116	106	91.4%	2.06
RHAPSODY	115	101	87.8%	2.42
COMBACTE-NET	109	99	90.8%	1.15
MIP-DILI	109	81	74.3%	1.89
COMBACTE-MAGNET	106	92	86.8%	1.32
Quic-Concept	103	98	95.1%	5.52
U-BIOPRED	101	91	90.1%	2.59
PROTECT	99	97	98.0%	1.04

[20] The last column in is only the citation impact of the papers from more than one institution.

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
COMPACT	97	76	78.4%	2.12
eTOX	92	52	56.5%	1.82
Pharma-Cog	91	85	93.4%	1.21
PRISM	91	86	94.5%	5.72
DIRECT	84	81	96.4%	4.41
ABIRISK	83	71	85.5%	1.37
RADAR-CNS	79	75	94.9%	2.18
DDMoRe	78	65	83.3%	1.11
AETIONOMY	74	73	98.6%	1.83
IMPRiND	73	66	90.4%	5.46
EPAD	71	63	88.7%	1.75
INNODIA HARVEST	71	63	88.7%	1.85
Open PHACTS	71	58	81.7%	3.80
BioVacSafe	71	44	62.0%	1.22
K4DD	70	56	80.0%	1.63
LITMUS	69	64	92.8%	5.37
ZAPI	67	55	82.1%	4.64
Onco Track	66	54	81.8%	2.25
AMYPAD	65	64	98.5%	2.43
RESCEU	64	57	89.1%	2.70
COMBACTE-CARE	62	60	96.8%	1.55
MARCAR	60	43	71.7%	1.11
ENABLE	59	54	91.5%	1.41
TransQST	59	51	86.4%	2.56
MOBILISE-D	58	55	94.8%	1.77
APPROACH	58	54	93.1%	2.32
PRECISESADS	57	54	94.7%	1.45
DRIVE-AB	54	48	88.9%	1.32
FLUCOP	53	51	96.2%	1.81
EHDEN	50	46	92.0%	2.70
PHAGO	49	41	83.7%	4.46
eTRIKS	48	47	97.9%	2.13
RAPP-ID	48	39	81.3%	0.86
Predect	47	38	80.9%	1.90

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
DRAGON	46	46	100.0%	4.82
none	88	80	90.9%	3.68
iPiE	41	34	82.9%	1.18
GETREAL	40	39	97.5%	1.74
iABC	40	36	90.0%	2.11
EBOVAC1	38	30	78.9%	2.25
Hypo-RESOLVE	38	32	84.2%	1.16
ADAPTED	35	34	97.1%	2.65
EBiSC	34	31	91.2%	4.25
IM2PACT	33	27	81.8%	2.30
3TR	33	30	90.9%	2.59
PREFER	30	29	96.7%	1.35
PROACTIVE	29	29	100.0%	2.26
eTRANSAFE	29	19	65.5%	1.44
PD-MitoQUANT	29	26	89.7%	2.66
ADVANCE	28	26	92.9%	1.11
TRISTAN	28	26	92.9%	1.53
SOPHIA	27	25	92.6%	3.31
IMI-PainCare	27	24	88.9%	1.53
CARE	27	26	96.3%	13.36
ROADMAP	26	24	92.3%	0.98
HARMONY	25	22	88.0%	1.36
EbolaMoDRAD	25	23	92.0%	1.21
BIOMAP	24	22	91.7%	5.44
VAC2VAC	24	21	87.5%	0.54
TransBioLine	24	23	95.8%	2.99
EBOVAC2	22	21	95.5%	2.26
SAFE-T	21	20	95.2%	1.73
DRIVE	21	20	95.2%	0.92
PERISCOPE	21	16	76.2%	0.95
EHR4CR	20	19	95.0%	1.05
EU-PEARL	18	16	88.9%	2.03
ITCC-P4	18	18	100.0%	2.00
CARDIATEAM	18	18	100.0%	4.18

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
c4c	17	17	100.0%	0.92
HIPPOCRATES	17	16	94.1%	2.71
MOPEAD	17	17	100.0%	1.94
COMBACTE	16	13	81.3%	3.80
ConcePTION	16	15	93.8%	1.25
WEB-RADR	16	14	87.5%	1.42
NeuroDeRisk	15	9	60.0%	1.13
IDEA-FAST	14	14	100.0%	1.58
KRONO	14	11	78.6%	2.37
VSV-EBOPLUS	13	12	92.3%	0.98
VALUE-Dx	13	12	92.3%	1.92
VITAL	13	11	84.6%	0.80
MAD-CoV 2	13	13	100.0%	5.48
T2EVOLVE	12	11	91.7%	3.16
iCONSENSUS	12	11	91.7%	1.56
ERA4TB	12	11	91.7%	1.17
EQIPD	12	9	75.0%	2.73
EBOVAC3	11	11	100.0%	1.74
MACUSTAR	11	10	90.9%	1.73
VSV-EBOVAC	11	9	81.8%	0.79
imSAVAR	10	9	90.0%	3.61
ReSOLUTE	10	8	80.0%	1.13
COMBACTE-CDI	10	10	100.0%	0.85
NECESSITY	10	10	100.0%	2.75
RADAR-AD	9	8	88.9%	0.95
ImmUniverse	9	9	100.0%	3.29
Immune-Image	9	9	100.0%	1.79
EBiSC2	8	8	100.0%	1.67
EBODAC	8	8	100.0%	2.55
Trials@Home	8	5	62.5%	2.08
PARADIGM	8	7	87.5%	1.40
FAIRplus	8	4	50.0%	1.81
EUPATI	7	7	100.0%	0.70
DECISION	7	6	85.7%	2.20

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
OPTIMA	7	7	100.0%	2.81
PIONEER	7	7	100.0%	1.40
IMMUCAN	6	6	100.0%	0.77
DO->IT	5	5	100.0%	8.18
PERSIST-SEQ	5	5	100.0%	1.97
MELLODDY	4	3	75.0%	0.99
Inno4Vac	4	4	100.0%	0.98
Eu2P	4	4	100.0%	4.09
SafeSciMET	4	4	100.0%	0.83
EBOMAN	4	4	100.0%	4.20
COVID-RED	4	4	100.0%	1.23
ARDAT	4	3	75.0%	0.81
VHFMoDRAD	4	4	100.0%	0.77
ADAPT-SMART	4	3	75.0%	0.76
STOPFOP	3	3	100.0%	1.18
Impentri	3	3	100.0%	0.68
ND4BB	3	3	100.0%	1.06
PREMIER	3	3	100.0%	1.01
BIGPICTURE	3	3	100.0%	1.53
PROTECT-trial	2	2	100.0%	0.00
Screen4Care	2	1	50.0%	0.88
GetReal Initiative	2	2	100.0%	0.00
NGN-PET	2	1	50.0%	0.48
HARMONY PLUS	2	2	100.0%	2.76
UNITE4TB	2	2	100.0%	2.12
NEURONET	2	1	50.0%	0.00
PEVIA	2	2	100.0%	0.73
RespiriNTM	2	1	50.0%	0.00
RealHOPE	1	1	100.0%	0.00
COMBINE	1	1	100.0%	0.15
Pharmatrain	1	1	100.0%	0.13
EMTRAIN	1	1	100.0%	0.09
REsolution	1	1	100.0%	0.00
FACILITATE	1	1	100.0%	1.10

PROJECT	NUMBER OF PAPERS	NUMBER OF PAPERS FROM MORE THAN ONE INSTITUTION	% OF PAPERS FROM MORE THAN ONE INSTITUTION	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
PRISM 2	1	1	100.0%	0.00
EBOVAC	1	1	100.0%	3.03
RespiriTB	1	0	0.0%	n/a
Gravitate-Health	1	1	100.0%	0.00

Table 7.2.3 Number percentage and citation impact[21] of IMI supported research papers with authors from more than one sector, 2010-2022

PROJECT	NUMBER OF PAPERS	NUMBER OF CROSS SECTOR PAPERS	% OF CROSS SECTOR PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
BTCure	679	437	64.4%	2.04
EU-AIMS	589	430	73.0%	2.28
ULTRA-DD	444	282	63.5%	2.19
EMIF	333	275	82.6%	2.53
AIMS-2-TRIALS	292	198	67.8%	4.56
NEWMEDS	220	125	56.8%	2.47
BigData@Heart	211	190	90.0%	3.70
INNODIA	200	158	79.0%	1.88
CANCER-ID	183	137	74.9%	3.53
EUROPAIN	182	95	52.2%	3.23
EUbOPEN	179	105	58.7%	2.31
ORBITO	168	105	62.5%	1.89
TRANSLOCATION	168	62	36.9%	1.64
RTCure	166	134	80.7%	3.47
STEMBANCC	149	75	50.3%	2.18
SUMMIT	143	106	74.1%	1.53
IMIDIA	141	75	53.2%	2.00
ELF	139	56	40.3%	0.99
CHEM21	129	29	22.5%	2.27
SPRINTT	125	91	72.8%	2.11
PreDiCT-TB	119	63	52.9%	1.20
BEAT-DKD	116	84	72.4%	2.32
RHAPSODY	115	74	64.3%	2.31
COMBACTE-NET	109	87	79.8%	1.22
MIP-DILI	109	73	67.0%	1.83
COMBACTE-MAGNET	106	77	72.6%	1.30
Quic-Concept	103	77	74.8%	3.98
U-BIOPRED	101	83	82.2%	2.59
PROTECT	99	95	96.0%	1.05
COMPACT	97	27	27.8%	3.40

[21] The last column is only field-normalised citation impact for cross sector papers only.

PROJECT	NUMBER OF PAPERS	NUMBER OF CROSS SECTOR PAPERS	% OF CROSS SECTOR PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
eTOX	92	28	30.4%	2.37
Pharma-Cog	91	78	85.7%	1.23
PRISM	91	72	79.1%	6.48
DIRECT	84	64	76.2%	4.96
ABIRISK	83	63	75.9%	1.45
RADAR-CNS	79	53	67.1%	2.55
DDMoRe	78	49	62.8%	1.26
AETIONOMY	74	48	64.9%	2.19
IMPRiND	73	46	63.0%	4.56
EPAD	71	55	77.5%	1.83
INNODIA HARVEST	71	53	74.6%	1.86
Open PHACTS	71	43	60.6%	4.71
BioVacSafe	71	33	46.5%	1.21
K4DD	70	38	54.3%	1.59
LITMUS	69	61	88.4%	5.54
ZAPI	67	40	59.7%	5.23
Onco Track	66	42	63.6%	2.26
AMYPAD	65	58	89.2%	2.56
RESCEU	64	51	79.7%	2.85
COMBACTE-CARE	62	57	91.9%	1.57
MARCAR	60	23	38.3%	1.19
ENABLE	59	37	62.7%	1.29
TransQST	59	36	61.0%	2.80
MOBILISE-D	58	45	77.6%	1.85
APPROACH	58	48	82.8%	2.05
PRECISESADS	57	45	78.9%	1.63
DRIVE-AB	54	40	74.1%	1.27
FLUCOP	53	47	88.7%	1.88
EHDEN	50	36	72.0%	3.02
PHAGO	49	34	69.4%	4.97
eTRIKS	48	38	79.2%	2.40
RAPP-ID	48	16	33.3%	1.04
Predect	47	31	66.0%	1.90
DRAGON	46	41	89.1%	5.17
none	88	64	72.7%	4.04

PROJECT	NUMBER OF PAPERS	NUMBER OF CROSS SECTOR PAPERS	% OF CROSS SECTOR PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
iPiE	41	21	51.2%	1.11
GETREAL	40	32	80.0%	1.93
iABC	40	35	87.5%	2.15
EBOVAC1	38	27	71.1%	2.25
Hypo-RESOLVE	38	22	57.9%	1.12
ADAPTED	35	32	91.4%	2.57
EBiSC	34	24	70.6%	4.85
IM2PACT	33	17	51.5%	2.35
3TR	33	28	84.8%	2.67
PREFER	30	28	93.3%	1.39
PROACTIVE	29	29	100.0%	2.26
eTRANSAFE	29	13	44.8%	1.64
PD-MitoQUANT	29	21	72.4%	2.43
ADVANCE	28	24	85.7%	1.00
TRISTAN	28	21	75.0%	1.38
SOPHIA	27	21	77.8%	3.65
IMI-PainCare	27	21	77.8%	1.57
CARE	27	18	66.7%	17.73
ROADMAP	26	22	84.6%	0.97
HARMONY	25	22	88.0%	1.36
EbolaMoDRAD	25	16	64.0%	1.37
BIOMAP	24	21	87.5%	5.44
VAC2VAC	24	18	75.0%	0.52
TransBioLine	24	21	87.5%	3.12
EBOVAC2	22	13	59.1%	3.25
SAFE-T	21	20	95.2%	1.73
DRIVE	21	19	90.5%	0.90
PERISCOPE	21	9	42.9%	0.98
EHR4CR	20	16	80.0%	1.06
EU-PEARL	18	14	77.8%	2.12
ITCC-P4	18	17	94.4%	2.08
CARDIATEAM	18	18	100.0%	4.18
c4c	17	17	100.0%	0.92
HIPPOCRATES	17	15	88.2%	2.71
MOPEAD	17	17	100.0%	1.94

PROJECT	NUMBER OF PAPERS	NUMBER OF CROSS SECTOR PAPERS	% OF CROSS SECTOR PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
COMBACTE	16	8	50.0%	4.74
ConcePTION	16	13	81.3%	1.29
WEB-RADR	16	12	75.0%	1.34
NeuroDeRisk	15	4	26.7%	0.93
IDEA-FAST	14	5	35.7%	0.37
KRONO	14	6	42.9%	1.21
VSV-EBOPLUS	13	9	69.2%	1.11
VALUE-Dx	13	10	76.9%	2.22
VITAL	13	9	69.2%	0.77
MAD-CoV 2	13	12	92.3%	5.60
T2EVOLVE	12	9	75.0%	2.23
iCONSENSUS	12	8	66.7%	1.63
ERA4TB	12	8	66.7%	1.30
EQIPD	12	6	50.0%	3.79
EBOVAC3	11	6	54.5%	2.38
MACUSTAR	11	10	90.9%	1.73
VSV-EBOVAC	11	6	54.5%	0.84
imSAVAR	10	7	70.0%	2.66
ReSOLUTE	10	7	70.0%	1.17
COMBACTE-CDI	10	10	100.0%	0.85
NECESSITY	10	10	100.0%	2.75
RADAR-AD	9	8	88.9%	0.95
ImmUniverse	9	9	100.0%	3.29
Immune-Image	9	6	66.7%	1.55
EBiSC2	8	8	100.0%	1.67
EBODAC	8	7	87.5%	2.76
Trials@Home	8	5	62.5%	2.08
PARADIGM	8	7	87.5%	1.40
FAIRplus	8	2	25.0%	2.88
EUPATI	7	7	100.0%	0.70
DECISION	7	3	42.9%	1.80
OPTIMA	7	5	71.4%	2.69
PIONEER	7	7	100.0%	1.40
IMMUCAN	6	5	83.3%	0.33
DO->IT	5	4	80.0%	9.71

PROJECT	NUMBER OF PAPERS	NUMBER OF CROSS SECTOR PAPERS	% OF CROSS SECTOR PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)
PERSIST-SEQ	5	4	80.0%	2.35
MELLODDY	4	3	75.0%	0.99
Inno4Vac	4	4	100.0%	0.98
Eu2P	4	2	50.0%	4.73
SafeSciMET	4	4	100.0%	0.83
EBOMAN	4	4	100.0%	4.20
COVID-RED	4	4	100.0%	1.23
ARDAT	4	2	50.0%	0.81
VHFMoDRAD	4	4	100.0%	0.77
ADAPT-SMART	4	3	75.0%	0.76
STOPFOP	3	2	66.7%	1.53
Impentri	3	2	66.7%	0.42
ND4BB	3	2	66.7%	0.92
PREMIER	3	3	100.0%	1.01
BIGPICTURE	3	3	100.0%	1.53
PROTECT-trial	2	2	100.0%	0.00
Screen4Care	2	1	50.0%	0.88
GetReal Initiative	2	2	100.0%	0.00
NGN-PET	2	1	50.0%	0.48
HARMONY PLUS	2	2	100.0%	2.76
UNITE4TB	2	2	100.0%	2.12
NEURONET	2	1	50.0%	0.00
PEVIA	2	2	100.0%	0.73
RespiriNTM	2	0	0.0%	n/a
RealHOPE	1	1	100.0%	0.00
COMBINE	1	1	100.0%	0.15
Pharmatrain	1	1	100.0%	0.13
EMTRAIN	1	1	100.0%	0.09
REsolution	1	0	0.0%	n/a
FACILITATE	1	0	0.0%	n/a
PRISM 2	1	1	100.0%	0.00
EBOVAC	1	1	100.0%	3.03
RespiriTB	1	0	0.0%	n/a
Gravitate-Health	1	1	100.0%	0.00

Figure 7.2.1 International collaboration by country, for IMI project: BTCURE, 2010-2022

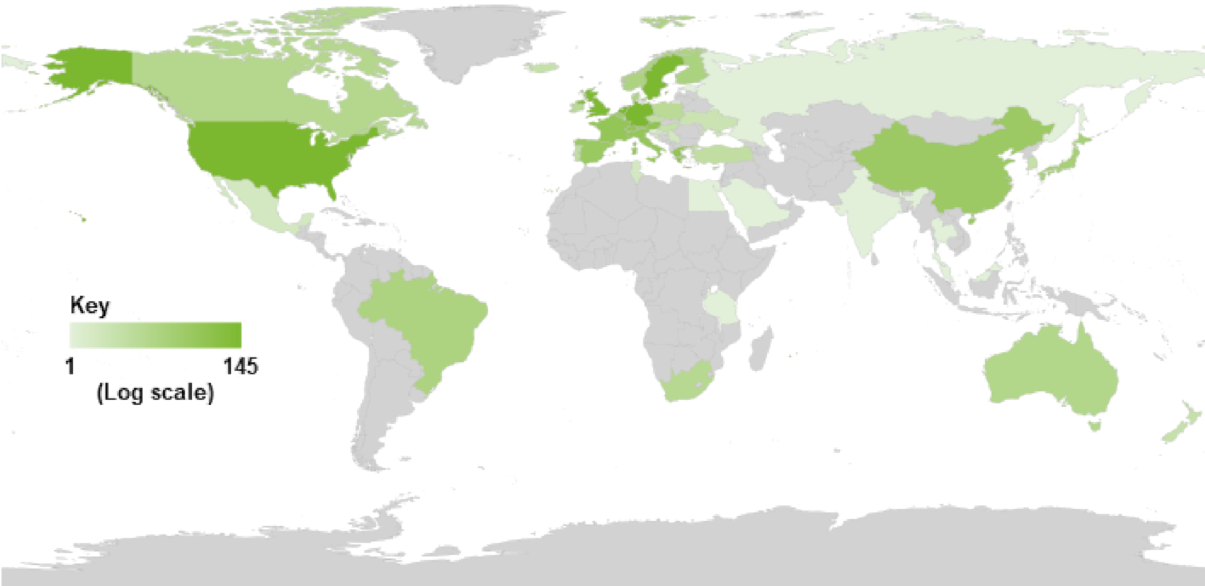


Figure 7.2.2 International collaboration by country, for IMI project: EMIF, 2010-2022

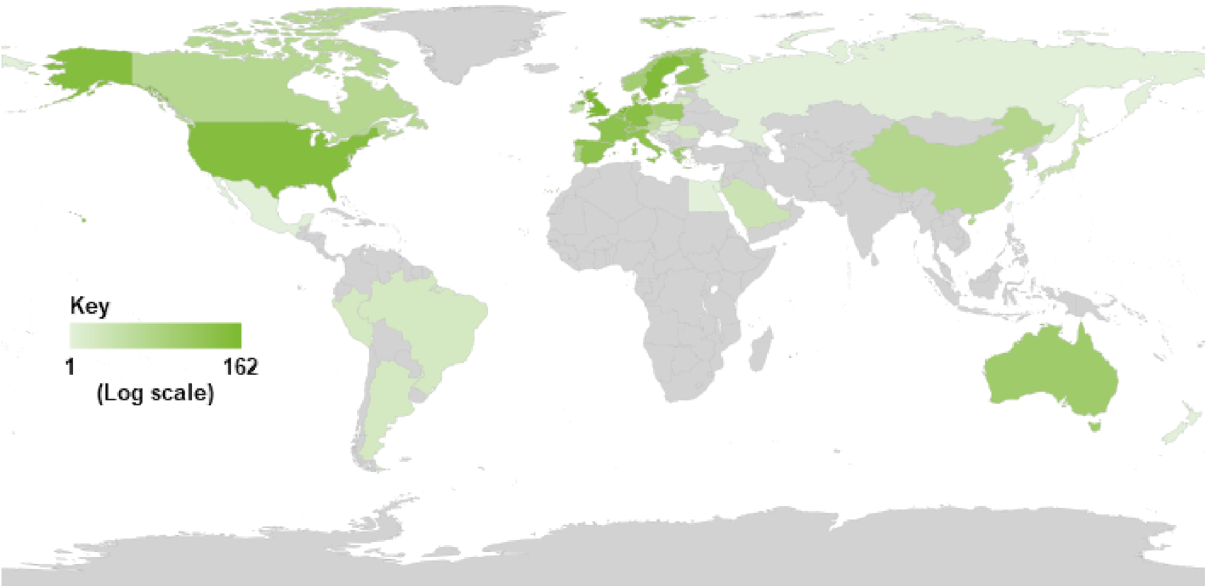


Figure 7.2.3 International collaboration by country, for IMI project: EU-AIMS, 2010-2022

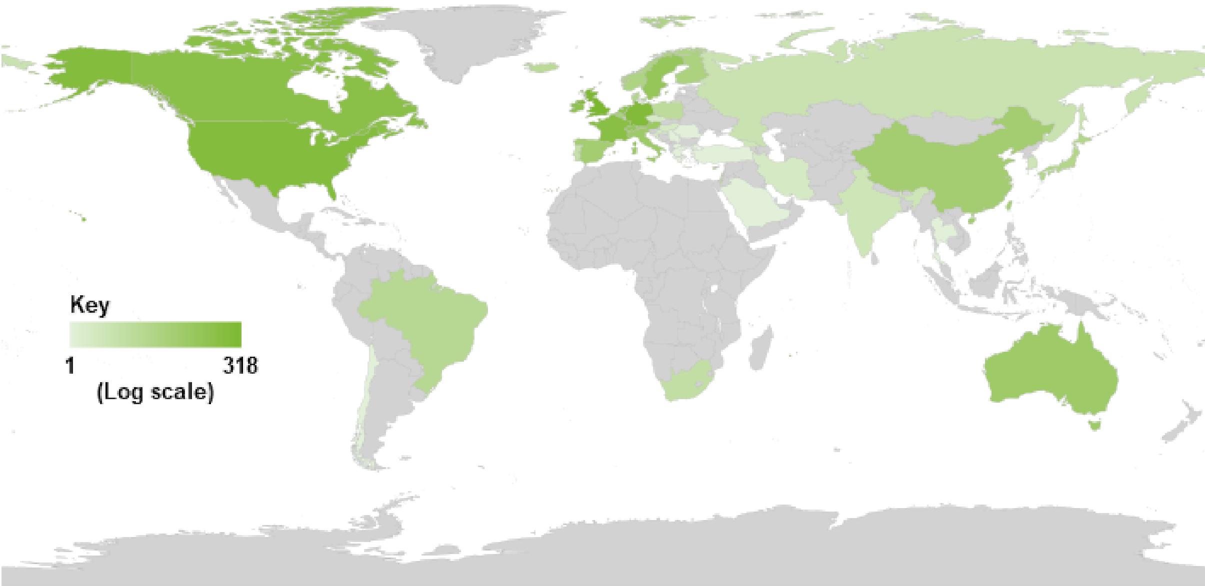


Figure 7.2.4 International collaboration by country, for IMI project: ULTRA-DD, 2010-2022

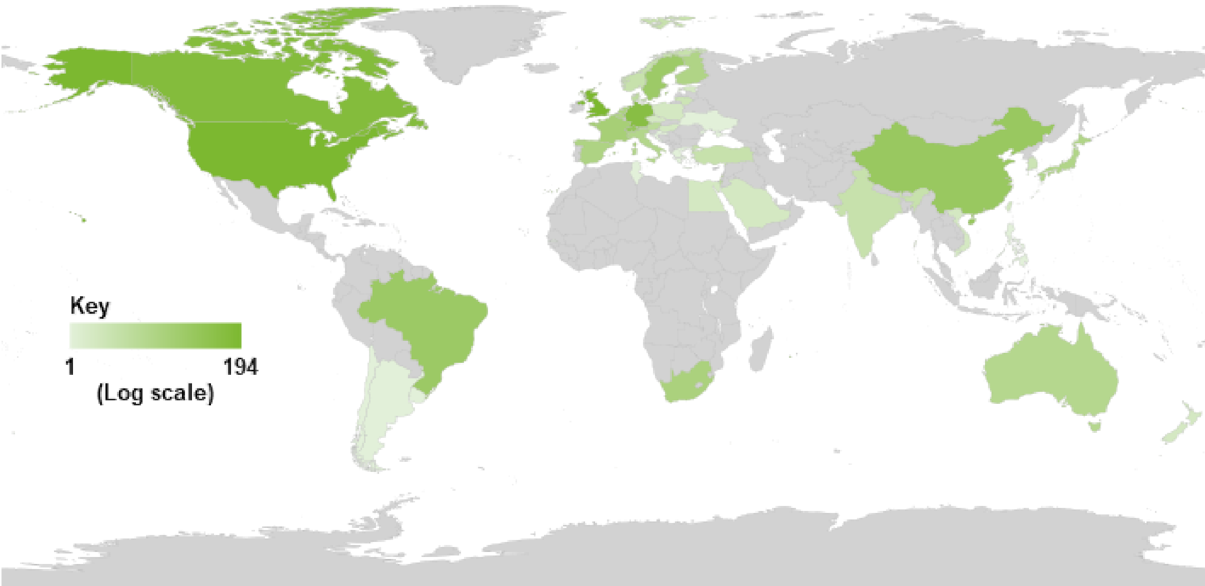
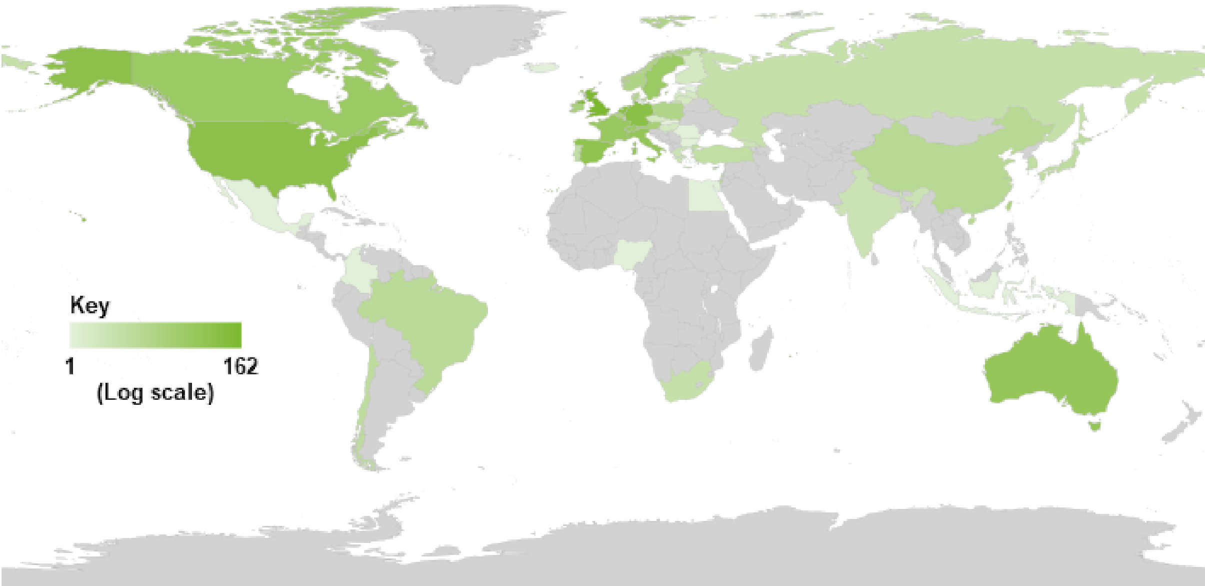


Figure 7.2.5 International collaboration by country, for IMI project: AIMS-2-TRIALS, 2010-2022



7.3 Collaboration metrics for IMI research

This section of the report analyses the types of collaboration that occurred within each IMI project and examines the stability of institutional collaborations within each project.

In common with other metrics based on papers and citations, the indicators we present here work best with larger sample sizes. Indicators based on small numbers of papers will be less informative than those calculated for larger bodies of work. Therefore, the analysis presented in this section is for projects with at least 20 papers published between 2010 and 2022.

In the ninth (2018) and earlier versions of this report metric 3 indicated the intensity of international collaboration, in the tenth report (2019) it was updated to measure the stability of institutional collaborations which is what it shows in this report.

The results for all projects are shown in Annex 5.

Three metrics were used to evaluate the collaborative nature of IMI projects:

- Metric 1 (Cross-sector Score) – Fraction of "cross-sector" papers with co-authors affiliated to institutions in different sectors (Figure 7.3.1.1). The institutions affiliated with each author on an IMI project paper were manually assigned by Clarivate to the relevant sector. Author affiliations were obtained through the Web of Science.
- Metric 2 (International Score) – Percentage of internationally collaborative papers. In calculating the international score for each project, greater weighting is given to papers with multilateral collaboration (co-authors from more than two countries), compared to bilateral collaboration (co-authors from two countries) (Figure 7.3.2.1). The country location of each author was determined using author addresses extracted in the Web of Science.
- Metric 3 (Stability Score) – Stability of institutional collaboration over the lifetime of the project. The collaboration stability for pairs of collaborating institutions was calculated following the method proposed by Y. Bu et al.[22] A stable institutional collaboration has a stable output, i.e. pairs of institutions co-publish a similar volume of papers in consecutive years for the duration of a project. The stability score for each project is the mean average stability of all the collaborating institutional pairs that have contributed to that IMI project research.

Each metric is calculated for an IMI project and can take a value between 0 and 1, with 1 indicating more collaborative activity. The collaboration index is a sum of all three metrics and the maximum possible value for a project is 3.

[22] Bu, Y., Murray, D.S., Ding, Y. et al. (2018) Measuring the stability of scientific collaboration. *Scientometrics,* **114**, 463.

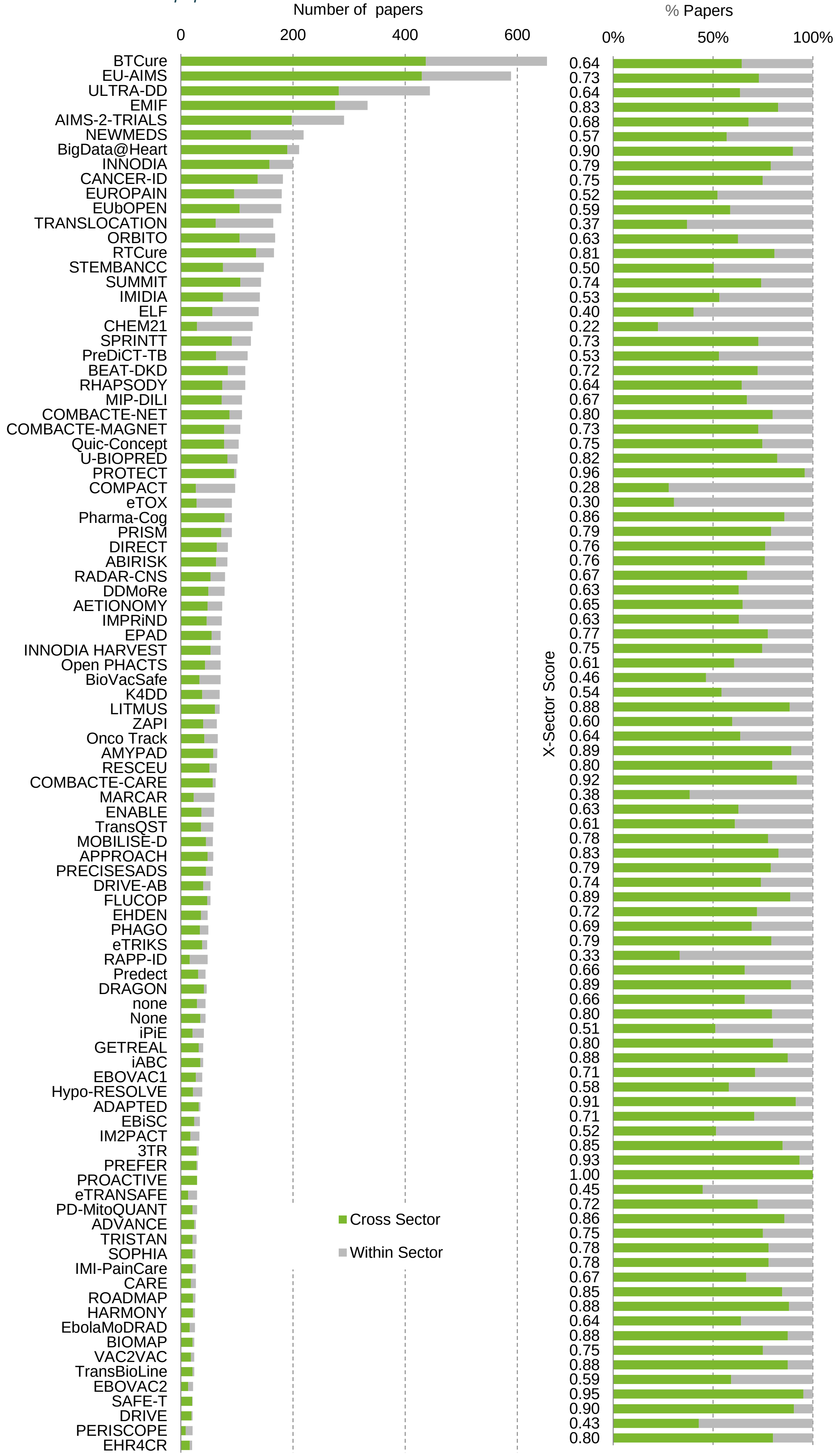
7.3.1 Metric 1 (Cross-sector Score): fraction of cross sector collaborative papers

Authors institutional affiliations, as they appear on IMI project research were assigned to sectors. Sector assignments were then used to classify each paper as “within one sector”, when all co-authors work within the same sector or “cross-sector” when co-authors work in two or more different sectors. The number and percentage of cross-sector papers for projects are presented in Table 7.2.3.

Figure 7.3.1.1 shows the total number of “within one sector” and “cross-sector” papers for each project. Projects are ordered by the number of cross-sector collaborative papers. The green bars represent the number or fraction of “cross-sector” papers. The fraction of cross-sector papers in each project is referred to in the figure as “Cross-Sector Score”. Only projects with more than 20 associated papers are shown.

- BTCURE had the greatest number of cross-sector collaborative papers, 437 out of a total of 679.
- All the published papers for the projects PROACTIVE, CARDIATEAM, c4c, MOPEAD, COMBACTE-CDI AND NECESSITY were cross-sector collaborative papers.

Figure 7.3.1.1 Number and fraction of cross-sector collaborative papers by project, 2010-2022. Ordered by number of cross-sector papers.



7.3.2 Metric 2 (International Score): fraction of internationally collaborative papers

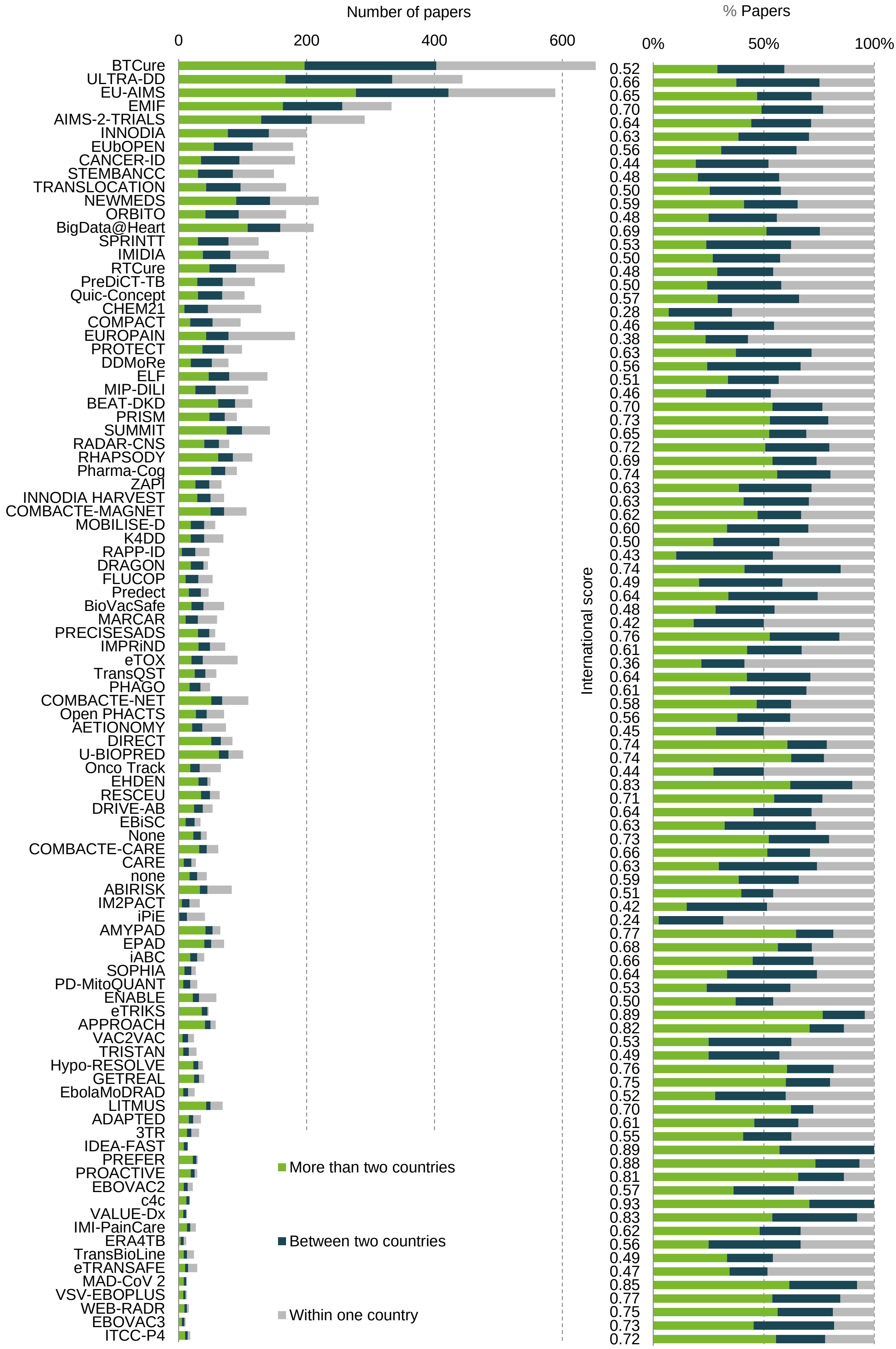
Author names and affiliations were extracted for all IMI project papers. The number of countries in the author affiliations for each paper was counted and used to classify the papers as “more than two countries”, “two countries” or “within one country” (same as domestic in Section 7.1).

Figure 7.3.2.1 below shows the total number of papers for each project. Projects are ordered by the number of papers with author affiliations from more than one country. The bar colours reflect the fraction of papers that include international collaboration between “two countries” (bilateral) and “more than two countries” (multilateral). Only projects with more than 20 associated papers are shown.

The International Score was calculated by weighting each paper that involved only two countries by 0.75 and each paper that involved more than two countries by 1.00. The sum of the weighted papers was then divided by the total number of project papers. Total number of internationally collaborative papers for each project is shown in Table 7.2.1.

- BTCure remained the project with the most internationally collaborative papers involving two countries (206 out of 679), with an International Score of 0.52.
- EU-AIMS remained the project with the most internationally collaborative papers involving more than two countries. (277 out of 589) and had the most internationally collaborative papers overall (422), with an international Score of 0.65.
- eTRICKS, PREFER, and ADVANCE had the highest International Scores (0.89, 0.88 and 0.83, respectively).

Figure 7.3.2.1 Number and fraction of internationally collaborative papers by project, 2010-2022

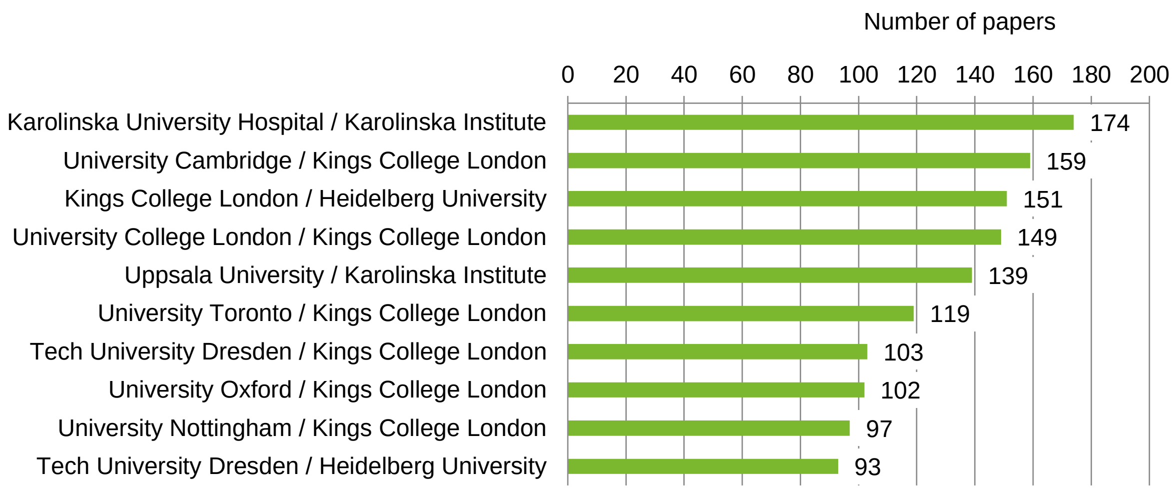


7.3.3 Metric 3 (Stability Score): stability of institutional collaboration

This section looks in depth at institutional collaboration activities in IMI funded research. Figure 7.3.3 shows the ten most productive, collaborating institution pairs, by total number of collaborative papers. Figure 7.3.4 shows the ten institutions that collaborate with the highest number of other institutions. Figure 7.3.5 shows the distribution of Metric 3 scores for IMI projects. Table 7.3.1 is an expansion of the data in Figure 7.3.5, showing the Metric 3 score and the number of collaborating institution pairs for all projects with at least 20 papers. The number and proportion of papers with authors from more than one institution for each project is shown in Table 7.2.2.

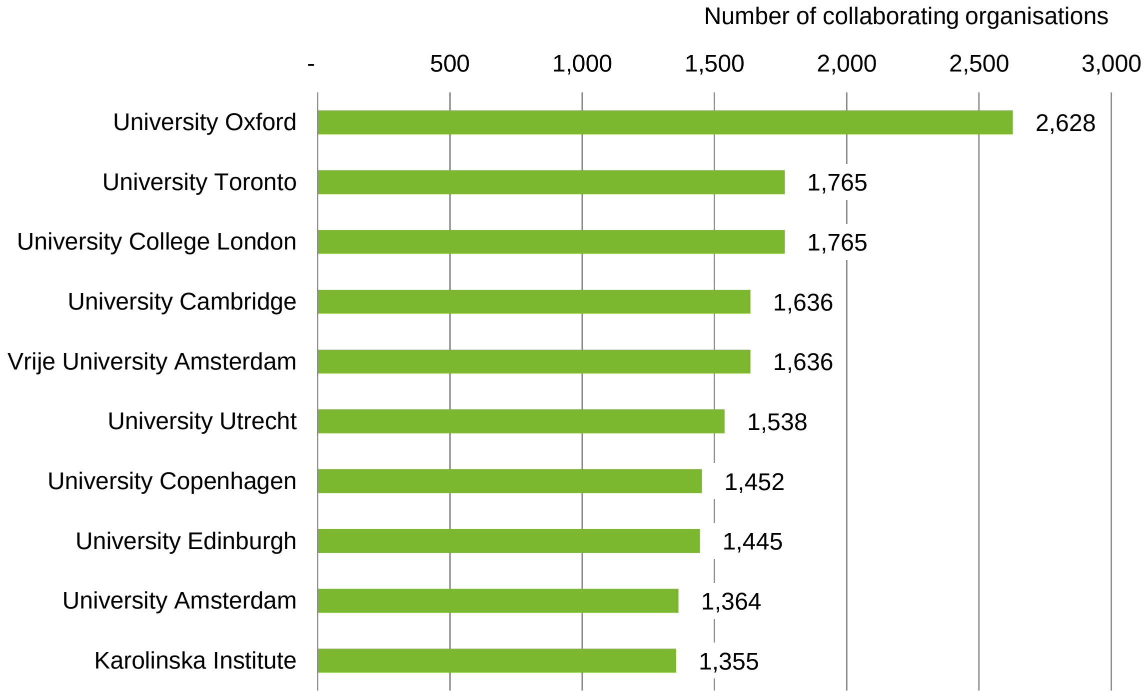
A project's Metric 3 score is the mean average stability of collaborations between pairs of institutions that have co-authored papers that belong to that project. Pairs of institutions must have published two or more papers together as part of the same IMI project to be considered. A second requirement is that the IMI projects must have started in, or before, 2020. If a project started after 2020, too little time has elapsed for most pairs of institutions to have published more than one paper.

Figure 7.3.3 The ten most productive pairs of collaborating institutions, 2010-2022



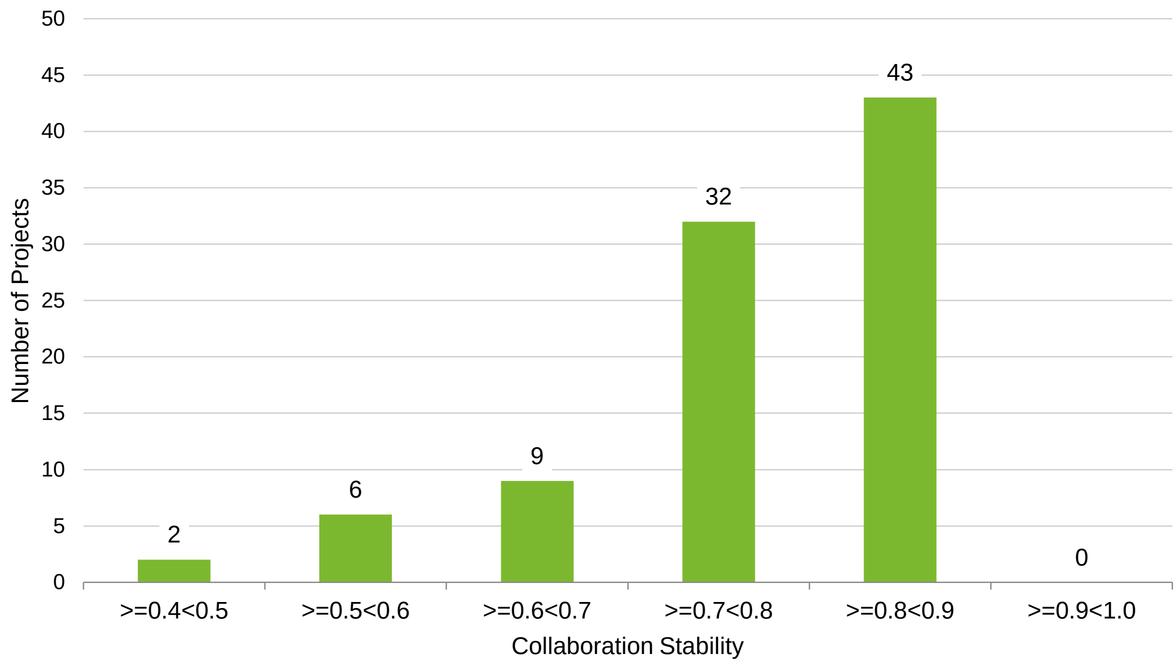
- The institutions that collaborated most frequently on IMI project papers remained Karolinska University Hospital and Karolinska Institute, researchers at these institutions co-authored 174 publications together.
- Kings College London is part of seven out of ten pairs of the most productive collaborative institutions.

Figure 7.3.4 The ten institutions that have collaborated with the greatest number of other institutions, 2010-2022



- The University of Oxford has collaborated with 2,628 other institutions on IMI project papers, the most of any of the other institutions.
- The University of Amsterdam returns to the top 10 collaborating organisations, displacing the University of Manchester.

Figure 7.3.5 Metric 3: Stability Score distribution, 2010-2022



- Most IMI projects have a stability score of between 0.70 and 0.90 indicating that most of the collaboration between institutions is relatively stable.

Table 7.3.1 Stability score for IMI projects, number of collaborating institution pairs, total number of papers and project start year for all projects with at least 20 papers that started in or before 2020, 2010-2022

PROJECT	STABILITY SCORE (METRIC 3)	NUMBER OF COLLABORATING INSTITUTION PAIRS	NUMBER OF PAPERS	PROJECT START YEAR
BTCure	0.85	1,135	679	2011
EU-AIMS	0.83	4,597	589	2012
ULTRA-DD	0.78	423	444	2015
EMIF	0.85	3,438	333	2012
AIMS-2-TRIALS	0.74	2,984	292	2018
NEWMEDS	0.83	866	220	2010
BigData@Heart	0.78	7,648	211	2017
INNODIA	0.75	493	200	2016
CANCER-ID	0.76	244	183	2015
EUROPAIN	0.86	363	182	2010
EUbOPEN	0.56	209	179	2020
ORBITO	0.76	348	168	2013
TRANSLOCATION	0.82	84	168	2013
RTCure	0.71	303	166	2017
STEMBANCC	0.83	71	149	2013
SUMMIT	0.85	10,227	143	2011
IMIDIA	0.84	159	141	2010
ELF	0.80	53	139	2014
CHEM21	0.83	22	129	2013
SPRINTT	0.81	343	125	2014
PreDiCT-TB	0.83	67	119	2013
BEAT-DKD	0.76	627	116	2017
RHAPSODY	0.80	492	115	2016
COMBACTE-NET	0.86	858	109	2013
MIP-DILI	0.83	146	109	2012
COMBACTE-MAGNET	0.80	641	106	2015
Quic-Concept	0.80	157	103	2012
U-BIOPRED	0.87	1,235	101	2010
PROTECT	0.86	300	99	2010
COMPACT	0.75	42	97	2014
eTOX	0.86	126	92	2010
Pharma-Cog	0.86	1,109	91	2010
PRISM	0.78	757	91	2017

PROJECT	STABILITY SCORE (METRIC 3)	NUMBER OF COLLABORATING INSTITUTION PAIRS	NUMBER OF PAPERS	PROJECT START YEAR
DIRECT	0.85	1,366	84	2012
ABIRISK	0.86	507	83	2012
RADAR-CNS	0.84	295	79	2016
DDMoRe	0.83	68	78	2012
AETIONOMY	0.81	96	74	2014
IMPRiND	0.80	102	73	2017
BioVacSafe	0.81	26	71	2012
EPAD	0.87	694	71	2015
INNODIA HARVEST	0.47	78	71	2020
Open PHACTS	0.85	70	71	2011
K4DD	0.81	39	70	2013
LITMUS	0.72	358	69	2018
ZAPI	0.78	66	67	2015
Onco Track	0.86	110	66	2011
AMYPAD	0.75	462	65	2017
RESCEU	0.69	784	64	2018
COMBACTE-CARE	0.81	693	62	2015
MARCAR	0.84	39	60	2011
ENABLE	0.82	59	59	2015
TransQST	0.74	31	59	2017
APPROACH	0.85	183	58	2015
MOBILISE-D	0.56	324	58	2020
PRECISESADS	0.77	260	57	2015
DRIVE-AB	0.72	84	54	2015
FLUCOP	0.77	46	53	2015
EHDEN	0.63	1,191	50	2019
PHAGO	0.71	75	49	2017
eTRIKS	0.77	746	48	2014
RAPP-ID	0.87	14	48	2011
Predect	0.81	27	47	2012
DRAGON	0.48	97	46	2020
iPiE	0.75	22	41	2016
GETREAL	0.81	40	40	2015
iABC	0.80	202	40	2015
EBOVAC1	0.85	90	38	2015

PROJECT	STABILITY SCORE (METRIC 3)	NUMBER OF COLLABORATING INSTITUTION PAIRS	NUMBER OF PAPERS	PROJECT START YEAR
Hypo-RESOLVE	0.70	103	38	2019
ADAPTED	0.78	2,607	35	2017
EBiSC	0.79	18	34	2015
3TR	0.66	214	33	2020
IM2PACT	0.56	10	33	2020
PREFER	0.73	159	30	2017
eTRANSAFE	0.63	11	29	2018
PD-MitoQUANT	0.69	6	29	2019
PROACTIVE	0.84	199	29	2011
ADVANCE	0.79	300	28	2015
TRISTAN	0.70	31	28	2017
CARE	0.54	39	27	2020
IMI-PainCare	0.74	143	27	2019
SOPHIA	0.36	151	27	2020
ROADMAP	0.70	376	26	2017
EbolaMoDRAD	0.55	33	25	2016
HARMONY	0.81	25	25	2017
BIOMAP	0.68	153	24	2019
TransBioLine	0.59	17	24	2020
VAC2VAC	0.67	9	24	2018
EBOVAC2	0.85	96	22	2017
DRIVE	0.74	8	21	2018
PERISCOPE	0.77	12	21	2018
SAFE-T	0.86	21	21	2011
EHR4CR	0.78	51	20	2012

- RAPP-ID, U-BIOPRED, and EPAD have the largest stability score (0.87) while SOPHIA has the lowest (0.36).
- There is considerable variation in the number collaborating institution pairs that does not appear to be proportional to the number of project papers or dependent on the project start year. For example, BTCure started in 2011 and has the highest output of papers (679), only has 1,135 institution pairs compared with SUMMIT that started in the same year, has only produced 143 papers but has 10,227 institution pairs. This suggests that SUMMIT publishes papers with many authors from multiple institutions. In fact, one of SUMMIT's papers has 267 affiliations.

7.4 Collaboration index

The cross-sector score (Metrics 1) and international score (Metric 2) (described above) measure different types of collaboration. The first measures the fraction of papers that involve cross-sector collaborations, and the second reflects the fraction of papers that involve multilateral and bilateral international collaborations. Metric 3 or stability score is based on the collaboration stability of pairs of institutional collaborators that contribute to IMI project research. We compute a "collaboration index" across IMI projects as the sum of all three of the metrics. These data are shown in Table 7.4.1 for all IMI projects with 20 or more papers.

This year's collaboration index is not comparable with the collaboration index in the ninth (2018) and earlier versions of this report as Metric 3 was updated in the tenth report (2019) to indicate the stability of institutional collaboration rather than intensity.

- PROACTIVE had the highest overall collaboration index score (2.65) followed by PREFER (2.55).

Table 7.4.1 Summary score for collaboration metrics, total number of papers, and field-normalised citation impact for IMI projects with at least 20 papers, 2010-2022

PROJECT	CROSS-SECTOR SCORE (METRIC 1)	INTERNATIONAL SCORE (METRIC 2)	STABILITY SCORE (METRIC 3)[23]	COLLABORATION INDEX	NUMBER OF PAPERS	CITATION IMPACT (FIELD-NORMALISED)
BTCure	0.64	0.52	0.85	2.01	679	1.78
EU-AIMS	0.73	0.65	0.83	2.22	589	1.97
ULTRA-DD	0.64	0.66	0.78	2.08	444	1.81
EMIF	0.83	0.70	0.85	2.38	333	2.42
AIMS-2-TRIALS	0.68	0.64	0.74	2.06	292	2.92
NEWMEDS	0.57	0.59	0.83	1.99	220	2.00
BigData@Heart	0.90	0.69	0.78	2.38	211	2.61
INNODIA	0.79	0.63	0.75	2.16	200	1.50
CANCER-ID	0.75	0.44	0.76	1.95	183	3.14
EUROPAIN	0.52	0.38	0.86	1.76	182	2.57
EUbOPEN	0.59	0.56	0.56	1.71	179	1.66
ORBITO	0.63	0.48	0.76	1.87	168	1.69
TRANSLOCATION	0.37	0.50	0.82	1.69	168	1.30
RTCure	0.81	0.48	0.71	2.00	166	2.58
STEMBANCC	0.50	0.48	0.83	1.81	149	1.89
SUMMIT	0.74	0.65	0.85	2.24	143	1.39
IMIDIA	0.53	0.50	0.84	1.87	141	1.63
ELF	0.40	0.51	0.80	1.71	139	1.11

23 Some projects do not have a Stability score due to the project not being active for at least 3 years. The Collaboration Index was not calculated for projects with no Stability Score.

PROJECT	CROSS-SECTOR SCORE (METRIC 1)	INTERNATIONAL SCORE (METRIC 2)	STABILITY SCORE (METRIC 3)[23]	COLLABORATION INDEX	NUMBER OF PAPERS	CITATION IMPACT (FIELD-NORMALISED)
CHEM21	0.22	0.28	0.83	1.34	129	1.70
SPRINTT	0.73	0.53	0.81	2.07	125	1.94
PreDiCT-TB	0.53	0.50	0.83	1.85	119	1.15
BEAT-DKD	0.72	0.70	0.76	2.19	116	1.86
RHAPSODY	0.64	0.69	0.80	2.13	115	1.92
COMBACTE-NET	0.80	0.58	0.86	2.24	109	1.04
MIP-DILI	0.67	0.46	0.83	1.96	109	1.71
COMBACTE-MAGNET	0.73	0.62	0.80	2.15	106	1.19
Quic-Concept	0.75	0.57	0.80	2.12	103	5.13
U-BIOPRED	0.82	0.74	0.87	2.43	101	2.39
PROTECT	0.96	0.63	0.86	2.45	99	1.02
COMPACT	0.28	0.46	0.75	1.49	97	1.88
eTOX	0.30	0.36	0.86	1.53	92	1.79
Pharma-Cog	0.86	0.74	0.86	2.46	91	1.10
PRISM	0.79	0.73	0.78	2.30	91	4.46
DIRECT	0.76	0.74	0.85	2.36	84	4.30
ABIRISK	0.76	0.51	0.86	2.12	83	1.23
RADAR-CNS	0.67	0.72	0.84	2.23	79	1.80
DDMoRe	0.63	0.56	0.83	2.02	78	1.15
AETIONOMY	0.65	0.45	0.81	1.91	74	1.77
IMPRiND	0.63	0.61	0.80	2.04	73	5.12
BioVacSafe	0.46	0.48	0.81	1.76	71	1.13
EPAD	0.77	0.68	0.87	2.32	71	1.43
INNODIA HARVEST	0.75	0.63	0.47	1.84	71	1.31
Open PHACTS	0.61	0.56	0.85	2.02	71	3.61
K4DD	0.54	0.50	0.81	1.85	70	1.44
LITMUS	0.88	0.70	0.72	2.30	69	4.37
ZAPI	0.60	0.63	0.78	2.01	67	3.65
Onco Track	0.64	0.44	0.86	1.94	66	2.16
AMYPAD	0.89	0.77	0.75	2.42	65	2.16
RESCEU	0.80	0.71	0.69	2.20	64	2.47
COMBACTE-CARE	0.92	0.66	0.81	2.39	62	1.48
MARCAR	0.38	0.42	0.84	1.64	60	0.99
ENABLE	0.63	0.50	0.82	1.94	59	1.42
TransQST	0.61	0.64	0.74	1.99	59	2.83
APPROACH	0.83	0.82	0.85	2.50	58	2.02

PROJECT	CROSS-SECTOR SCORE (METRIC 1)	INTERNATIONAL SCORE (METRIC 2)	STABILITY SCORE (METRIC 3)[23]	COLLABORATION INDEX	NUMBER OF PAPERS	CITATION IMPACT (FIELD-NORMALISED)
MOBILISE-D	0.78	0.60	0.56	1.93	58	1.33
PRECISESADS	0.79	0.76	0.77	2.33	57	1.36
DRIVE-AB	0.74	0.64	0.72	2.10	54	1.24
FLUCOP	0.89	0.49	0.77	2.15	53	1.57
EHDEN	0.72	0.83	0.63	2.18	50	2.31
PHAGO	0.69	0.61	0.71	2.02	49	4.02
eTRIKS	0.79	0.89	0.77	2.46	48	2.00
RAPP-ID	0.33	0.43	0.87	1.64	48	0.81
Predect	0.66	0.64	0.81	2.11	47	2.80
DRAGON	0.89	0.74	0.48	2.11	46	3.81
iPiE	0.51	0.24	0.75	1.51	41	1.09
GETREAL	0.80	0.75	0.81	2.36	40	1.61
iABC	0.88	0.66	0.80	2.33	40	1.66
EBOVAC1	0.71	0.66	0.85	2.22	38	1.76
Hypo-RESOLVE	0.58	0.76	0.70	2.05	38	0.88
ADAPTED	0.91	0.61	0.78	2.30	35	2.39
EBiSC	0.71	0.63	0.79	2.13	34	4.80
3TR	0.85	0.55	0.66	2.06	33	2.14
IM2PACT	0.52	0.42	0.56	1.50	33	1.94
PREFER	0.93	0.88	0.73	2.55	30	1.21
eTRANSAFE	0.45	0.47	0.63	1.55	29	3.12
PD-MitoQUANT	0.72	0.53	0.69	1.94	29	1.70
PROACTIVE	1.00	0.81	0.84	2.65	29	2.23
ADVANCE	0.86	0.83	0.79	2.48	28	1.00
TRISTAN	0.75	0.49	0.70	1.94	28	1.41
CARE	0.67	0.63	0.54	1.84	27	8.91
IMI-PainCare	0.78	0.62	0.74	2.13	27	1.59
SOPHIA	0.78	0.64	0.36	1.78	27	2.30
ROADMAP	0.85	0.78	0.70	2.32	26	0.87
EbolaMoDRAD	0.64	0.52	0.55	1.71	25	1.17
HARMONY	0.88	0.56	0.81	2.25	25	1.32
BIOMAP	0.88	0.71	0.68	2.26	24	3.73
TransBioLine	0.88	0.49	0.59	1.96	24	2.37
VAC2VAC	0.75	0.53	0.67	1.95	24	0.42
EBOVAC2	0.59	0.57	0.85	2.01	22	2.07
DRIVE	0.90	0.35	0.74	1.99	21	0.84
PERISCOPE	0.43	0.44	0.77	1.64	21	1.12

PROJECT	CROSS-SECTOR SCORE (METRIC 1)	INTERNATIONAL SCORE (METRIC 2)	STABILITY SCORE (METRIC 3)[23]	COLLABORATION INDEX	NUMBER OF PAPERS	CITATION IMPACT (FIELD-NORMALISED)
SAFE-T	0.95	0.54	0.86	2.35	21	1.68
EHR4CR	0.80	0.60	0.78	2.18	20	1.03

8 Benchmarking analysis - IMI project research against research from selected comparators

This section of the report analyses the output and citation impact of IMI project research benchmarked against research supported by other Public-Private Partnerships, and funders of biomedical research across Europe, Asia, Australia, and North America.

The publications funded by each comparator were identified using specific searches of the funding acknowledgment data provided by authors and extracted in Web of Science. This is the same process by which IMI project publications have been identified. Authors may not always acknowledge their sources of funding and may not always do so correctly. Therefore, the coverage of the datasets used in these analyses may not be complete and may not be entirely accurate; however, the sample represented by these datasets is sufficient to allow a comparison to be made.

8.1 Identifying comparators

The seven funders listed in Table 8.1.1 are used as comparators for IMI in this report. They are the same comparators as in the previous thirteenth report produced in 2022. Each comparator had sufficient publications to allow a meaningful analysis.

Table 8.1.1 Summary of information for IMI-selected comparators, 2010-2022

COMPARATOR	NUMBER OF PUBLICATIONS (2010-2022)	NUMBER OF PAPERS (2010-2022)	COUNTRY	REGION
Critical Path (C-Path)	616	574	USA	North America
Commonwealth Scientific and Industrial Research Organization (CSIRO)	1,113	1,075	Australia	Australia
Foundation for the National Institutes of Health (FNIH)	5,598	5,256	USA	North America
Grand Challenges in Global Health (GCGH)	896	895	USA	North America
Indian Council of Medical Research (ICMR)	20,177	19,541	India	Asia
Medical Research Council (MRC)	149,382	133,787	UK	Europe
Wellcome Trust (WT)	104,568	97,110	UK	Europe

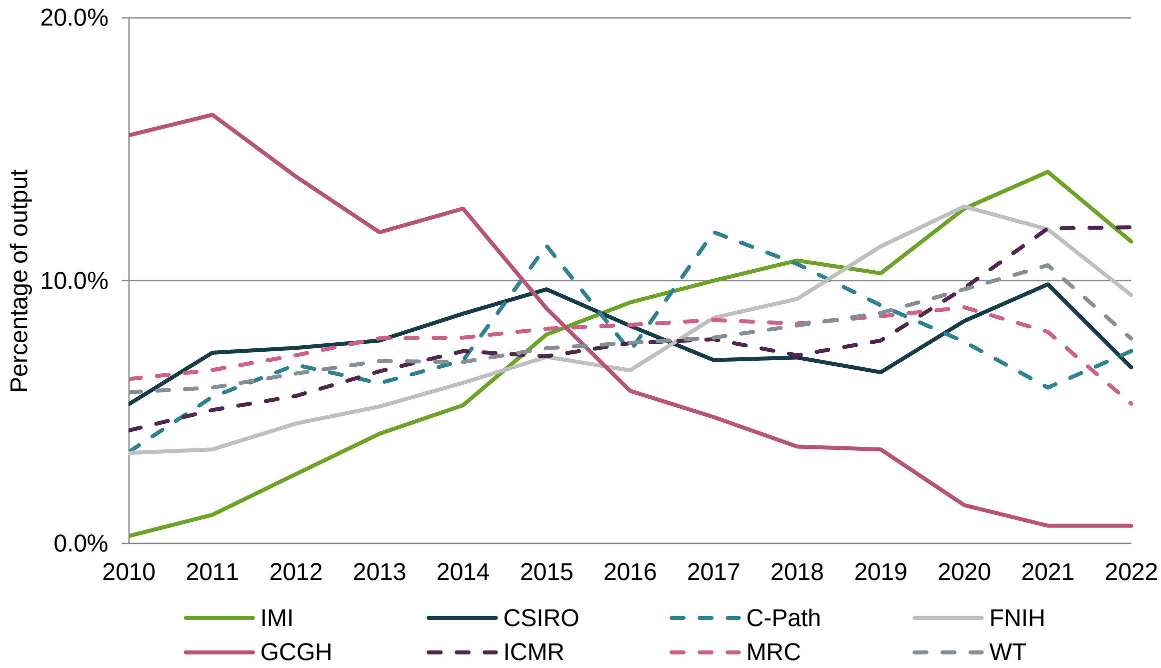
8.2 Trends in output: IMI project research compared with selected comparators

This section of the report analyses trends in the performance of IMI project research and the selected comparators.

8.2.1 Trends in output: IMI project research compared with selected comparators

The output of IMI and the comparators varies widely (some produced many papers and some relatively few), therefore a visual comparison of absolute paper counts would not provide an understanding of their growth relative to one another. To provide a more easily interpretable comparison, Figure 8.2.1 shows the percentage of each organisation's total paper count between 2010 and 2022 published in each year. Table 8.2.1 shows the same data as in Figure 8.2.1 and Table 8.2.2 show the number of papers per year for IMI and the selected comparators.

Figure 8.2.1 Trends in output – IMI project research compared with selected comparators, 2010-2022



- Most of IMI's research output was published in the last five years 2018-2022, accounting for more than half of its paper output.
- IMI has experienced the most rapid increase in percentage of output, however seeing a decrease in 2019 and in the most recent year of 2022.
- GCGH has sustained a decreasing percentage of output since 2011. Similarly, C-path has been on a downward trend since 2017 and while there appears to be an increase in 2022, this is insignificant as C-path published 8 more papers in 2022 than in 2021.

Figure 8.2.2 Comparing percentage output in the first five years (2010-2015) to most recent five years (2017-2022) – IMI project research compared with selected comparators, 2010-2022

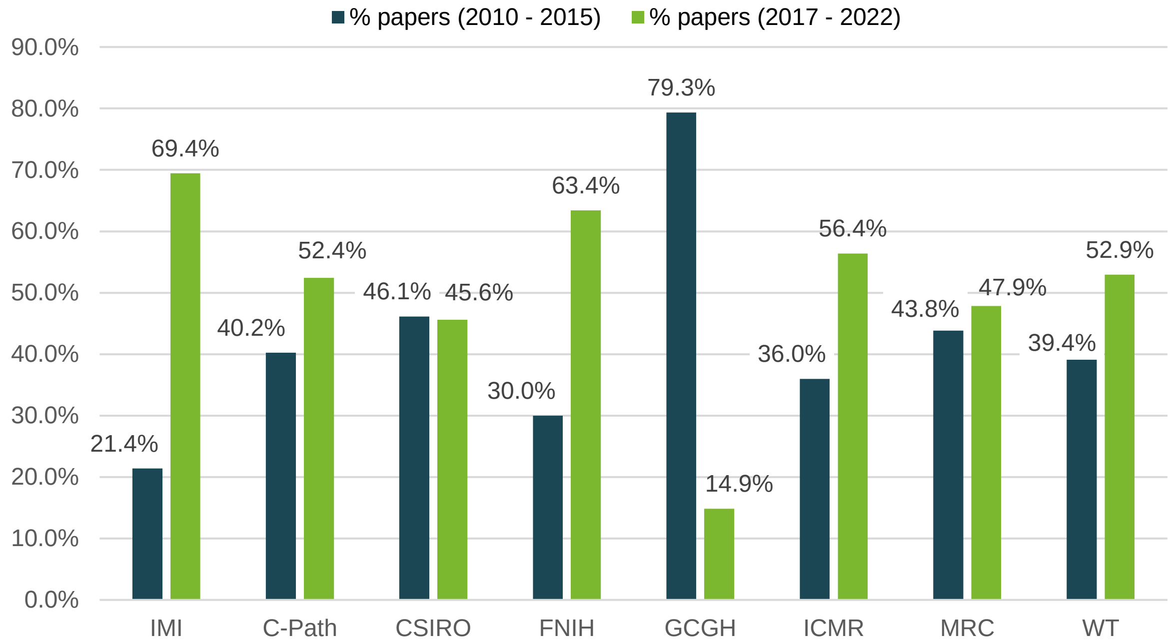


Table 8.2.1 Share of output – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	0.3%	5.3%	3.5%	3.4%	15.5%	4.3%	6.3%	5.8%
2011	1.1%	7.3%	5.6%	3.6%	16.3%	5.1%	6.6%	5.9%
2012	2.6%	7.4%	6.8%	4.6%	14.0%	5.6%	7.2%	6.5%
2013	4.2%	7.7%	6.1%	5.2%	11.8%	6.5%	7.8%	6.9%
2014	5.3%	8.7%	7.0%	6.1%	12.7%	7.3%	7.8%	6.9%
2015	7.9%	9.7%	11.3%	7.1%	8.9%	7.1%	8.2%	7.4%
2016	9.2%	8.3%	7.3%	6.6%	5.8%	7.6%	8.3%	7.6%
2017	10.0%	7.0%	11.8%	8.6%	4.8%	7.8%	8.5%	7.8%
2018	10.8%	7.1%	10.6%	9.3%	3.7%	7.2%	8.4%	8.3%
2019	10.3%	6.5%	9.1%	11.3%	3.6%	7.7%	8.6%	8.8%
2020	12.7%	8.5%	7.7%	12.8%	1.5%	9.7%	9.0%	9.7%
2021	14.1%	9.9%	5.9%	11.9%	0.7%	12.0%	8.1%	10.6%
2022	11.5%	6.7%	7.3%	9.5%	0.7%	12.0%	5.3%	7.8%

Table 8.2.2 Number of papers – IMI project research compared with selected comparators, 2010-2022

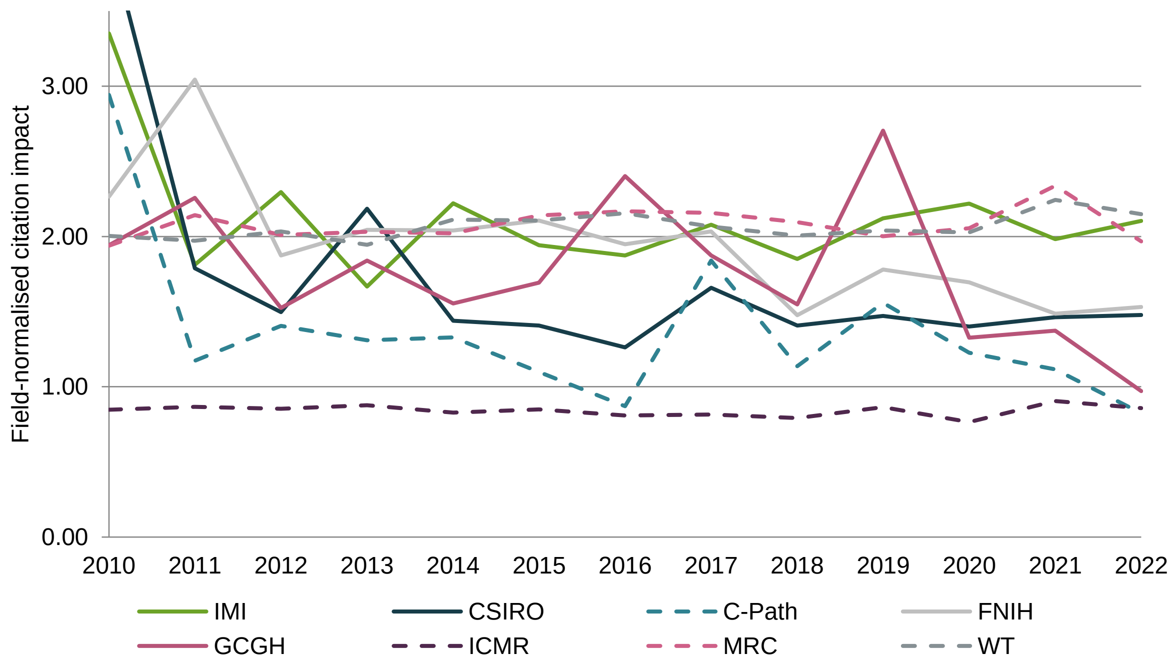
YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	25	57	20	181	139	840	8,377	5,589
2011	97	78	32	188	146	991	8,827	5,761
2012	235	80	39	240	125	1,097	9,574	6,277
2013	371	83	35	274	106	1,279	10,436	6,741
2014	468	94	40	321	114	1,431	10,476	6,706
2015	707	104	65	373	80	1,392	10,933	7,214
2016	816	89	42	346	52	1,489	11,131	7,419
2017	890	75	68	451	43	1,519	11,375	7,598
2018	958	76	61	489	33	1,400	11,191	8,055
2019	915	70	52	594	32	1,509	11,569	8,512
2020	1,134	91	44	674	13	1,900	12,018	9,390
2021	1,258	106	34	628	6	2,343	10,770	10,281
2022	1,022	72	42	497	6	2,351	7,110	7,567
Total	**8,896**	**1,075**	**574**	**5,256**	**895**	**19,541**	**133,787**	**97,110**

8.2.2 Trends in field-normalised citation impact: IMI project research compared with selected comparators

As discussed in Section 3, citations accumulate over time at a rate that is dependent upon the field of research. Therefore, it is standard bibliometric practice to normalise citation counts for these two factors. In this report, field-normalised citation impact has been calculated by dividing the citations received by each publication by the world average citations per publication for the relevant year and field.

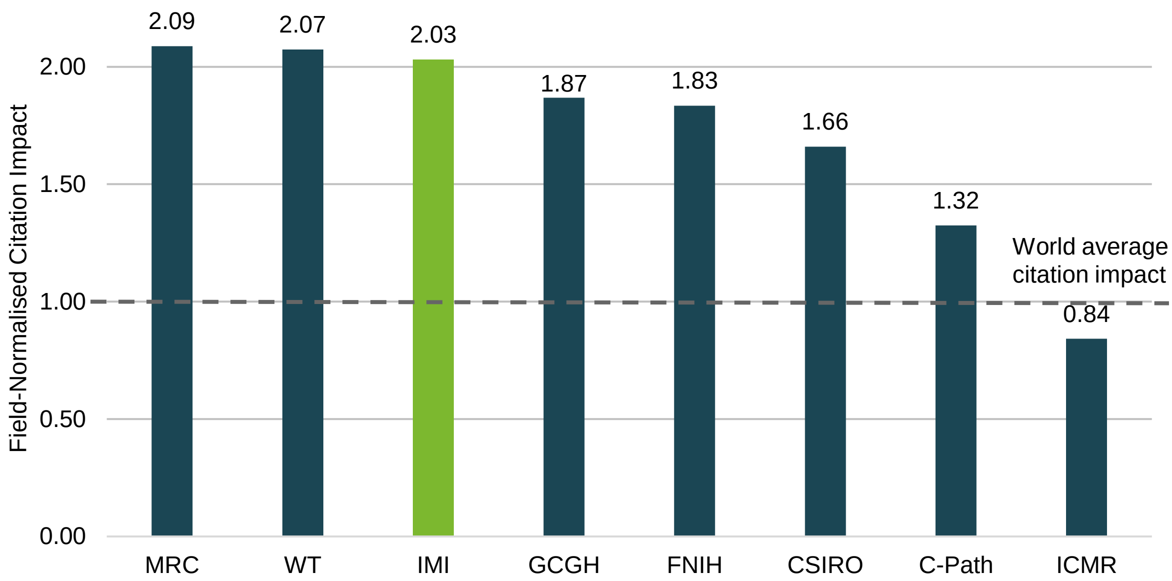
Figure 8.2.3 shows the annual trends in field-normalised citation impact of IMI and the comparators between 2010 and 2022 and Figure 8.2.4 shows the average field-normalised citation impact of IMI and the comparators between 2010 and 2022. Table 8.2.3 has the same data as in Figure 8.2.3 and Figure 8.2.4.

Figure 8.2.3 Trends in field-normalised citation impact – IMI project research compared with selected comparators, 2010-2022



- The field-normalised citation impact of IMI, MRC and the WT were stable at close to twice the world average between 2010 and 2022, indicating highly cited, internationally significant research.
- The exceptionally high field-normalised citation impact of IMI, CSIRO, and C-Path project research in 2010 was driven by a small number of highly cited papers.
- ICMR has consistently underperformed in comparison to the world average between 2010-2022.
- In 2022, it is notable that IMI’s CNCI for 2022 papers increased by 6% and was more than two-times (2.10) the world average (1.00) compared to 2021 (1.98). In comparison the CNCI for five out of the seven comparators decreased in 2022.

Figure 8.2.4 Average field-normalised citation impact – IMI project research compared with selected comparators, 2010-2022



- The average field-normalised citation impact of IMI project research (2.03) between 2010 and 2022 was two times the world average and was comparable to MRC's and WT's citation impact and ahead of all other comparators.
- Only ICMR's average field-normalised citation impact (0.83) was below world average (1.00).

Table 8.2.3 Field-normalised citation impact – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	3.35	3.99	2.94	2.27	1.94	0.85	1.94	2.00
2011	1.81	1.79	1.17	3.04	2.26	0.87	2.14	1.97
2012	2.30	1.50	1.41	1.87	1.52	0.85	2.01	2.03
2013	1.67	2.18	1.31	2.05	1.84	0.88	2.03	1.94
2014	2.22	1.44	1.33	2.04	1.55	0.83	2.02	2.11
2015	1.94	1.41	1.10	2.11	1.69	0.85	2.14	2.11
2016	1.87	1.26	0.87	1.95	2.40	0.81	2.17	2.15
2017	2.08	1.66	1.84	2.03	1.87	0.82	2.16	2.06
2018	1.85	1.41	1.14	1.48	1.55	0.79	2.10	2.01
2019	2.12	1.47	1.56	1.78	2.70	0.86	2.00	2.04
2020	2.22	1.40	1.23	1.69	1.33	0.77	2.06	2.03
2021	1.98	1.46	1.12	1.49	1.37	0.91	2.34	2.24
2022	2.10	1.48	0.82	1.53	0.97	0.86	1.97	2.15
Average	**2.03**	**1.66**	**1.32**	**1.83**	**1.87**	**0.84**	**2.09**	**2.07**

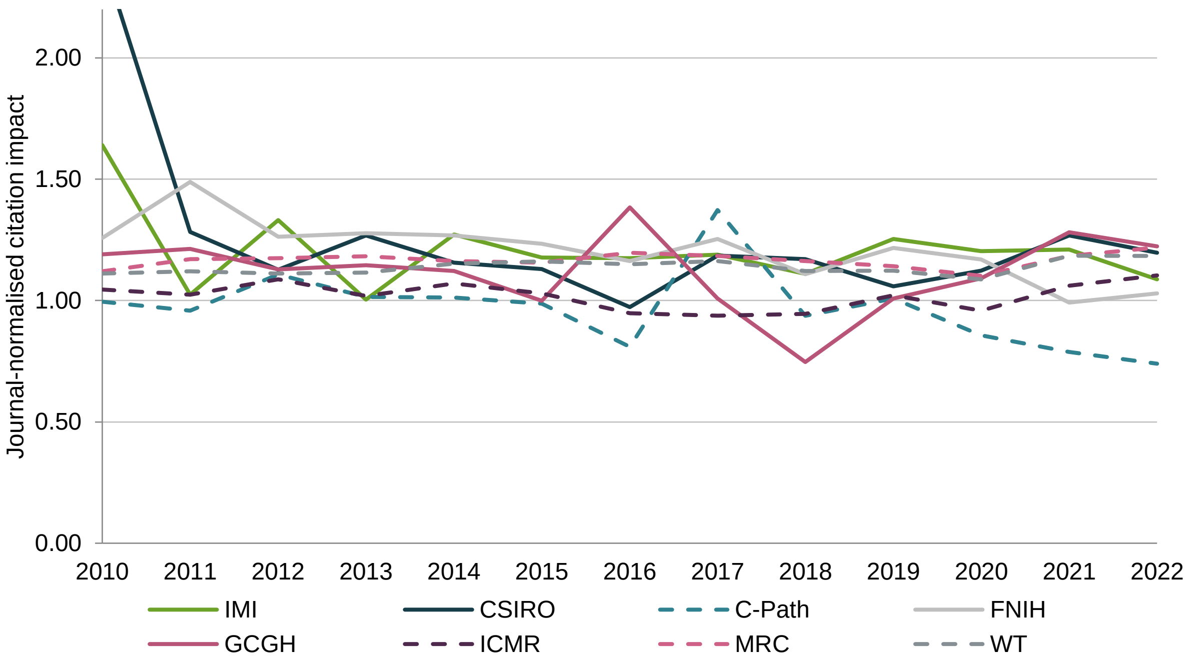
- In 2012, 2014, 2020 IMI had the highest field-normalised citation impact (2.30, 2.22, and 2.22 respectively) of the funding organisations analysed and since 2017 has remained in the Top 3.

8.2.3 Trends in journal-normalised citation impact: IMI project research compared with selected comparators

As discussed in Section 3, an alternative indicator to field-normalised citation impact is citation impact normalised at the journal level. The journal-normalised citation impact is calculated by dividing the number of citations a paper received by the average number of citations for the year and the journal in which the paper is published. As for the field-normalised citation impact, the world average for journal-normalised citation impact is 1.00.

Figure 8.2.5 shows the annual trends in journal-normalised citation impact of IMI and the comparators between 2010 and 2022. Figure 8.2.6 shows the average field-normalised citation impact of IMI and the comparators between 2010 and 2022. Table 8.2.4 shows the same data as in Figure 8.2.5 and Figure 8.2.6.

Figure 8.2.5 Trends in journal normalised citation impact – IMI project research compared with selected comparators, 2010-2022



- IMI project research has a journal-normalised citation impact that has remained above the world average between 2010 and 2022 indicating that IMI research performs well in the journals they are published in.
- IMI project research has shown slight variability of its journal normalised citation impact and had the highest journal normalised citation impact in 2012, 2014, 2019 and 2020.

Figure 8.2.6 Average journal-normalised citation impact – IMI project research compared with selected comparators, 2010-2022

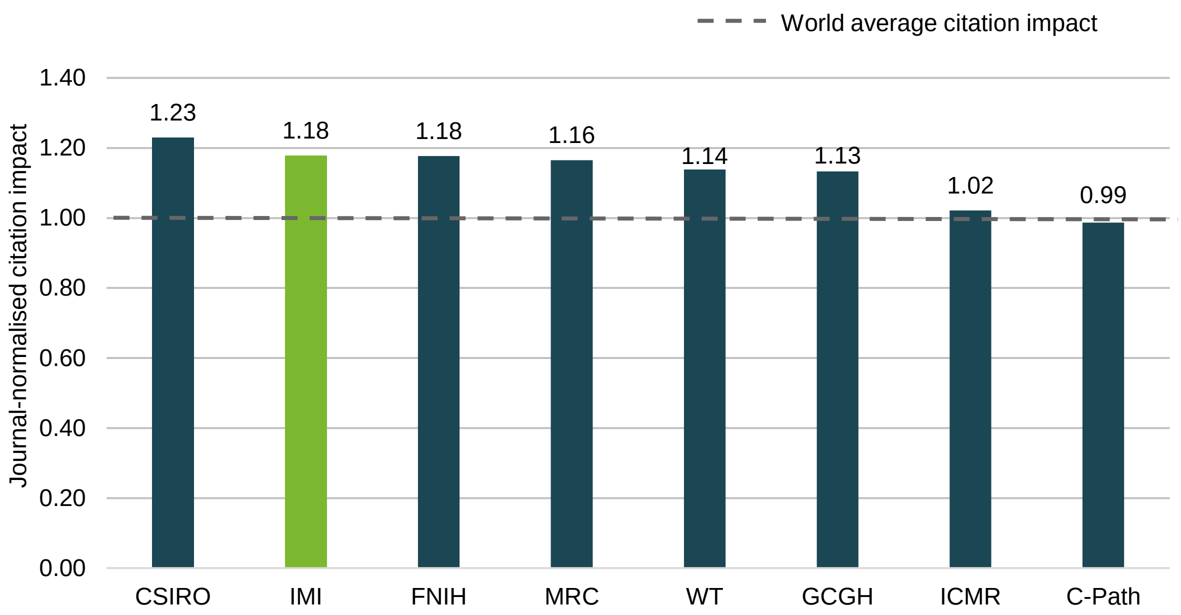


Table 8.2.4 Journal-normalised citation impact – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	1.64	2.42	1.00	1.26	1.19	1.04	1.12	1.11
2011	1.02	1.28	0.96	1.49	1.21	1.02	1.17	1.12
2012	1.33	1.13	1.11	1.26	1.13	1.09	1.17	1.11
2013	1.00	1.27	1.02	1.28	1.15	1.02	1.18	1.11
2014	1.27	1.16	1.01	1.27	1.12	1.07	1.16	1.15
2015	1.18	1.13	0.99	1.23	1.00	1.03	1.16	1.16
2016	1.17	0.97	0.81	1.16	1.38	0.95	1.20	1.15
2017	1.19	1.19	1.37	1.25	1.01	0.94	1.18	1.16
2018	1.11	1.17	0.94	1.11	0.75	0.94	1.16	1.12
2019	1.25	1.06	1.01	1.22	1.01	1.02	1.14	1.12
2020	1.20	1.12	0.86	1.17	1.09	0.96	1.10	1.09
2021	1.21	1.27	0.79	0.99	1.28	1.06	1.18	1.18
2022	1.09	1.20	0.74	1.03	1.22	1.10	1.22	1.18
Average	**1.18**	**1.23**	**0.99**	**1.18**	**1.13**	**1.02**	**1.16**	**1.14**

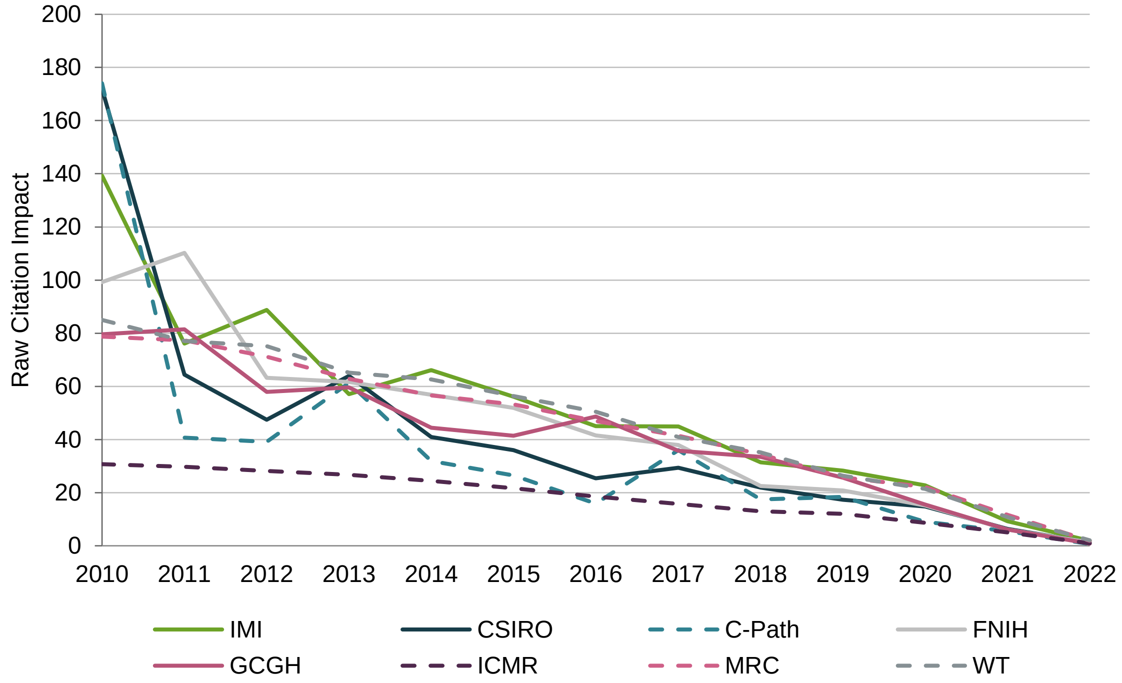
- IMI had the second highest journal normalised citation impact (1.18) with only CSIRO having a higher journal normalised citation impact (1.23).

8.2.4 Trends in raw citation impact: IMI project research compared with selected comparators

The raw (un-normalised) citation impact of a group of papers is calculated by dividing the sum of citations by the total number of papers published. As such it is the mean average number of citations to a paper. This indicator must be used with caution as it is not normalised to field or year.

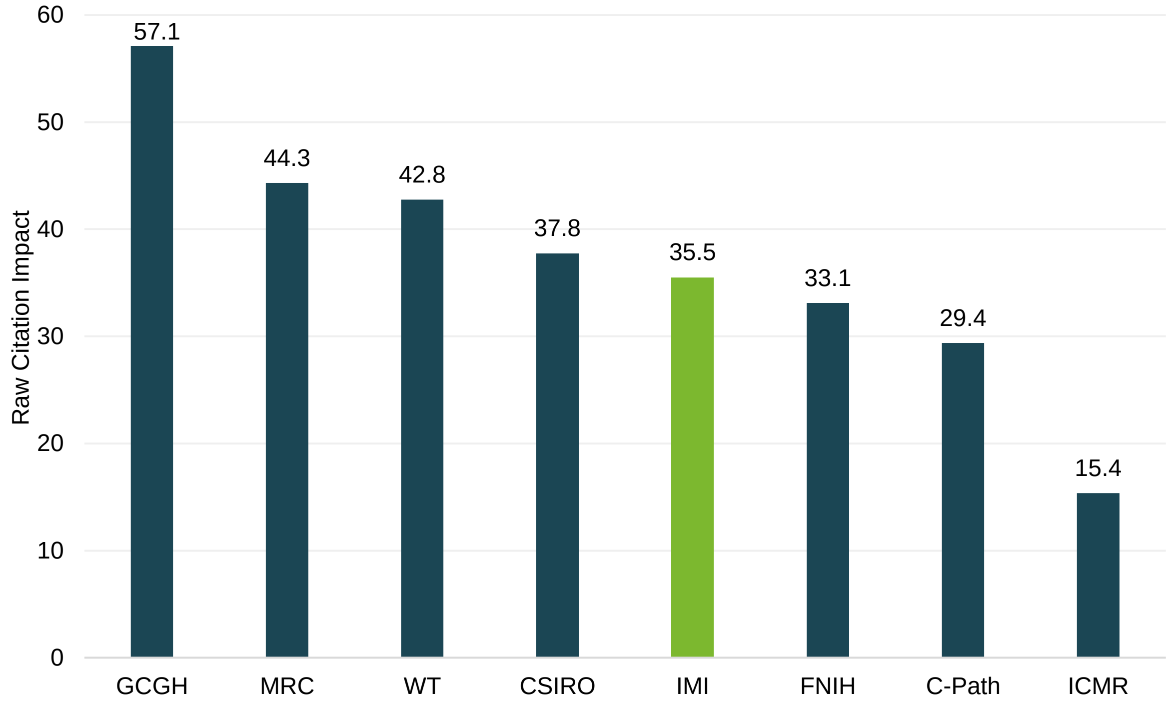
Figure 8.2.7 shows the annual trends in average raw citation impact of IMI and the comparators for papers published each year between 2010 and 2022. Figure 8.2.8 shows the average raw citation impact of IMI and the comparators for papers published between 2010 and 2022. Table 8.2.5 has the same data as in Figure 8.2.7 and Figure 8.2.8.

Figure 8.2.7 Trends in raw citation impact – IMI project research compared with selected comparators, 2010-2022



- The raw citation impact of all organisations in the most recent years between 2010 to 2022 are lower in comparison to previous years. This is expected as more recent publications have had less time to accumulate citations, and the raw citation impact is not normalised.
- IMI's 2022 raw citation impact (1.88) is higher than all comparators' raw citation impacts except for WT and MRC. This is similar to previous reports and IMI has remained in the Top 3 for raw citation impact since 2017.

Figure 8.2.8 Average raw citation impact – IMI project research compared with selected comparators, 2010-2022



- IMI's average raw citation impact between 2010 and 2022 (35.5) is higher than three out of the seven comparators (C-Path (29.4) ICMR (15.4) and FNIH (33.1).
- IMI's raw citation impact increased the most (13%) from the thirteenth report, relative to the comparators.
- GCGH had the highest raw citation impact (57.1).

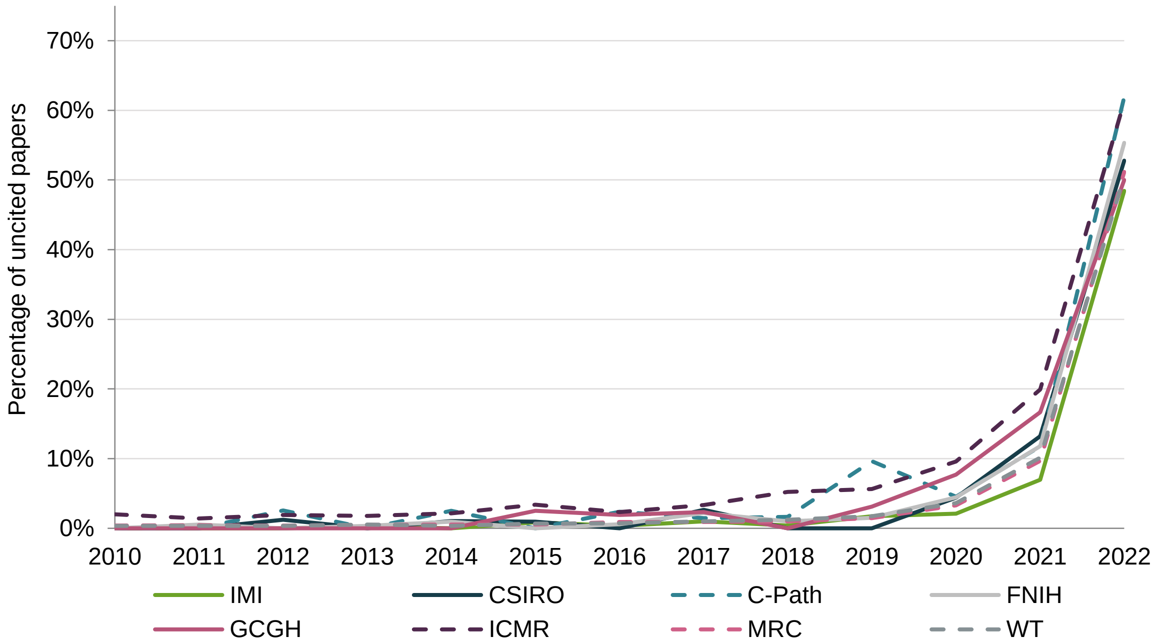
Table 8.2.5 Raw citation impact – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	139.31	171.95	174.05	99.23	79.62	30.72	78.73	84.99
2011	76.16	64.47	40.66	110.23	81.47	29.68	77.36	77.05
2012	88.73	47.43	39.17	63.20	57.86	28.18	71.14	75.18
2013	57.06	63.98	61.26	61.62	59.57	26.68	62.82	65.11
2014	66.14	40.89	31.88	56.89	44.47	24.47	56.64	62.61
2015	56.05	36.03	26.42	51.95	41.45	21.70	53.27	56.32
2016	45.06	25.42	15.91	41.55	48.64	18.52	47.01	50.43
2017	44.91	29.40	36.04	37.92	35.79	15.80	41.46	40.94
2018	31.48	21.88	17.44	22.55	33.42	12.93	34.42	35.13
2019	28.33	17.33	18.38	20.81	25.66	11.98	25.76	26.38
2020	22.69	14.85	9.02	15.16	15.54	8.60	22.11	21.46
2021	9.25	6.41	5.55	6.08	6.17	4.99	11.68	10.79
2022	1.88	1.24	0.67	1.29	0.83	0.94	1.89	2.07
Average	**35.5**	**37.8**	**29.4**	**33.1**	**57.1**	**15.4**	**44.3**	**42.8**

8.2.5 Trends in uncited research: IMI project research compared with selected comparators

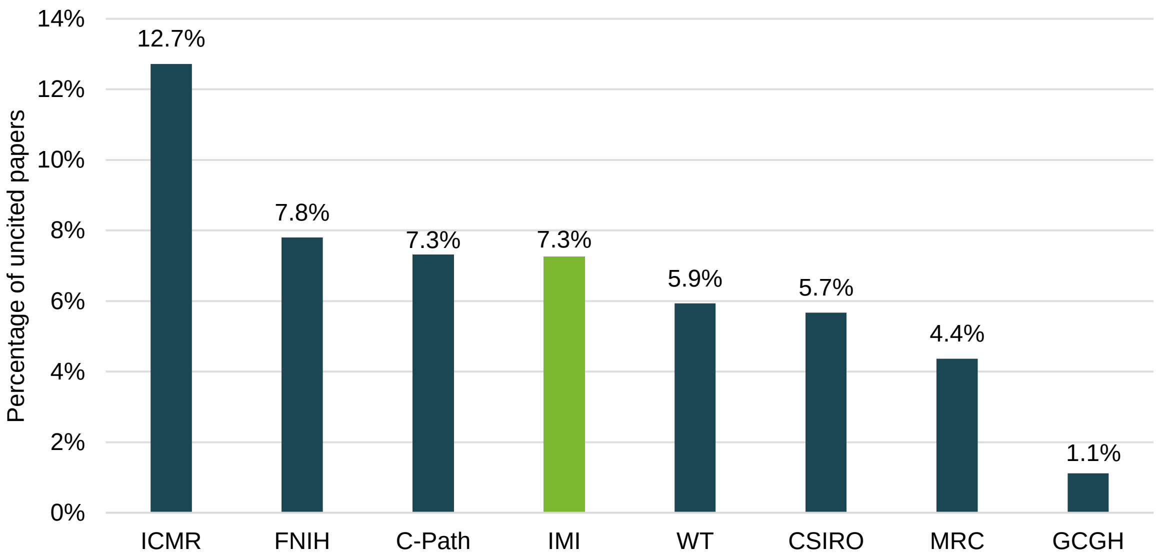
Most publication datasets will include papers which have no citations. Figure 8.2.9 shows the trend in average percentage of uncited papers between 2010 and 2022 for IMI and the selected comparators. Figure 8.2.10 shows the percentage of uncited papers between 2010 and 2022 for IMI and the selected comparators. Table 8.2.6 has the same data as in Figure 8.2.9 and Figure 8.2.10.

Figure 8.2.9 Trends in uncited papers – IMI project research compared with selected comparators, 2010-2022



- The similar trends in uncited papers indicate the similar citation life cycles for biomedical research funded across all the benchmarking organisations. More recent publications are less likely to be cited than older publications. Therefore, the higher percentage of uncited papers in most recent years should not be taken as evidence that these articles are more likely to remain uncited.
- IMI has the lowest percentage of uncited papers in 2022 with less than half of IMI's papers being uncited. In comparison, all the comparators have at least half of their papers being uncited in 2022.
- ICMR has most often had one of the highest. This helps explain ICMR's lower than average citation impact.

Figure 8.2.10 Average percentage of uncited papers – IMI project research compared with selected comparators, 2010-2022



- Around 7% of IMI project papers remained uncited between 2010 and 2022, this is a decrease of over 1% from the thirteenth report.
- FNIH's percentage of uncited papers has decreased by 2% since the thirteenth report, the largest change of all the comparators. While notably, C-Path's percentage of uncited papers increased by 1%.
- GCGH has the lowest percentage of uncited papers, around 1% of its papers are uncited, however it also produces the lowest number of papers each year.

Table 8.2.6 Percentage of uncited papers – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.4%	0.4%
2011	0.0%	0.0%	0.0%	0.5%	0.0%	1.4%	0.5%	0.4%
2012	0.0%	1.3%	2.6%	0.0%	0.0%	1.9%	0.4%	0.4%
2013	0.3%	0.0%	0.0%	0.4%	0.0%	1.8%	0.5%	0.5%
2014	0.0%	1.1%	2.5%	0.9%	0.0%	2.2%	0.6%	0.4%
2015	0.8%	1.0%	0.0%	0.0%	2.5%	3.4%	0.5%	0.7%
2016	0.4%	0.0%	2.4%	0.6%	1.9%	2.4%	0.9%	0.7%
2017	1.0%	2.7%	1.5%	2.2%	2.3%	3.4%	0.9%	1.0%
2018	0.4%	0.0%	1.6%	1.0%	0.0%	5.2%	1.0%	1.2%
2019	1.7%	0.0%	9.6%	1.5%	3.1%	5.6%	1.5%	1.7%
2020	2.1%	4.4%	4.5%	4.5%	7.7%	9.6%	3.3%	3.6%
2021	7.0%	13.2%	11.8%	11.8%	16.7%	19.9%	9.7%	10.1%
2022	48.4%	52.8%	61.9%	55.3%	50.0%	61.3%	51.2%	50.6%
Total	**7.3%**	**5.7%**	**7.3%**	**7.8%**	**1.1%**	**12.7%**	**4.4%**	**5.9%**

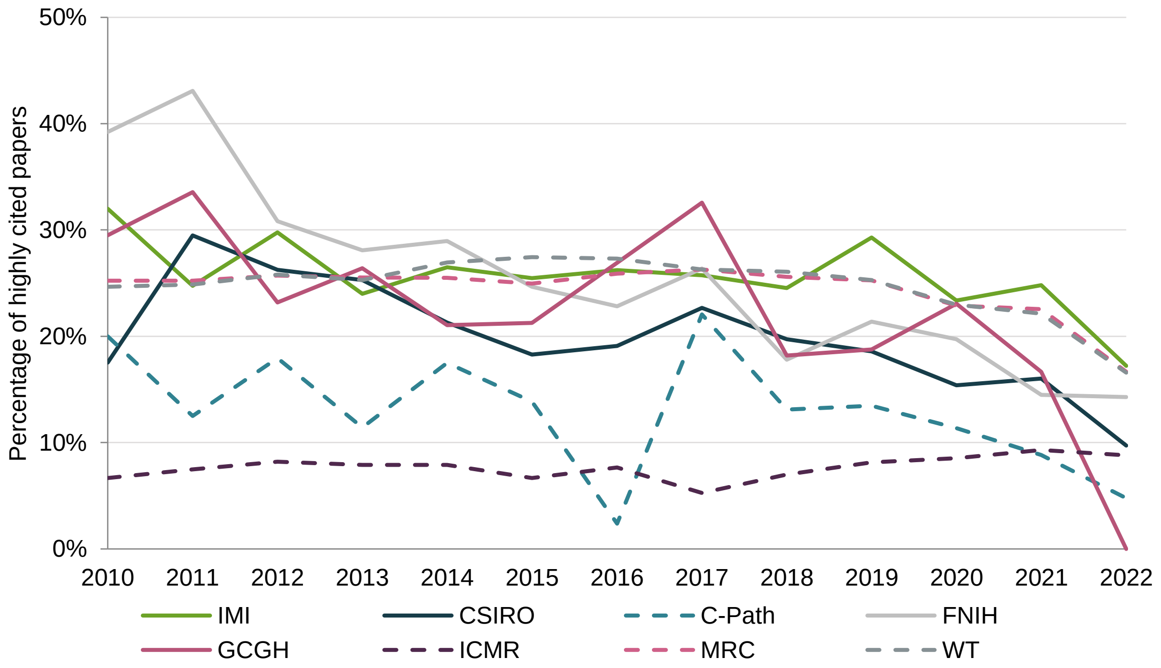
- No IMI project papers published between 2010 and 2012 or in 2014 are uncited.

8.2.6 Trends in highly cited research: IMI project research compared with selected comparators

As discussed in Section 3, highly cited work is recognised as having a greater impact, and citation counts have been correlated with other qualitative evaluations of research performance, such as peer review. For institutional research evaluation, we have found that the world's top 10% of most highly cited papers is often a suitable definition of highly cited work. Therefore, if more than 10% of an entity's publications are in the top 10% of the world's most highly cited papers, then it has performed better than expected.

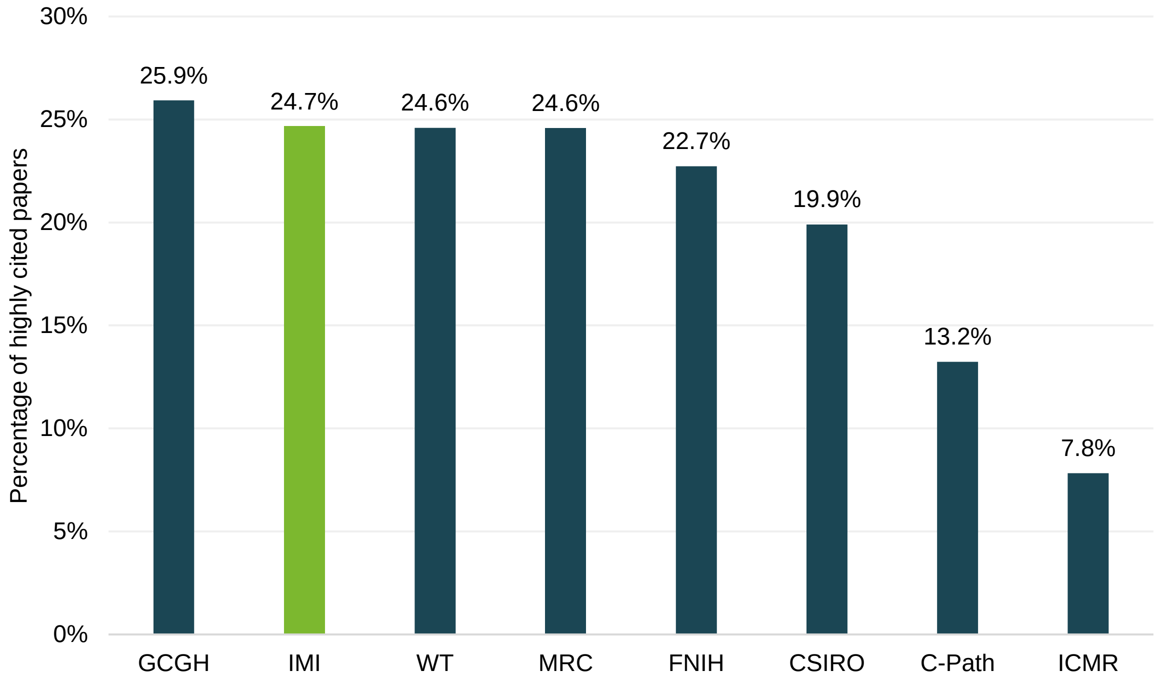
Figure 8.2.11 shows the annual trends in percentage of highly cited papers between 2010 and 2022 for IMI and the selected comparators. Figure 8.2.12 shows the total percentage of highly cited papers between 2010 and 2022 for IMI and the selected comparators. Table 8.2.7 has the same data as in Figure 8.2.11 and Figure 8.2.12.

Figure 8.2.11 Trends in highly cited papers – IMI project research compared with selected comparators, 2010-2022



- Between 2010 and 2022, IMI, FNIH, MRC and WT have had an above average percentage (10%) of highly cited papers. While ICMR has consistently performed below the world average.
- Up until 2022, CSIRO and GCGH performed above the world average, however in 2022 they have 9.7% and 0% highly cited papers respectively. It is possible not enough time has passed for those papers published later in 2022 to collect citations and therefore this should be considered with caution.
- In most years, IMI is among the organisations with the highest percentage of highly cited papers. IMI has had the highest percentage of highly cited papers since 2019.

Figure 8.2.12 Percentage of highly cited papers – IMI project research compared with selected comparators, 2010-2022



- IMI ranks second in comparison to the comparators for percentage of highly cited papers, with only GCGH outperforming IMI.
- Around a quarter of papers published by IMI between 2010 and 2022 were highly cited. With all comparators except for ICMR performing above world average. ICMR's percentage of highly cited papers was well below world average performance (7.8%).

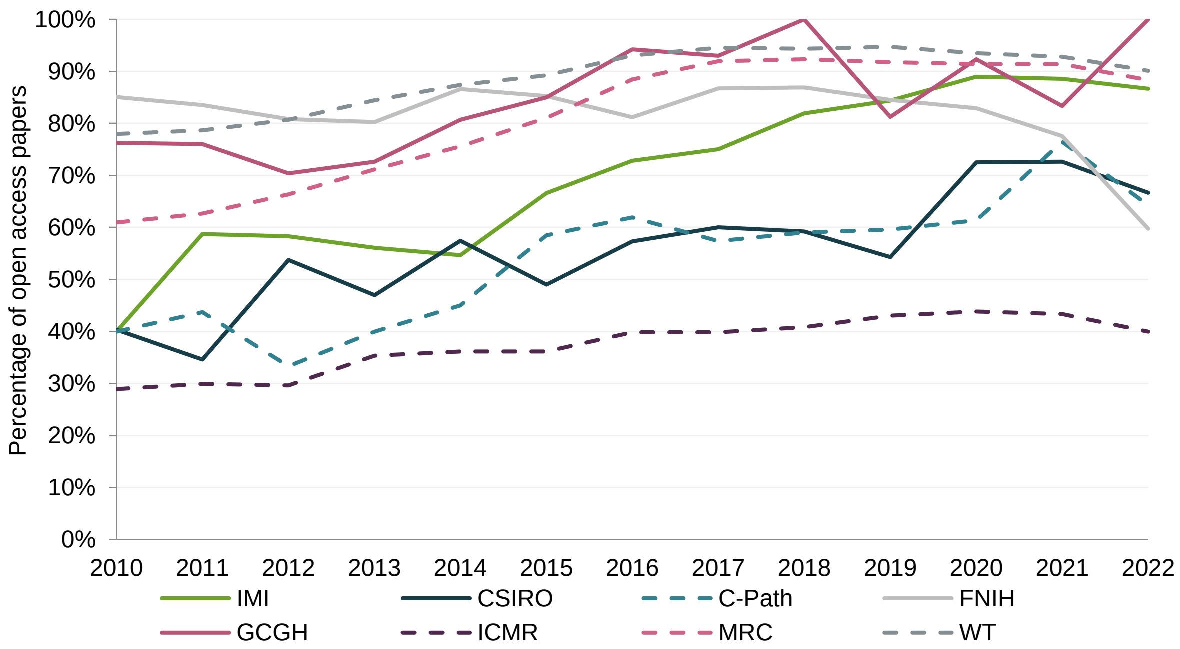
Table 8.2.7 Percentage of highly cited papers – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	32.0%	17.5%	20.0%	39.2%	29.5%	6.7%	25.2%	24.7%
2011	24.7%	29.5%	12.5%	43.1%	33.6%	7.5%	25.2%	24.9%
2012	29.8%	26.3%	17.9%	30.8%	23.2%	8.2%	25.7%	25.8%
2013	24.0%	25.3%	11.4%	28.1%	26.4%	7.9%	25.5%	25.3%
2014	26.5%	21.3%	17.5%	29.0%	21.1%	7.9%	25.5%	26.9%
2015	25.5%	18.3%	13.8%	24.7%	21.2%	6.7%	25.0%	27.4%
2016	26.2%	19.1%	2.4%	22.8%	26.9%	7.7%	25.9%	27.3%
2017	25.7%	22.7%	22.1%	26.4%	32.6%	5.3%	26.3%	26.3%
2018	24.5%	19.7%	13.1%	17.8%	18.2%	7.0%	25.6%	26.1%
2019	29.3%	18.6%	13.5%	21.4%	18.8%	8.2%	25.2%	25.3%
2020	23.4%	15.4%	11.4%	19.7%	23.1%	8.5%	22.9%	23.0%
2021	24.8%	16.0%	8.8%	14.5%	16.7%	9.3%	22.6%	22.1%
2022	17.2%	9.7%	4.8%	14.3%	0.0%	8.8%	16.7%	16.6%
Total	**24.7%**	**19.9%**	**13.2%**	**22.7%**	**25.9%**	**7.8%**	**24.6%**	**24.6%**

8.2.7 Trends in open access research: IMI project research compared with selected comparators

Figure 8.2.13 shows annual trends in the percentage of open access papers between 2010 and 2022 for IMI and the selected comparators. Figure 8.2.14 shows the total percentage of open access papers between 2010 and 2022 for IMI and the selected comparators. Table 8.2.8 shows the same data as in Figure 8.2.13 and Figure 8.2.14.[24]

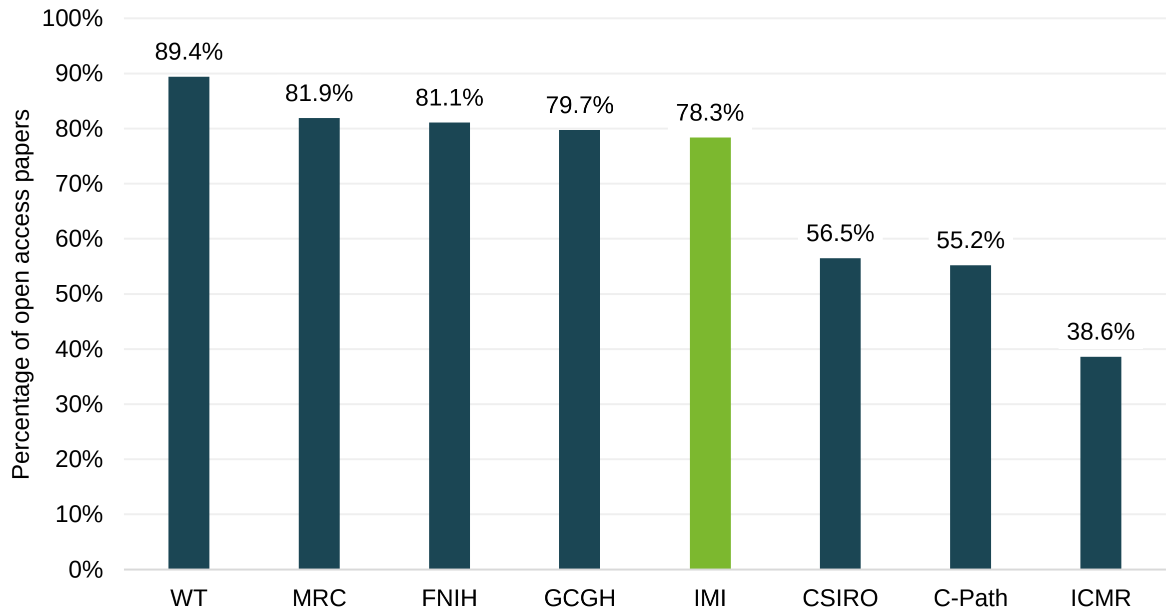
Figure 8.2.13 Trends in open access papers – IMI project research compared with selected comparators, 2010-2022



- IMI and most of the comparators have increased their output of open access papers between 2010 and 2022, except for FNIH which continues its downward trend.

[24] The Web of Science open access data come from the Directory of Open Access Journals (DOAJ) and collaborations with Impact Story and Our Research's Unpaywall services. The Web of Science therefore provides unrivalled coverage of open access publications that are published through DOAJ Gold, Other Gold, Green Published, Green Accepted or Bronze routes. It is also possible that some publishers make publications available without following a recognised open access route. In these cases publications will not be indexed as open access in the Web of Science or in this report.

Figure 8.2.14 Total percentage of open access papers – IMI project research compared with selected comparators, 2010-2022



- Most organisations, including IMI, have published more than half of their publications as open access. IMI had a lower share of open access papers compared to FNIH, GCGH, MRC, and WT.
- WT has the highest total percentage of open access papers (89.4%) between 2010 and 2022. In contrast ICMR, had the lowest percentage of open access papers (38.6%).
- FNIH ranks third in this year's report which is a change from the thirteenth report where it ranked second. This is likely due to its downward trend which began in 2017.

Table 8.2.8 Percentage of open access papers – IMI project research compared with selected comparators, 2010-2022

YEAR	IMI	CSIRO	C-PATH	FNIH	GCGH	ICMR	MRC	WT
2010	40.0%	40.4%	40.0%	85.1%	76.3%	28.9%	61.0%	78.0%
2011	58.8%	34.6%	43.8%	83.5%	76.0%	30.0%	62.7%	78.6%
2012	58.3%	53.7%	33.3%	80.8%	70.4%	29.6%	66.4%	80.7%
2013	56.1%	47.0%	40.0%	80.3%	72.6%	35.3%	71.1%	84.4%
2014	54.7%	57.4%	45.0%	86.6%	80.7%	36.1%	75.6%	87.4%
2015	66.6%	49.0%	58.5%	85.3%	85.0%	36.1%	81.1%	89.3%
2016	72.8%	57.3%	61.9%	81.2%	94.2%	39.8%	88.4%	93.1%
2017	75.1%	60.0%	57.4%	86.7%	93.0%	39.8%	92.0%	94.5%
2018	81.9%	59.2%	59.0%	86.9%	100.0%	40.9%	92.3%	94.4%
2019	84.4%	54.3%	59.6%	84.5%	81.3%	43.1%	91.8%	94.7%
2020	89.0%	72.5%	61.4%	82.9%	92.3%	43.8%	91.4%	93.5%
2021	88.6%	72.6%	76.5%	77.5%	83.3%	43.4%	91.4%	92.8%
2022	86.7%	66.7%	64.3%	59.8%	100.0%	40.0%	88.3%	90.1%
Total	**78.3%**	**56.5%**	**55.2%**	**81.1%**	**79.7%**	**38.6%**	**81.9%**	**89.4%**

8.3 Summary of bibliometric indicators: IMI project research compared with selected comparators

Although IMI has only been funding research for just over a decade, its performance is on par with well-established funding bodies that have been operating for much longer, like the MRC and the Wellcome Trust, as indicated by comparable citation impacts, and percentages of highly cited papers (Table 8.3.1).

Table 8.3.1 Summary of bibliometric indicators – IMI project research compared with selected comparators, 2010-2022

PROJECT	NUMBER OF PAPERS	CITATION IMPACT (NORMALISED AT FIELD LEVEL)	PERCENTAGE OF UNCITED PAPERS	PERCENTAGE OF HIGHLY CITED PAPERS
IMI	8,896	2.03	7.3%	25.3%
C-Path	574	1.32	7.3%	13.2%
CSIRO	1,075	1.66	5.7%	19.9%
FNIH	5,256	1.83	7.8%	22.7%
GCGH	895	1.87	1.1%	25.9%
ICMR	19,541	0.84	12.7%	7.8%
MRC	133,787	2.09	4.4%	24.6%
WT	97,110	2.07	5.9%	24.6%

Annex 1: Bibliometrics and citation analysis

Bibliometrics are about publications and their citations. The academic field emerged from ‘information science’ and now usually refers to the methods used to study and index texts and information.

Publications cite other publications. These citation links grow into networks, and their numbers are likely to be related to the significance or impact of the publication. The meaning of the publication is determined from keywords and content. Citation analysis and content analysis have therefore become a common part of bibliometric methodology. Historically, bibliometric methods were used to trace relationships amongst academic journal citations. Now, bibliometrics are important in indexing research performance.

Bibliometric data have characteristics of which the user should be aware, and these are considered here.

Journal papers (publications, sources) report research work. Papers refer to or ‘cite’ earlier work relevant to the material being reported. New papers are cited in their turn. Papers that accumulate more citations are thought of as having greater ‘impact’, which is interpreted as significance or influence on their field. Citation counts are therefore recognised as a measure of impact, which can be used to index the excellence of the research from a particular group, institution or country.

The origins of citation analysis as a tool that could be applied to research performance can be traced to the mid-1950s, when Eugene Garfield proposed the concept of citation indexing and introduced the Science Citation Index, the Social Sciences Citation Index and the Arts & Humanities Citation Index, produced by the Institute of Scientific Information (now Clarivate).[25]

We can count citations, but they are only ‘indicators’ of impact and quality – not metrics. Most impact indicators use average citation counts from groups of papers, because some individual papers may have unusual or misleading citation profiles. These outliers are diluted in larger samples.

Data source

The data we use come from the Clarivate Web of Science databases which give access not only to journals but also to conference proceedings, books, patents, websites, and chemical structures, compounds and reactions. It has a unified structure that integrates all data and search terms together and therefore provides a level of comparability not found in other databases. It is widely acknowledged to be the world’s leading source of citation and bibliometric data. The Clarivate Web of Science Core Collection is part of the Web of Science and focuses on research published in journals and conferences in science, medicine, arts, humanities and social sciences.

The Web of Science was originally created as an awareness and information retrieval tool but it has acquired an important primary use as a tool for research evaluation, using citation analysis and bibliometrics. Data coverage is both current and retrospective in the sciences, social sciences, arts and humanities, in some cases back to 1900. Within the research community this data source was previously referred to by the acronym ‘ISI’.

[25] Garfield, E (1955) Citation Indexes for Science – New dimension in documentation through association of ideas. *Science*: **122**, 108-111.

Unlike other databases, the Web of Science and underlying databases are selective, that is: the journals abstracted are selected using rigorous editorial and quality criteria. The authoritative, multidisciplinary content covers over 21,000 of the highest impact journals worldwide, including open access journals, and over 300,000 conference proceedings. The abstracted journals encompass the majority of significant, frequently cited scientific reports and, more importantly, an even greater proportion of the scientific research output which is cited. This selective process ensures that the citation counts remain relatively stable in given research fields and do not fluctuate unduly from year to year, which increases the usability of such data for performance evaluation.

Clarivate has extensive experience with databases on research inputs, activity and outputs and has developed innovative analytical approaches for benchmarking and interpreting international, national and institutional research impact.

Database categories

The source data can be grouped in various classification systems. Most of these are based on groups of journals that have a relatively high cross-citation linkage and naturally cluster together. Custom classifications use subject maps in third-party data such as the OECD categories set out in the Frascati manual.

Clarivate frequently uses the broader field categories in the InCites: Essential Science Indicators™ and the finer journal categories in the Web of Science. There are 22 fields in Essential Science Indicators and 254 fields in Web of Science. In either case, our bibliometric analyses draw on the full range of data available in the underlying database, so analyses in our reports will differ slightly from anything created 'on the fly' from data in the web interface.

The lists of journal categories in these systems are listed at the end of this annex.

Most analyses start with an overall view across the data, then move to a view across broad categories and only then focus in at a finer level in the areas of greatest interest to policy, programme or organisational purpose.

Assigning papers to addresses

A paper is assigned to each country and each organisation whose address appears at least once for any author on that paper. One paper counts once and only once for each assignment, however many address variants occur for the country or organisation. No weighting is applied.

For example, a paper has five authors, thus:

AUTHOR	ORGANISATION	COUNTRY		
Gurney, KA	Univ Leeds	UK	**Counts for Univ Leeds**	**Counts for UK**
Adams, J	Univ Leeds	UK	No gain for Univ Leeds	No gain for UK
Kochalko, D	Univ C San Diego	USA	**Counts for UCSD**	**Counts for USA**
Munshi, S	Gujarat Univ	India	**Counts for Gujarat Univ**	**Counts for India**
Pendlebury, D	Univ Oregon	USA	**Counts for Univ Oregon**	No gain for USA

So, this one paper with five authors would be included once in the tallies for each of four universities and once in the tallies for each of three countries.

Work carried out within Clarivate, and research published elsewhere, indicates that fractional weighting based on the balance of authors by organisation and country makes little difference to the conclusions of an analysis at an aggregate level. Such fractional analysis can introduce unforeseen errors in the attempt to create a detailed but uncertain assignment. Partitioning credit would make a greater difference at a detailed, group level but the analysis can then be manually validated.

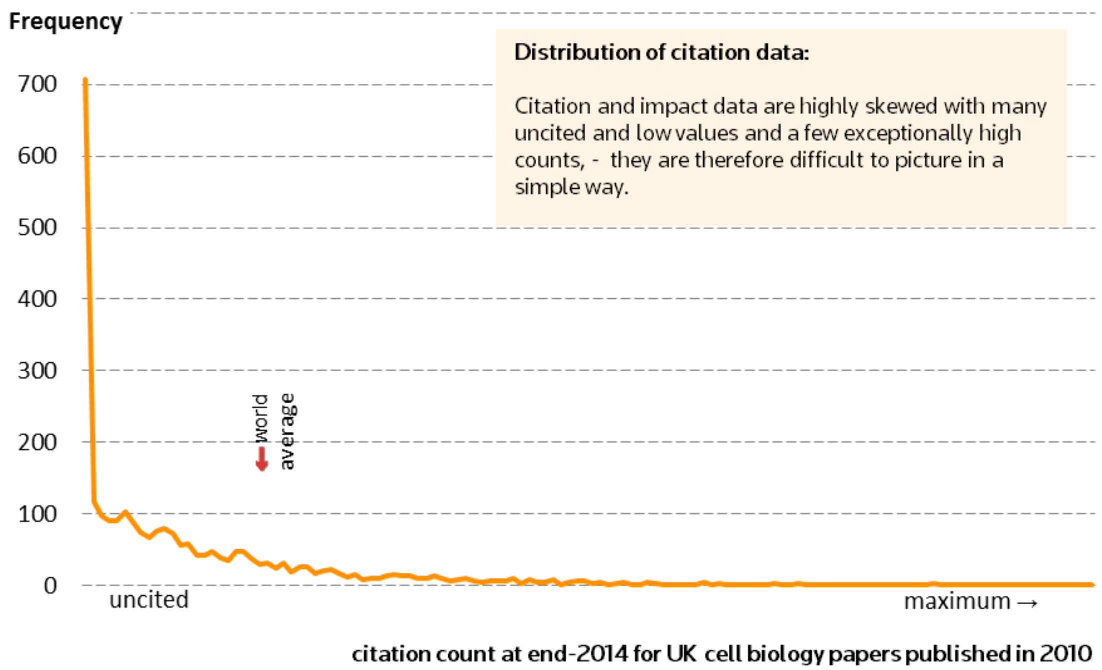
Citation counts

A publication accumulates citation counts when it is referred to by more recent publications. Some papers get cited frequently and many get cited rarely or never, so the distribution of citations is highly skewed.

Why are many papers never cited? Certainly, some papers remain uncited because their content is of little or no impact, but that is not the only reason. It might be because they have been published in a journal not read by researchers to whom the paper might be interesting. It might be that they represent important but ‘negative’ work reporting a blind alley to be avoided by others. The publication may be a commentary in an editorial, rather than a normal journal article and thus of general rather than research interest. Or it might be that the work is a ‘sleeping beauty’ that has yet to be recognised for its significance.

Other papers can be very highly cited: hundreds, even thousands of times. Again, there are multiple reasons for this. Most frequently cited work is being recognised for its innovative significance and impact on the research field of which it speaks. Impact here is a good reflection of quality: it is an indicator of excellence. But there are other papers which are frequently cited because their significance is slightly different: they describe key methodology; they are a thoughtful and wide-ranging review of a field; or they represent contentious views which others seek to refute.

Citation analysis cannot make value judgments about why an article is uncited nor about why it is highly cited. The analysis can only report the citation impact that the publication has achieved. We normally assume, based on many other studies linking bibliometric and peer judgments, that high citation counts correlate on average with the quality of the research.



The figure shows the skewed distribution of more or less frequently cited papers from a sample of UK authored publications in cell biology. The skew in the distribution varies from field to field. It is to compensate for such factors that actual citation counts must be normalised, or rebased, against a world baseline.

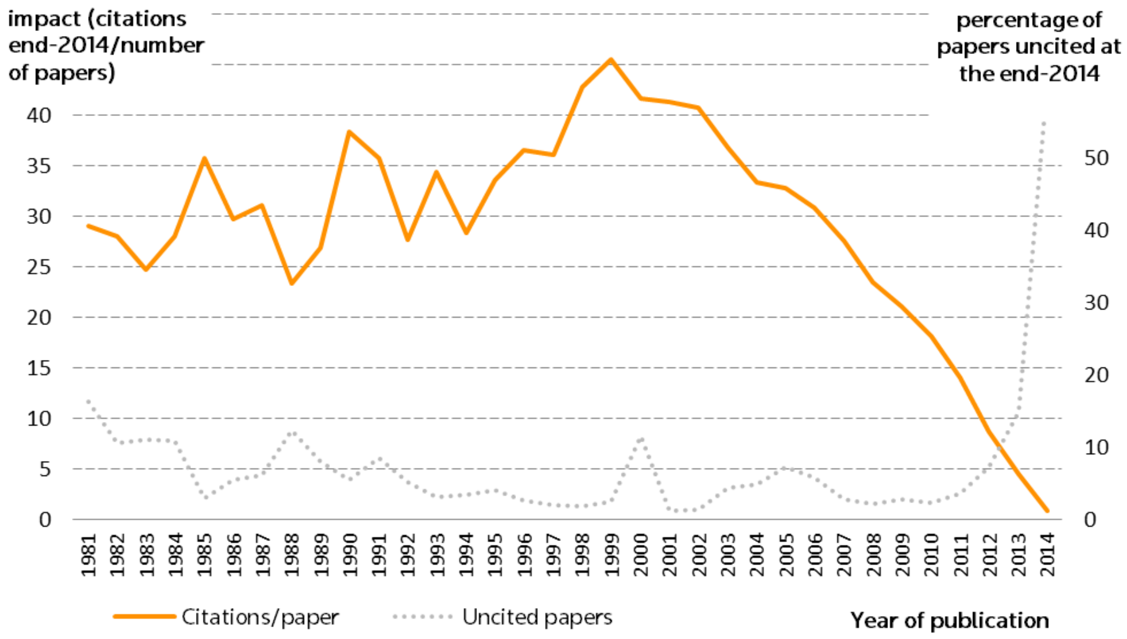
We do not seek to account separately for the effect of self-citation. If the citation count is significantly affected by self-citation then the paper is likely to have been infrequently cited. This is therefore only of consequence for low impact activity. Studies show that for large samples at national and organisational level the effect of self-citation has little or no effect on the analytical outcomes and would not alter interpretation of the results.

Time factors

Citations accumulate over time. Older papers therefore have, on average, more citations than more recent work. The graph below shows the pattern of citation accumulation for a set of 33 journals in the journal category ***Materials Science, Biomaterials***. Papers less than eight years old are, on average, still accumulating additional citations. The citation count goes on to reach a plateau for older sources.

The graph shows that the percentage of papers that have never been cited drops over about five years. Beyond five years, between 5% and 10% or more of papers remain uncited.

Account must be taken of these time factors in comparing current research with historical patterns. For these reasons, it is sometimes more appropriate to use a fixed five-year window of papers and citations to compare two periods than to look at the longer-term profile of citations and of uncitedness for a recent year and an historical year.



Discipline factors

Citation rates vary between disciplines and fields. For the UK science base, ten years produces a general plateau beyond which few additional citations would be expected. Overall, citations accumulate more rapidly and plateau at a higher level in biological sciences than physical sciences, and natural sciences generally cite at a higher rate than social sciences.

Papers are assigned to disciplines (journal categories or research fields) by Clarivate, bringing cognate research areas together. The journal category classification scheme was revised and updated in 2007. Before 2007, journals were assigned to the older, well established Current Contents categories which were informed by extensive work by Thomson and with the research community since the early 1960s. This scheme has been superseded by the 252 Web of Science journal categories which allow for greater disaggregation for the growing volume of research which is published and abstracted.

Papers are allocated according to the journal in which the paper is published. Some journals may be part of the publication record for more than one research field. As the example below illustrates, the journal *Acta Biomaterialia* is assigned to two journal categories: ***Materials Science, Biomaterials and Engineering, Biomedical.***

Very few papers are not assigned to any research field and as such will not be included in specific analyses using normalised citation impact data. The journals included in the Clarivate databases and how they are selected are detailed here: mjl.clarivate.com.

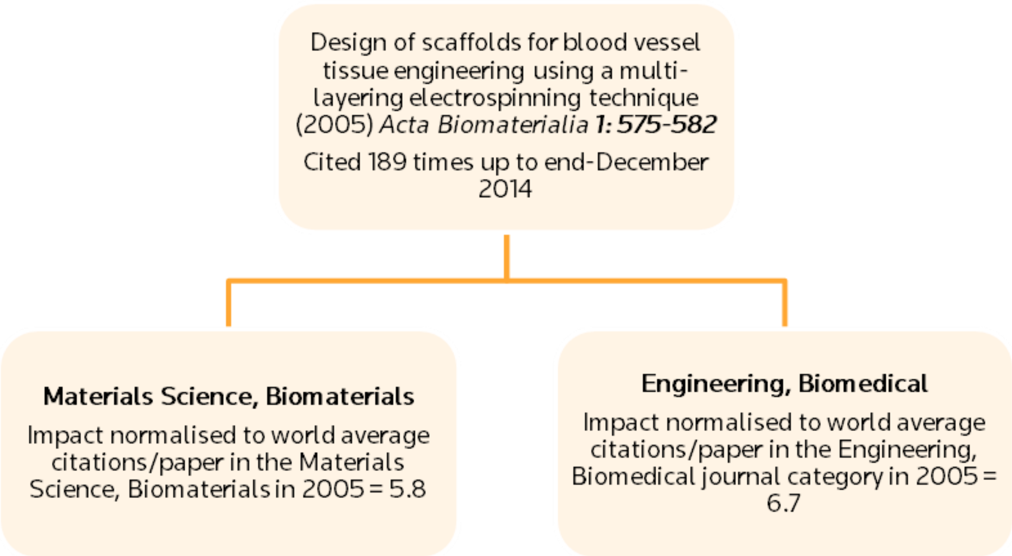
Some journals with a very diverse content, including the prestigious journals *Nature and Science* were classified as ***Multidisciplinary*** in databases created prior to 2007. The papers from these ***Multidisciplinary*** journals are now re-assigned to more specific research fields using an algorithm based on the research area(s) of the references cited by the article.

Normalised citation impact

Because citations accumulate over time at a rate that is dependent upon the field of research, all analyses must take both field and year into account. In other words, because the absolute citation count for a specific article is influenced by its field and by the year it was published, we can only make comparisons of indexed data after normalising with reference to these two variables.

We only use citation counts for reviews and articles in calculations of impact, because document type influences the citation count. For example, a review will often be cited more frequently than an article in the same field, but editorials and meeting abstracts are rarely cited and citation rates for conference proceedings are extremely variable. The most common normalisation factors are the average citations per paper for (1) the year and (2) either the field or the journal in which the paper was published. This normalisation is also referred to as ‘rebasing’ the citation count.

Impact is therefore most commonly analysed in terms of ‘normalised impact’, or NCI. The following schematic illustrates how the normalised citation impact is calculated at paper level and journal category level.



This article in the journal *Acta Biomaterialia* is assigned to two journal categories: ***Materials Science, Biomaterials*** and ***Engineering, Biomedical***. The world average baselines for, as an example, ***Materials science, Biomaterials*** are calculated by summing the citations to all the articles and reviews published worldwide in the journal *Acta Biomaterialia* and the other 32 journals assigned to this category for each year and dividing this by the total number of articles and reviews published in the journal category. This gives the category-specific normalised citation impact (in the above example the category-specific field-normalised citation impact for ***Materials Science, Biomaterials*** is 5.8 and the category-specific field-normalised citation impact for ***Engineering, Biomedical*** is higher at 6.7). Most papers (nearly two-thirds) are assigned to a single journal category whilst a minority are assigned to more than 5.

Citation data provided by Clarivate are assigned on an annual census date referred to as the Article Time Period. For most publications, the Article Time Period is the same as the year of publication, but for a few publications (especially those published at the end of the calendar year in less main-stream journals) the Article Time Period may vary from the actual year of publication.

World average impact data are sourced from the Clarivate National Science Indicators baseline data for 2016.

Mean normalised citation impact

Research performance has historically been indexed by using average citation impact, usually compared to a world average that accounts for time and discipline. As noted, however, the distribution of citations amongst papers is highly skewed because many papers are never cited while a few papers accumulate very large citation counts. That means that an average may be misleading if assumptions are made about the distribution of the underlying data.

In fact, almost all research activity metrics are skewed: for research income, PhD numbers and publications there are many low activity values and a few exceptionally high values. Therefore, the skewed distribution means that average impact tends to be greater than and often significantly different from either the median or mode in the distribution. This should be borne in mind when reviewing analytical outcomes.

The average (normalised) citation impact can be calculated at an individual paper level where it can be associated with more than one journal category. It can also be calculated for a set of papers at any level from a single country to an individual researcher's output. In the example above, the average citation impact of the Acta Biomaterialia paper can be expressed as ((5.8 + 6.7)/2) = 6.3.

What are uncited papers?

It may be a surprise that some journal papers are never subsequently cited after publication, even by their authors. This accounts for about half the total global output for a typical, recent 10-year period. We cannot tell why papers are not cited. It is likely that a significant proportion of papers remain uncited because they are reporting negative results which are an essential matter of record in their field but make the content less likely to be referenced in other papers. Inevitably, other papers are uncited because their content is trivial or marginal to the mainstream. However, it should not be assumed that this is the case for all such papers.

There is variation in non-citation between countries and between fields. For example, relatively more engineering papers tend to remain uncited than papers in other sciences, indicative of a disciplinary factor but not a quality factor. While there is also an obvious increase in the likelihood of citation over time, most papers that are going to be cited will be cited within a few years of publication.

Journal category systems used in our analyses

Web of Science

Acoustics
Agricultural economics & policy
Agricultural engineering
Agriculture, dairy & animal science
Agriculture, multidisciplinary
Agriculture, soil science
Agronomy
Allergy
Anatomy & morphology
Andrology
Anesthesiology
Anthropology
Applied linguistics
Archaeology
Architecture
Area studies
Art
Asian studies
Astronomy & astrophysics
Automation & control systems
Behavioral sciences
Biochemical research methods
Biochemistry & molecular biology
Biodiversity conservation
Biology
Biology, miscellaneous
Biophysics
Biotechnology & applied microbiology
Business
Business, finance
Cardiac & cardiovascular systems
Cell biology
Chemistry, analytical
Chemistry, applied
Chemistry, inorganic & nuclear
Chemistry, medicinal
Chemistry, multidisciplinary
Chemistry, organic
Chemistry, physical
Classics
Clinical neurology
Communication
Computer science, artificial intelligence
Computer science, cybernetics
Computer science, hardware & architecture
Computer science, information systems
Computer science, interdisciplinary applications
Computer science, software engineering
Computer science, theory & methods
Construction & building technology
Criminology & penology
Critical care medicine
Crystallography
Dance
Demography
Dentistry, oral surgery & medicine
Dermatology
Developmental biology
Ecology
Economics
Education & educational research
Education, scientific disciplines
Education, special
Electrochemistry
Emergency medicine
Endocrinology & metabolism
Energy & fuels
Engineering, aerospace
Engineering, biomedical
Engineering, chemical
Engineering, civil
Engineering, electrical & electronic
Engineering, environmental
Engineering, geological
Engineering, industrial
Engineering, manufacturing
Engineering, marine
Engineering, mechanical
Engineering, multidisciplinary
Engineering, ocean
Engineering, petroleum
Entomology
Environmental sciences
Environmental studies
Ergonomics
Ethics
Ethnic studies
Evolutionary biology
Family studies
Film, radio, television
Fisheries
Folklore
Food science & technology
Forestry
Gastroenterology & hepatology
Genetics & heredity
Geochemistry & geophysics
Geography
Geography, physical
Geology
Geosciences, multidisciplinary
Geriatrics & gerontology
Health care sciences & services
Health policy & services
Hematology
History
History & philosophy of science
History of social sciences
Horticulture
Humanities, multidisciplinary
Imaging science & photographic technology
Immunology
Industrial relations & labor
Infectious diseases
Information & library science
Instruments & instrumentation
Integrative & complementary medicine
International relations
Language & linguistics
Language & linguistics theory
Law
Limnology
Linguistics
Literary reviews
Literary theory & criticism
Literature
Mining & mineral processing
Multidisciplinary sciences
Music
Mycology
Nanoscience & nanotechnology
Neuroimaging
Neurosciences
Nuclear science & technology
Psychology
Psychology, applied
Psychology, biological
Psychology, clinical
Psychology, developmental
Psychology, educational
Psychology, experimental
Psychology, mathematical
Psychology, multidisciplinary

Literature, African, Australian, Canadian
Literature, American
Literature, British Isles
Literature, German, Dutch, Scandinavian
Literature, romance
Literature, Slavic
Management
Marine & freshwater biology
Materials science, biomaterials
Materials science, ceramics
Materials science, characterization & testing
Materials science, coatings & films
Materials science, composites
Materials science, multidisciplinary
Materials science, paper & wood
Materials science, textiles
Math & computational biology
Mathematics
Mathematics, applied
Mathematics, interdisciplinary applications
Mechanics
Medical ethics
Medical informatics
Medical laboratory technology
Medicine, general & internal
Medicine, legal
Medicine, research & experimental
Medieval & renaissance studies
Metallurgy & metallurgical engineering
Meteorology & atmospheric sciences
Microbiology
Microscopy
Mineralogy
Urban studies
Urology & nephrology
Veterinary
Veterinary sciences
Virology
Water resources
Women's studies
Zoology

Nursing
Nutrition & dietetics
Obstetrics & gynecology
Oceanography
Oncology
Operations research & management science
Ophthalmology
Optics
Ornithology
Orthopedics
Otorhinolaryngology
Paleontology
Parasitology
Pathology
Pediatrics
Peripheral vascular disease
Pharmacology & pharmacy
Philosophy
Physics, applied
Physics, atomic, molecular & chemical
Physics, condensed matter
Physics, fluids & plasmas
Physics, mathematical
Physics, multidisciplinary
Physics, nuclear
Physics, particles & fields
Physiology
Planning & development
Plant sciences
Poetry
Political science
Polymer science
Psychiatry

Psychology, psychoanalysis
Psychology, social
Public administration
Public, environmental & occupational health
Radiology, nuclear medicine & medical imaging
Rehabilitation
Religion
Remote sensing
Reproductive biology
Respiratory system
Rheumatology
Robotics
Social issues
Social sciences, biomedical
Social sci, interdisciplinary
Social sci, mathematical methods
Social work
Sociology
Soil science
Spectroscopy
Sport sciences
Statistics & probability
Substance abuse
Surgery
Telecommunications
Theater
Thermodynamics
Toxicology
Transplantation
Transportation
Transportation science & technology
Tropical medicine

ESSENTIAL SCIENCE INDICATORS

Agricultural Sciences

Biology & Biochemistry

Chemistry

Clinical Medicine

Computer Science

Ecology/Environment

Economics & Business

Education

Engineering

Geosciences

Immunology

Law

Materials Science

Mathematics

Microbiology

Molecular Biology & Genetics

Multidisciplinary

Neurosciences & Behaviour

Pharmacology

Physics

Plant & Animal Science

Psychology/Psychiatry

Social Sciences, general

Space Science

Annex 2: Biomedically related journal categories

This Annex lists the Web of Science journal categories which capture biomedically related publications.

Allergy
Anaesthesiology
Anatomy & Morphology
Andrology
Audiology & Speech-Language Pathology
Behavioural Sciences
Cardiac & Cardiovascular Systems
Cell & Tissue Engineering
Clinical Neurology
Critical Care Medicine
Dentistry, Oral Surgery & Medicine
Dermatology
Emergency Medicine
Endocrinology & Metabolism
Ergonomics
Gastroenterology & Hepatology
Geriatrics & Gerontology
Gerontology
Haematology
Health Care Sciences & Services
Health Policy & Services
Immunology
Infectious Diseases
Integrative & Complementary Medicine
Medical Ethics
Medical Informatics
Medical Laboratory Technology
Medicine, General & Internal
Medicine, Legal
Medicine, Research & Experimental
Neuroimaging
Neurosciences
Nursing
Nutrition & Dietetics
Obstetrics & Gynaecology
Oncology
Ophthalmology
Orthopaedics
Otorhinolaryngology
Paediatrics
Pathology
Peripheral Vascular Disease
Pharmacology & Pharmacy
Physiology
Primary Health Care
Psychiatry
Psychology
Psychology, Applied
Psychology, Biological
Psychology, Clinical
Psychology, Developmental
Psychology, Educational
Psychology, Experimental
Psychology, Mathematical
Psychology, Psychoanalysis
Psychology, Social
Public, Environmental & Occupational Health
Radiology, Nuclear Medicine & Medical Imaging
Rehabilitation
Reproductive Biology
Respiratory System
Rheumatology
Substance Abuse
Surgery
Transplantation
Tropical Medicine
Urology & Nephrology
Virology

Annex 3: Total number of publications from IMI projects between 2010 and 2022 by country

COUNTRY	NUMBER OF PUBLICATIONS
UK	4,253
Germany	3,160
Netherlands	2,483
USA	2,392
Sweden	1,599
France	1,584
Italy	1,448
Spain	1,256
Switzerland	1,201
Belgium	1,017
Denmark	727
Canada	649
Austria	579
Finland	457
Australia	374
Peoples R China	361
Norway	293
Greece	284
Ireland	229
Poland	198
Japan	182
Portugal	179
Brazil	153
Israel	143
Singapore	116
Hungary	105
South Africa	97
Luxembourg	85
Czech Republic	81

COUNTRY	NUMBER OF PUBLICATIONS
Estonia	75
India	67
South Korea	62
Saudi Arabia	62
Iceland	56
Turkey	51
Taiwan	49
Lithuania	48
Egypt	44
Slovenia	43
New Zealand	41
Croatia	38
Cyprus	37
Russia	31
Argentina	30
Romania	29
Serbia	23
Chile	22
Thailand	21
Qatar	21
Kenya	21
Iran	18
Mexico	17
Latvia	16
Palestine	13
Bulgaria	11
Sierra Leone	11
Lebanon	11
Tanzania	10
Uganda	10
Vietnam	10
Ukraine	10
Colombia	9
Pakistan	8
U Arab Emirates	7
Malaysia	7

COUNTRY	NUMBER OF PUBLICATIONS
Nigeria	7
Uruguay	7
Guinea	7
Georgia	7
Philippines	7
Kuwait	7
Malta	7
Liechtenstein	7
DEM REP CONGO	6
Gabon	6
Iraq	6
Peru	6
Slovakia	6
Tunisia	6
Gambia	5
Mali	5
Sri Lanka	5
Mozambique	5
Burkina Faso	5
Jordan	5
BELARUS	4
Bangladesh	4
Senegal	4
Cote Ivoire	3
Liberia	3
Guatemala	3
Ghana	3
Malawi	3
Monaco	3
Nepal	2
Armenia	2
Bosnia & Herceg	2
Mongolia	2
Kazakhstan	2
North Macedonia	2
Ethiopia	2

COUNTRY	NUMBER OF PUBLICATIONS
Moldova	2
Oman	2
Rwanda	2
Indonesia	2
Bahrain	1
Niger	1
Macedonia	1
Libya	1
Algeria	1
Kosovo	1
Ecuador	1
Albania	1
Zambia	1
Costa Rica	1
Cook Islands	1
Cameroon	1
Cambodia	1
Burundi	1
Botswana	1
Zimbabwe	1
Bolivia	1
Bhutan	1
Benin	1
Uzbekistan	1
Morocco	1

Annex 4: Total number of publications, papers and open access papers and impact between 2010 and 2022 by project

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
BTCure	727	679	464	68.3%	1.78
EU-AIMS	610	589	492	83.5%	1.97
ULTRA-DD	452	444	381	85.8%	1.81
EMIF	354	333	284	85.3%	2.42
AIMS-2-TRIALS	310	292	269	92.1%	2.92
INNODIA	242	200	177	88.5%	1.50
BigData@Heart	238	211	202	95.7%	2.61
NEWMEDS	226	220	128	58.2%	2.00
CANCER-ID	212	183	142	77.6%	3.14
RTCure	191	166	135	81.3%	2.58
EUbOPEN	185	179	138	77.1%	1.66
EUROPAIN	184	182	77	42.3%	2.57
ORBITO	171	168	63	37.5%	1.69
TRANSLOCATION	168	168	113	67.3%	1.30
U-BIOPRED	158	101	75	74.3%	2.39
STEMBANCC	155	149	124	83.2%	1.89
IMIDIA	151	141	118	83.7%	1.63
SUMMIT	149	143	109	76.2%	1.39
ELF	141	139	120	86.3%	1.11
RHAPSODY	137	115	107	93.0%	1.92
SPRINTT	132	125	72	57.6%	1.94
CHEM21	132	129	66	51.2%	1.70
BEAT-DKD	126	116	103	88.8%	1.86
PreDiCT-TB	125	119	111	93.3%	1.15
COMBACTE-NET	119	109	92	84.4%	1.04
COMBACTE-MAGNET	117	106	90	84.9%	1.19
MIP-DILI	117	109	70	64.2%	1.71
RADAR-CNS	112	79	68	86.1%	1.80

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
DIRECT	111	84	74	88.1%	4.30
ABIRISK	104	83	52	62.7%	1.23
PRISM	104	91	77	84.6%	4.46
Quic-Concept	104	103	88	85.4%	5.13
PROTECT	101	99	46	46.5%	1.02
Pharma-Cog	97	91	40	44.0%	1.10
COMPACT	97	97	55	56.7%	1.88
eTOX	97	92	64	69.6%	1.79
DDMoRe	83	78	56	71.8%	1.15
INNODIA HARVEST	82	71	68	95.8%	1.31
LITMUS	81	69	58	84.1%	4.37
PRECISESADS	79	57	37	64.9%	1.36
AETIONOMY	77	74	60	81.1%	1.77
EPAD	76	71	63	88.7%	1.43
IMPRiND	76	73	64	87.7%	5.12
BioVacSafe	74	71	57	80.3%	1.13
Open PHACTS	74	71	64	90.1%	3.61
AMYPAD	73	65	62	95.4%	2.16
K4DD	72	70	51	72.9%	1.44
APPROACH	71	58	44	75.9%	2.02
ZAPI	70	67	63	94.0%	3.65
Onco Track	70	66	46	69.7%	2.16
RESCEU	68	64	60	93.8%	2.47
COMBACTE-CARE	67	62	54	87.1%	1.48
TransQST	67	59	50	84.7%	2.83
EHDEN	64	50	48	96.0%	2.31
MOBILISE-D	64	58	49	84.5%	1.33
MARCAR	61	60	44	73.3%	0.99
ENABLE	61	59	52	88.1%	1.42
DRIVE-AB	60	54	44	81.5%	1.24
eTRIKS	59	48	45	93.8%	2.00
iABC	58	40	31	77.5%	1.66
Hypo-RESOLVE	58	38	36	94.7%	0.88
FLUCOP	54	53	45	84.9%	1.57
DRAGON	53	46	43	93.5%	3.81

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
Predect	51	47	39	83.0%	2.80
PHAGO	50	49	49	100.0%	4.02
RAPP-ID	49	48	33	68.8%	0.81
GETREAL	46	40	29	72.5%	1.61
PREFER	46	30	30	100.0%	1.21
iPiE	42	41	29	70.7%	1.09
EBOVAC1	40	38	38	100.0%	1.76
3TR	39	33	26	78.8%	2.14
HARMONY	39	25	21	84.0%	1.32
IMI-PainCare	38	27	23	85.2%	1.59
eTRANSAFE	38	29	27	93.1%	3.12
EBiSC	37	34	32	94.1%	4.80
ADAPTED	37	35	31	88.6%	2.39
PROACTIVE	34	29	26	89.7%	2.23
IM2PACT	33	33	30	90.9%	1.94
ROADMAP	32	26	25	96.2%	0.87
SOPHIA	29	27	23	85.2%	2.30
PD-MitoQUANT	29	29	25	86.2%	1.70
TRISTAN	29	28	28	100.0%	1.41
CARE	29	27	27	100.0%	8.91
ADVANCE	29	28	25	89.3%	1.00
BIOMAP	28	24	21	87.5%	3.73
TransBioLine	26	24	23	95.8%	2.37
EbolaMoDRAD	26	25	17	68.0%	1.17
IDEA-FAST	25	14	11	78.6%	1.36
VAC2VAC	24	24	22	91.7%	0.42
EU-PEARL	24	18	17	94.4%	1.73
SAFE-T	23	21	9	42.9%	1.68
EHR4CR	23	20	16	80.0%	1.03
HIPPOCRATES	22	17	13	76.5%	1.77
DRIVE	22	21	18	85.7%	0.84
PERISCOPE	22	21	21	100.0%	1.12
EBOVAC2	22	22	22	100.0%	2.07
c4c	21	17	15	88.2%	0.76
CARDIATEAM	20	18	15	83.3%	3.97

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
EQIPD	19	12	10	83.3%	2.74
MACUSTAR	18	11	10	90.9%	1.33
ITCC-P4	18	18	16	88.9%	2.00
ConcePTION	18	16	15	93.8%	1.17
COMBACTE	17	16	10	62.5%	3.53
KRONO	17	14	13	92.9%	1.51
MOPEAD	17	17	16	94.1%	1.94
NeuroDeRisk	17	15	11	73.3%	0.94
WEB-RADR	17	16	14	87.5%	1.37
RADAR-AD	15	9	9	100.0%	1.20
ReSOLUTE	14	10	9	90.0%	0.76
NECESSITY	14	10	8	80.0%	2.59
VSV-EBOPLUS	14	13	11	84.6%	0.95
MAD-CoV 2	14	13	13	100.0%	5.48
T2EVOLVE	13	12	9	75.0%	2.50
ERA4TB	13	12	11	91.7%	0.92
VITAL	13	13	12	92.3%	0.65
VALUE-Dx	13	13	13	100.0%	1.72
iCONSENSUS	12	12	11	91.7%	1.04
VSV-EBOVAC	12	11	8	72.7%	0.78
COMBACTE-CDI	12	10	8	80.0%	0.85
EBOVAC3	11	11	11	100.0%	1.58
imSAVAR	11	10	10	100.0%	2.16
Immune-Image	10	9	9	100.0%	1.39
ImmUniverse	10	9	9	100.0%	2.19
DECISION	9	7	6	85.7%	2.12
Trials@Home	9	8	7	87.5%	1.92
FAIRplus	9	8	8	100.0%	1.07
PARADIGM	8	8	8	100.0%	1.24
EBODAC	8	8	8	100.0%	2.55
EUPATI	8	7	7	100.0%	0.69
EBiSC2	8	8	8	100.0%	1.67
OPTIMA	8	7	7	100.0%	1.61
PIONEER	8	7	7	100.0%	1.40
MELLODDY	7	4	4	100.0%	1.00

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
IMMUCAN	6	6	6	100.0%	0.51
SafeSciMET	5	4	2	50.0%	0.83
ARDAT	5	4	3	75.0%	0.41
BIGPICTURE	5	3	3	100.0%	1.53
COVID-RED	5	4	4	100.0%	1.23
DO->IT	5	5	5	100.0%	8.18
HARMONY PLUS	5	2	1	50.0%	2.76
PERSIST-SEQ	5	5	5	100.0%	1.97
ADAPT-SMART	4	4	2	50.0%	0.57
Inno4Vac	4	4	4	100.0%	0.98
VHFMoDRAD	4	4	4	100.0%	0.77
Eu2P	4	4	3	75.0%	4.09
EBOMAN	4	4	4	100.0%	4.20
NEURONET	3	2	2	100.0%	0.00
Screen4Care	3	2	2	100.0%	0.82
PREMIER	3	3	2	66.7%	1.01
STOPFOP	3	3	3	100.0%	1.18
PEVIA	3	2	2	100.0%	0.73
UNITE4TB	3	2	1	50.0%	2.12
Impentri	3	3	2	66.7%	0.68
ND4BB	3	3	3	100.0%	1.06
NGN-PET	2	2	2	100.0%	0.98
GetReal Initiative	2	2	0	0.0%	0.00
RespiriNTM	2	2	2	100.0%	1.33
EMTRAIN	2	1	0	0.0%	0.09
PROTECT-trial	2	2	1	50.0%	0.00
FACILITATE	2	1	1	100.0%	1.10
REsolution	2	1	1	100.0%	0.00
EBOVAC	1	1	1	100.0%	3.03
RealHOPE	1	1	1	100.0%	0.00
PRISM 2	1	1	0	0.0%	0.00
H2O	1	0	0	0.0%	n/a
ESCulab	1	0	0	0.0%	n/a
RespiriTB	1	1	1	100.0%	2.66
Pharmatrain	1	1	1	100.0%	0.13

PROJECT	NUMBER OF PUBLICATIONS	NUMBER OF PAPERS	NUMBER OF OPEN ACCESS PAPERS	% OF OPEN ACCESS PAPERS	FIELD-NORMALISED CITATION IMPACT
COMBINE	1	1	1	100.0%	0.15
FILODIAG	1	0	0	0.0%	n/a
Gravitate-Health	1	1	1	100.0%	0.00

Annex 5: Collaboration index for all IMI supported research projects

This Annex provides the calculation of the collaboration indicators for all IMI supported research projects with at least one paper. Collaboration index only calculated for projects with a Stability score and at least 20 papers.

PROJECT	CROSS-SECTOR SCORE	INTERNATIONAL SCORE	STABILITY SCORE	COLLABORATION INDEX	TOTAL PAPERS	CITATION IMPACT (FIELD-NORMALISED)
BTCure	0.64	0.52	0.85	2.01	679	1.78
EU-AIMS	0.73	0.65	0.83	2.22	589	1.97
ULTRA-DD	0.64	0.66	0.78	2.08	444	1.81
EMIF	0.83	0.70	0.85	2.38	333	2.42
AIMS-2-TRIALS	0.68	0.64	0.74	2.06	292	2.92
NEWMEDS	0.57	0.59	0.83	1.99	220	2.00
BigData@Heart	0.90	0.69	0.78	2.38	211	2.61
INNODIA	0.79	0.63	0.75	2.16	200	1.50
CANCER-ID	0.75	0.44	0.76	1.95	183	3.14
EUROPAIN	0.52	0.38	0.86	1.76	182	2.57
EUbOPEN	0.59	0.56	0.56	1.71	179	1.66
TRANSLOCATION	0.37	0.50	0.82	1.69	168	1.30
ORBITO	0.63	0.48	0.76	1.87	168	1.69
RTCure	0.81	0.48	0.71	2.00	166	2.58
STEMBANCC	0.50	0.48	0.83	1.81	149	1.89
SUMMIT	0.74	0.65	0.85	2.24	143	1.39
IMIDIA	0.53	0.50	0.84	1.87	141	1.63
ELF	0.40	0.51	0.80	1.71	139	1.11
CHEM21	0.22	0.28	0.83	1.34	129	1.70
SPRINTT	0.73	0.53	0.81	2.07	125	1.94
PreDiCT-TB	0.53	0.50	0.83	1.85	119	1.15
BEAT-DKD	0.72	0.70	0.76	2.19	116	1.86
RHAPSODY	0.64	0.69	0.80	2.13	115	1.92
MIP-DILI	0.67	0.46	0.83	1.96	109	1.71
COMBACTE-NET	0.80	0.58	0.86	2.24	109	1.04
COMBACTE-MAGNET	0.73	0.62	0.80	2.15	106	1.19
Quic-Concept	0.75	0.57	0.80	2.12	103	5.13
U-BIOPRED	0.82	0.74	0.87	2.43	101	2.39
PROTECT	0.96	0.63	0.86	2.45	99	1.02
COMPACT	0.28	0.46	0.75	1.49	97	1.88

PROJECT	CROSS-SECTOR SCORE	INTERNATIONAL SCORE	STABILITY SCORE	COLLABORATION INDEX	TOTAL PAPERS	CITATION IMPACT (FIELD-NORMALISED)
eTOX	0.30	0.36	0.86	1.53	92	1.79
Pharma-Cog	0.86	0.74	0.86	2.46	91	1.10
PRISM	0.79	0.73	0.78	2.30	91	4.46
DIRECT	0.76	0.74	0.85	2.36	84	4.30
ABIRISK	0.76	0.51	0.86	2.12	83	1.23
RADAR-CNS	0.67	0.72	0.84	2.23	79	1.80
DDMoRe	0.63	0.56	0.83	2.02	78	1.15
AETIONOMY	0.65	0.45	0.81	1.91	74	1.77
IMPRiND	0.63	0.61	0.80	2.04	73	5.12
BioVacSafe	0.46	0.48	0.81	1.76	71	1.13
Open PHACTS	0.61	0.56	0.85	2.02	71	3.61
INNODIA HARVEST	0.75	0.63	0.47	1.84	71	1.31
EPAD	0.77	0.68	0.87	2.32	71	1.43
K4DD	0.54	0.50	0.81	1.85	70	1.44
LITMUS	0.88	0.70	0.72	2.30	69	4.37
ZAPI	0.60	0.63	0.78	2.01	67	3.65
Onco Track	0.64	0.44	0.86	1.94	66	2.16
AMYPAD	0.89	0.77	0.75	2.42	65	2.16
RESCEU	0.80	0.71	0.69	2.20	64	2.47
COMBACTE-CARE	0.92	0.66	0.81	2.39	62	1.48
MARCAR	0.38	0.42	0.84	1.64	60	0.99
TransQST	0.61	0.64	0.74	1.99	59	2.83
ENABLE	0.63	0.50	0.82	1.94	59	1.42
APPROACH	0.83	0.82	0.85	2.50	58	2.02
MOBILISE-D	0.78	0.60	0.56	1.93	58	1.33
PRECISESADS	0.79	0.76	0.77	2.33	57	1.36
DRIVE-AB	0.74	0.64	0.72	2.10	54	1.24
FLUCOP	0.89	0.49	0.77	2.15	53	1.57
EHDEN	0.72	0.83	0.63	2.18	50	2.31
PHAGO	0.69	0.61	0.71	2.02	49	4.02
eTRIKS	0.79	0.89	0.77	2.46	48	2.00
RAPP-ID	0.33	0.43	0.87	1.64	48	0.81
Predect	0.66	0.64	0.81	2.11	47	2.80
DRAGON	0.89	0.74	0.48	2.11	46	3.81
iPiE	0.51	0.24	0.75	1.51	41	1.09
GETREAL	0.80	0.75	0.81	2.36	40	1.61
iABC	0.88	0.66	0.80	2.33	40	1.66
Hypo-RESOLVE	0.58	0.76	0.70	2.05	38	0.88

PROJECT	CROSS-SECTOR SCORE	INTERNATIONAL SCORE	STABILITY SCORE	COLLABORATION INDEX	TOTAL PAPERS	CITATION IMPACT (FIELD-NORMALISED)
EBOVAC1	0.71	0.66	0.85	2.22	38	1.76
ADAPTED	0.91	0.61	0.78	2.30	35	2.39
EBiSC	0.71	0.63	0.79	2.13	34	4.80
IM2PACT	0.52	0.42	0.56	1.50	33	1.94
3TR	0.85	0.55	0.66	2.06	33	2.14
PREFER	0.93	0.88	0.73	2.55	30	1.21
PD-MitoQUANT	0.72	0.53	0.69	1.94	29	1.70
eTRANSAFE	0.45	0.47	0.63	1.55	29	3.12
PROACTIVE	1.00	0.81	0.84	2.65	29	2.23
ADVANCE	0.86	0.83	0.79	2.48	28	1.00
TRISTAN	0.75	0.49	0.70	1.94	28	1.41
CARE	0.67	0.63	0.54	1.84	27	8.91
SOPHIA	0.78	0.64	0.36	1.78	27	2.30
IMI-PainCare	0.78	0.62	0.74	2.13	27	1.59
ROADMAP	0.85	0.78	0.70	2.32	26	0.87
EbolaMoDRAD	0.64	0.52	0.55	1.71	25	1.17
HARMONY	0.88	0.56	0.81	2.25	25	1.32
TransBioLine	0.88	0.49	0.59	1.96	24	2.37
BIOMAP	0.88	0.71	0.68	2.26	24	3.73
VAC2VAC	0.75	0.53	0.67	1.95	24	0.42
EBOVAC2	0.59	0.57	0.85	2.01	22	2.07
SAFE-T	0.95	0.54	0.86	2.35	21	1.68
PERISCOPE	0.43	0.44	0.77	1.64	21	1.12
DRIVE	0.90	0.35	0.74	1.99	21	0.84
EHR4CR	0.80	0.60	0.78	2.18	20	1.03
ITCC-P4	0.94	0.72	n/a	n/a	18	2.00
EU-PEARL	0.78	0.75	n/a	n/a	18	1.73
CARDIATEAM	1.00	0.96	n/a	n/a	18	3.97
MOPEAD	1.00	0.74	n/a	n/a	17	1.94
c4c	1.00	0.93	n/a	n/a	17	0.76
HIPPOCRATES	0.88	0.29	n/a	n/a	17	1.77
COMBACTE	0.50	0.11	n/a	n/a	16	3.53
ConcePTION	0.81	0.84	n/a	n/a	16	1.17
WEB-RADR	0.75	0.75	n/a	n/a	16	1.37
NeuroDeRisk	0.27	0.27	n/a	n/a	15	0.94
KRONO	0.43	0.13	n/a	n/a	14	1.51
IDEA-FAST	0.36	0.89	n/a	n/a	14	1.36
MAD-CoV 2	0.92	0.85	n/a	n/a	13	5.48

PROJECT	CROSS-SECTOR SCORE	INTERNATIONAL SCORE	STABILITY SCORE	COLLABORATION INDEX	TOTAL PAPERS	CITATION IMPACT (FIELD-NORMALISED)
VSV-EBOPLUS	0.69	0.77	n/a	n/a	13	0.95
VITAL	0.69	0.52	n/a	n/a	13	0.65
VALUE-Dx	0.77	0.83	n/a	n/a	13	1.72
iCONSENSUS	0.67	0.31	n/a	n/a	12	1.04
ERA4TB	0.67	0.56	n/a	n/a	12	0.92
EQIPD	0.50	0.58	n/a	n/a	12	2.74
T2EVOLVE	0.75	0.38	n/a	n/a	12	2.50
EBOVAC3	0.55	0.73	n/a	n/a	11	1.58
MACUSTAR	0.91	0.80	n/a	n/a	11	1.33
VSV-EBOVAC	0.55	0.64	n/a	n/a	11	0.78
COMBACTE-CDI	1.00	0.95	n/a	n/a	10	0.85
ReSOLUTE	0.70	0.50	n/a	n/a	10	0.76
imSAVAR	0.70	0.50	n/a	n/a	10	2.16
NECESSITY	1.00	0.80	n/a	n/a	10	2.59
RADAR-AD	0.89	0.44	n/a	n/a	9	1.20
ImmUniverse	1.00	0.72	n/a	n/a	9	2.19
Immune-Image	0.67	0.58	n/a	n/a	9	1.39
Trials@Home	0.63	0.44	n/a	n/a	8	1.92
PARADIGM	0.88	0.84	n/a	n/a	8	1.24
EBiSC2	1.00	0.94	n/a	n/a	8	1.67
FAIRplus	0.25	0.34	n/a	n/a	8	1.07
EBODAC	0.88	0.81	n/a	n/a	8	2.55
PIONEER	1.00	0.96	n/a	n/a	7	1.40
EUPATI	1.00	0.96	n/a	n/a	7	0.69
OPTIMA	0.71	0.86	n/a	n/a	7	1.61
DECISION	0.43	0.00	n/a	n/a	7	2.12
IMMUCAN	0.83	0.75	n/a	n/a	6	0.51
PERSIST-SEQ	0.80	0.20	n/a	n/a	5	1.97
DO->IT	0.80	0.85	n/a	n/a	5	8.18
SafeSciMET	1.00	1.00	n/a	n/a	4	0.83
MELLODDY	0.75	0.75	n/a	n/a	4	1.00
Inno4Vac	1.00	0.56	n/a	n/a	4	0.98
Eu2P	0.50	0.75	n/a	n/a	4	4.09
EBOMAN	1.00	0.94	n/a	n/a	4	4.20
COVID-RED	1.00	1.00	n/a	n/a	4	1.23
ARDAT	0.50	0.00	n/a	n/a	4	0.41
VHFMoDRAD	1.00	0.19	n/a	n/a	4	0.77
ADAPT-SMART	0.75	0.50	n/a	n/a	4	0.57

PROJECT	CROSS-SECTOR SCORE	INTERNATIONAL SCORE	STABILITY SCORE	COLLABORATION INDEX	TOTAL PAPERS	CITATION IMPACT (FIELD-NORMALISED)
PREMIER	1.00	1.00	n/a	n/a	3	1.01
ND4BB	0.67	0.58	n/a	n/a	3	1.06
Impentri	0.67	0.58	n/a	n/a	3	0.68
STOPFOP	0.67	0.92	n/a	n/a	3	1.18
BIGPICTURE	1.00	1.00	n/a	n/a	3	1.53
GetReal Initiative	1.00	1.00	n/a	n/a	2	0.00
RespiriNTM	0.00	0.38	n/a	n/a	2	1.33
HARMONY PLUS	1.00	1.00	n/a	n/a	2	2.76
Screen4Care	0.50	0.50	n/a	n/a	2	0.82
NEURONET	0.50	0.50	n/a	n/a	2	0.00
UNITE4TB	1.00	1.00	n/a	n/a	2	2.12
PEVIA	1.00	0.88	n/a	n/a	2	0.73
PROTECT-trial	1	0.5	n/a	n/a	2	0.00
NGN-PET	0.5	0.5	n/a	n/a	2	0.98
COMBINE	1	0	n/a	n/a	1	0.15
EBOVAC	1	1	n/a	n/a	1	3.03
FACILITATE	0	0.75	n/a	n/a	1	1.10
Gravitate-Health	1	1	n/a	n/a	1	0.00
PRISM 2	1	1	n/a	n/a	1	0.00
RealHOPE	1	0.75	n/a	n/a	1	0.00
Pharmatrain	1	1	n/a	n/a	1	0.13
RespiriTB	0	0	n/a	n/a	1	2.66
REsolution	0	0	n/a	n/a	1	0.00

Annex 6: Bibliography of hot papers and highly cited papers

This Annex provides bibliographic data for hot and highly cited papers. Hot papers are papers that receive citations soon after publication, relative to other papers of the same field and age. For the purpose of this report, highly cited papers have been defined as those articles and reviews which belong to the world's top decile of papers in that journal category and year of publication, when ranked by number of citations received. A percentage that is above 10 indicates above-average performance.

Papers are listed in ascending alphabetical order (project, first author) and unassigned papers, are listed at the end of each section.

This section lists papers that have been identified as current hot papers or that have been identified as highly cited in the IMI project publications published between 2010 and 2022.

HOT PAPERS ASSOCIATED WITH IMI PROJECTS

AIMS-2-TRIALS: Trubetskoy, Vassily et al. Mapping genomic loci implicates genes and synaptic biology in schizophrenia, NATURE 604: 502-+

AMYPAD: Frisoni, Giovanni B. et al. The probabilistic model of Alzheimer disease: the amyloid hypothesis revised, NAT REV NEUROSCI 23: 53-66

CARE: Vangeel, Laura et al. Remdesivir, Molnupiravir and Nirmatrelvir remain active against SARS-CoV-2 Omicron and other variants of concern, ANTIVIR RES 198:

DRAGON: Xie, Chenglong et al. Amelioration of Alzheimers disease pathology by mitophagy inducers identified via machine learning and a cross-species workflow, NAT BIOMED ENG 6: 76-+

EPAD: Frisoni, Giovanni B. et al. The probabilistic model of Alzheimer disease: the amyloid hypothesis revised, NAT REV NEUROSCI 23: 53-66

EUbOPEN: Attwood, Misty M. et al. Trends in kinase drug discovery: targets, indications and inhibitor design, NAT REV DRUG DISCOV 20: 839-861

EUROPAIN: Kosek, Eva et al. Chronic nociplastic pain affecting the musculoskeletal system: clinical criteria and grading system, PAIN 162: 2629-2634

FLUCOP: Blomberg, Bjorn et al. Long COVID in a prospective cohort of home-isolated patients, NAT MED 27: 1607-+

HARMONY: DAgostino, Mattia et al. Second Revision of the International Staging System (R2-ISS) for Overall Survival in Multiple Myeloma: A European Myeloma Network (EMN) Report Within the HARMONY Project, J CLIN ONCOL 40: 3406-+

IMI-PainCare: Kosek, Eva et al. Chronic nociplastic pain affecting the musculoskeletal system: clinical criteria and grading system, PAIN 162: 2629-2634

LITMUS: Pfister, Dominik et al. NASH limits anti-tumour surveillance in immunotherapy-treated HCC, NATURE 592: 450-456

PHAGO: Meinhardt, Jenny et al. Olfactory transmucosal SARS-CoV-2 invasion as a port of central nervous system entry in individuals with COVID-19, NAT NEUROSCI 24: 168-175

PRISM: Trubetskoy, Vassily et al. Mapping genomic loci implicates genes and synaptic biology in schizophrenia, NATURE 604: 502-+

RTCure: Haberman, Rebecca H. et al. Methotrexate hampers immunogenicity to BNT162b2 mRNA COVID-19 vaccine in immune-mediated inflammatory disease, ANN RHEUM DIS 80: 1339-1344

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