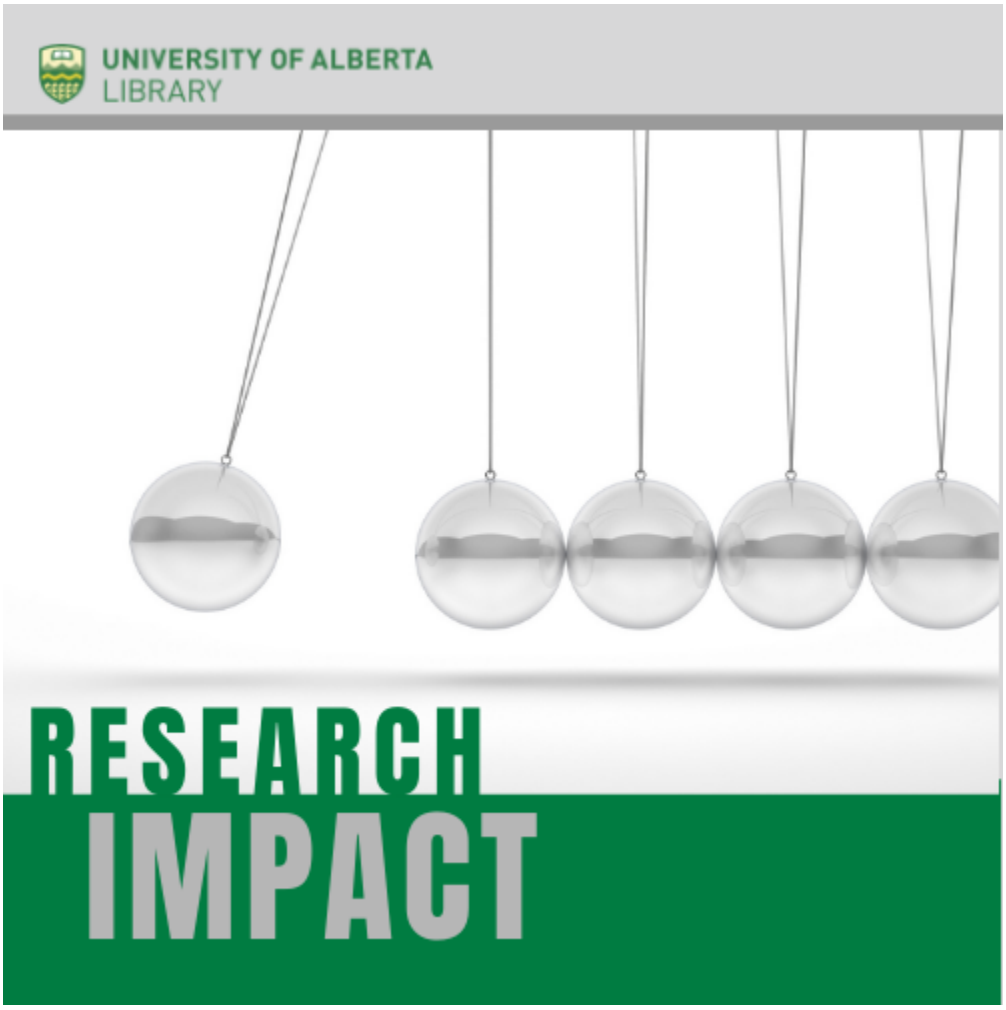

WCHRI Bibliometrics Report

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with thanks to Thane Chambers and Sonya Leung
for their assistance with data collection

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Highlights from this report

- 43 % Open Access Publications
- High annual publication output, especially in Pediatrics, Cardiovascular and Cardiology, and Oncology topics.
- Above-average Impact Relative to World across all WCHRI themes.
- Above-average normalized impact scores for articles and reviews.
- More than 14% of publications in the Top 10% most-cited documents in their subject category.
- International collaboration evident in nearly 40% of publications.
- Collaboration with researchers from more than 3,000 institutions in Canada and around the world.
- High collaboration rate among WCHRI-affiliated researchers.

Data Sources

Web of Science

- Data was retrieved by searching WCHRI-affiliated authors in the new Author Search. Profiles were combined as needed to gather as complete a publication record as possible. Document inclusion was limited to the years 2015-present.
- Themed sets were created by searching the accession numbers of publications by authors in each theme area.
- Searches were conducted in April 2021.

InCites

- Analysis is based on datasets exported from the Web of Science Core Collection.
- Data was retrieved in April 2021.
- Emerging Sources Citation Index journals were included in all analyses.

Limitations of this analysis

- This analysis is based only on publications that are indexed in the Web of Science Core Collection. This automatically means that this analysis is not fully inclusive and will miss research publications in journals not indexed by this database.
- Our search was based on author name searches and we did not have access to the CVs of these authors to verify completeness of retrieval. Some indexed publications may be missing from our dataset.
- Our list of WCHRI-affiliated researchers represents only current affiliations, and many authors publish on additional topics not related to WCHRI themes. Publications from these authors are included in our dataset regardless of whether or not the author was affiliated with WCHRI or UAlberta at time of publication, and regardless of article topic.
- Many types of significant research impact are not included in this analysis. Some of these are government/health system consultations, patents, public presentations, clinical and health impacts, and outputs created for the public or clinicians that exist outside of journal publications. A full examination of the impact of this institute would include information about those types of activities as well as scholarly publications.
- Research publications reflect existing power structures within academia and our culture. This means the following:
    - Certain types of research are cited more than other types of research. For example, reviews and quantitative research receive more citations than editorials and qualitative research.
    - Certain topics will receive more citations than others in health research. For example, articles on conditions that impact large segments of the populations will receive more citations than articles on rare conditions.
    - There is a language bias around citations. English language publications will receive more citations and are easier to find outlets for publication.
    - Unfortunately there are many structural societal constraints around equity, diversity, and inclusion and research publishing. This means the following:
        - Women academics are cited less than men.
        - Women have less structural support around research.
        - Racism exists in academic institutions. This directly impacts BIPOC academics, their research outputs, and their ability to progress through professional ranks in these institutions.
    - We strongly recommend that these data limitations are carefully considered in understanding the data provided in this report.
    - We strongly recommend that structural constraints that limit the ability of members to conduct research are considered and mitigated or removed as much as possible.

Recommendations

- ORCID is an international, interdisciplinary, open, non-proprietary, and not-for-profit organization created by the research community to address these common issues:
    - Disambiguation;
    - Credit and attribution;
    - Likelihood that academic work can be easily discovered by others (funders, employers etc.);
    - Management of privacy and identity; and
    - Reduction of administrative burden.

  We strongly recommend a strategy to promote the use of ORCID for the researchers included in this analysis. To highlight this issue, one researcher's name led to 83 possible name matches in the Web of Science. Of the authors who did have an ORCID that was viewable, many were not up to date and not synced with the bibliographic databases. This caused significant delays and complications in performing this type of analysis and being able to understand and tell the impact story of these researchers. **University of Alberta Library would be happy to assist in the development of a multi-pronged strategy to support the adoption of ORCID.**

- Many WCHRI-affiliated clinicians and scientists have a small percentage of their time devoted to research. It may make more sense, for future analyses, to focus on those with at least 30% research time. This was discussed during the data collection phase of this project, but not implemented.

- Open Access (OA) publication can sometimes involve extra expenses when done via traditional publisher options. If authors are unwilling to prioritize publishing in fully open journals, they could take advantage of institutional or discipline-specific repositories in order to open up their papers. University of Alberta Library provides an institutional repository, **ERA**, where authors can deposit their publications in order to make them Open Access without paying inflated publishing fees. This can also be a method of achieving compliance with funding agency OA mandates.

Publication Overview

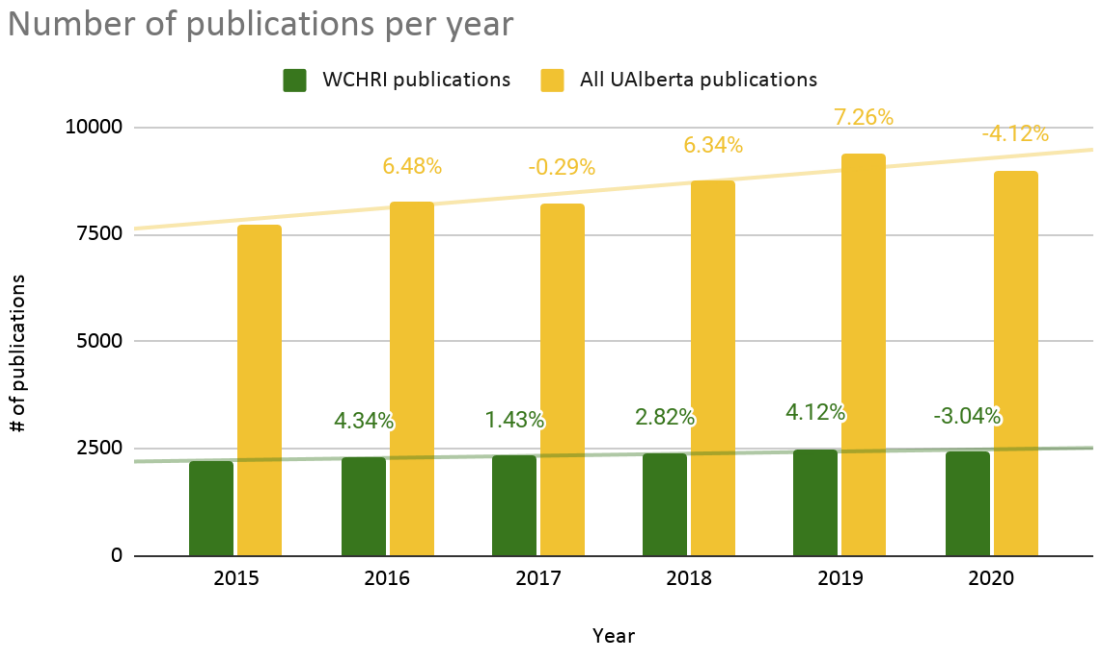

Figure 1. Total publications per year compared to all UAlberta publications (% year-over-year change)
Data source: Web of Science Core Collection

Number of publications per year

Publications by WCHRI-affiliated authors represent approximately one quarter of the total output of the University of Alberta, as available in the Web of Science Core Collection. While there was a slight decrease in the number of publications for 2020, this decrease was slightly less than that of the university as a whole, and is not surprising given the global pandemic.

There were approximately 100 researchers who did not select a Research Theme, whereas other researchers are assigned to more than one theme. For this reason, the sum of publications by theme exceeds the total number of publications, and some of the impact measures below show some difference in performance by theme compared to overall.

Publication Year	Total publications	By theme: Children's health and wellbeing	Pregnancy and developmental trajectories	Lifelong women's health
2015	2210	1535	719	1266
2016	2306	1667	847	1392
2017	2339	1761	842	1378
2018	2405	1756	863	1437
2019	2504	1849	927	1479
2020	2428	1745	929	1432

Table 1. Total publications per year, overall and by theme
Data source: Web of Science Core Collection

Top 10 Research Areas by Number of Publications

Research Area	# of Documents
PEDIATRICS	728
CARDIAC & CARDIOVASCULAR SYSTEMS	687
ONCOLOGY	669
PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH	634
BIOCHEMISTRY & MOLECULAR BIOLOGY	608
SURGERY	563
NEUROSCIENCES	504
CELL BIOLOGY	482
CLINICAL NEUROLOGY	472
IMMUNOLOGY	469

Table 2. Top Research Area by number of publications
Data source: InCites

Open Access Publication

43.17% of WCHRI-affiliated publications are openly available to the entire world. Open Access publication allows research to be disseminated more rapidly and more widely than other forms of publication. These publications tend to receive more citations and show higher impact than traditional publication models. University of Alberta Library provides an institutional repository, ERA, where authors can deposit their publications in order to make them Open Access without paying inflated publishing fees.

Citation Impact

Documents in Top 10%

The % Documents in Top 10% indicator includes the top ten percent most cited documents in a given subject category, year and publication type divided by the total number of documents in a given set, displayed as a percentage. Typical performance is approximately a value of 10 and values higher than 10 are considered above average performance. **14.67%** of WCHRI publications 2015-2019 are in the Top 10% most cited documents.

Dataset	% Documents in Top 10%
All WCHRI publications	14.67%
Pregnancy and developmental trajectories	15.46%
Child health and wellbeing	15.47%
Lifelong Women's Health	15.78%

Table 3. Documents in Top 10% overall and by theme
Data source: InCites

Impact Relative to World

This indicator shows the impact of the research in question relative to the impact of global research, and it's an indicator of relative research performance. The world average is always equal to one. If the numerical value of the Impact Relative to World exceeds one, then the assessed entity is performing above the world average. If it is less than one, then it is performing below the world average. In determining this indicator, we considered only research areas in which there were at least 25 publications. Overall, WCHRI is performing just above the world average, with an Impact Relative to World of **1.01**. Top-performing Research Areas by this metric are shown in Table 4.

Research Area	Impact Relative to World
NANOSCIENCE & NANOTECHNOLOGY	2.29
MEDICINE, GENERAL & INTERNAL	2.22
MATERIALS SCIENCE, MULTIDISCIPLINARY	2.11
CELL BIOLOGY	2.09
NUTRITION & DIETETICS	1.84
PHYSIOLOGY	1.81
GENETICS & HEREDITY	1.77
ALLERGY	1.67
MICROBIOLOGY	1.62
SPORT SCIENCES	1.53
WCHRI Themes	
Pregnancy and developmental trajectories	1.03
Child health and wellbeing	1.01
Lifelong Women's Health	1.03

Table 4. Impact Relative to World by Research Areas and by WCHRI Theme
Data source: InCites

Category Normalized Citation Impact

Category Normalized Citation Impact or CNCI is an indicator value that is normalized for subject, year, and document type. A score of 1.0 means that the documents have received the same number of cites as the average paper in its field, published in the same year. A value >1 indicates above average performance. This indicator has been collected by year of publication, and by Journal Citation Reports Quartile, where Q1 represents the highest-ranking 25% of journals in a given category, Q2 includes journals ranked 25%-50%, etc. Of note in the table below, publications appearing in first quartile or Q1 journals are outperforming other articles significantly. This represents the majority of WCHRI publications. However, publications that appear in Q3 and Q4 journals are underperforming when compared to other articles in the same categories.

Publication Year	CNCI Value		Publication Type	CNCI Value
2015	1.38		Article	1.53
2016	1.44		Review	1.33
2017	1.5		Q1 Journals	2.14
2018	1.54		Q2 Journals	0.99
2019	1.53		Q3 Journals	0.8
Overall 2015-2019	**1.53**		Q4 Journals	0.6

Table 5. CNCI Values overall and by article type
Data source: InCites

WCHRI Theme	Pregnancy and developmental trajectories	Child and Youth Development	Women's Health
Q1 Journals	57.39 %	58.14 %	59.28 %
Q2 Journals	27.52 %	25.24 %	25.56 %
Q3 Journals	11.3 %	12.19 %	11.52 %
Q4 Journals	3.79 %	4.43 %	3.64 %

Table 6. Percentage of publications in each JIF quartile, by WCHRI theme area
Data source: InCites

Journal Normalized Citation Impact

The Journal Normalized Citation Impact (JNCI) indicator normalizes the citation rate for the journal in which the document is published. The JNCI for a set of publications is the average of the JNCI for each publication. If the numerical value of the JNCI exceeds one, then the assessed research entity is performing above average. If it is less than one, then it is performing below the average.

When all document types are included, WCHRI-affiliated publications perform slightly below average based on both this indicator and the Average Percentile described below. However, both articles and reviews, which are the most citable document types, show above-average performance in both of these measures.

Publication Year	JNCI Value		Publication Type	JNCI Value
2015	0.9		Article	1.12
2016	0.93		Review	1.1
2017	0.93		Q1 Journals	0.87
2018	0.93		Q2 Journals	0.95
2019	0.91		Q3 Journals	1
Overall 2015-2019	**0.91**		Q4 Journals	1.09

Table 7. JNCI Values overall and by article type
Data source: InCites

Average Percentile

The percentile of a publication is determined by creating a citation frequency distribution for all publications in the same year, subject category, and document type (arranging the papers in descending order of citation count), and determining the percentage of papers at each level of citation. If a paper has a percentile value of one, then 99% of the papers in the same subject category, year, and document type have a lower citation count. For this indicator, the dataset was limited to articles, data papers, proceedings papers, and reviews.

Publication Year	Average Percentile		Publication Type	Average Percentile
2015	40.84		Article	42.3
2016	41.1		Review	43.44
2017	41.33		Q1 Journals	30.55
2018	41.99		Q2 Journals	46.39
2019	46.42		Q3 Journals	52.12
Overall 2015-2019	**42.95**		Q4 Journals	65.14

Table 8. Average Percentile Values overall and by article type
Data source: InCites

Overall, WCHRI publications are performing well when compared to other publications in their subject categories. The papers in top tier journals, however, do not seem to receive quite as much attention as might be expected based on the journals in which they appear. That said, these articles are still more highly cited than most, as evidenced by strong CNCI and Average Percentile numbers.

Collaboration

International Collaboration

39 % of all WCHRI publications involve international collaboration. The top 10 countries for collaboration, by number of publications and by citation impact, are shown in Table 9. The Citation Impact indicator divides the total number of citations received by the number of papers, and is not normalized by subject area or year of publication. For this indicator, only countries with at least 100 papers in collaboration were included.

Country	Publications		Country	Citation Impact
CANADA	10,266		NORWAY	68.00
USA	2,615		ISRAEL	62.16
UNITED KINGDOM	1,114		BELGIUM	58.20
ENGLAND	970		NEW ZEALAND	56.22
AUSTRALIA	638		SWEDEN	55.92
GERMANY (FED REP GER)	501		SCOTLAND	55.72
CHINA MAINLAND	452		AUSTRIA	52.64
FRANCE	372		SWITZERLAND	51.71
ITALY	343		INDIA	50.49
NETHERLANDS	317		JAPAN	47.47

Table 9. Top 10 Countries for collaboration, by number of publications and by citation impact
Data source: InCites

Institutional Collaboration

WCHRI researchers collaborate with authors from more than 3,000 other institutions. The top institutions for collaboration, by number of publications and by citation impact, and shown in Table 10. For the citation impact indicator, only institutions with at least 100 papers with WCHRI authors were included.

Institution	Publications		Institution	Citation Impact
University of Calgary	1,389		Imperial College London	77.93
University of Toronto	1,387		King's College London	75.96
University of British Columbia	986		University of Washington Seattle	72.72
University of Ottawa	678		University of Washington	71.72
Alberta Health Services (AHS)	596		University of California San Francisco	70.63
McMaster University	568		Johns Hopkins University	67.73
McGill University	557		National Institutes of Health (NIH) - USA	67.00
Stollery Children's Hospital	545		University of Sydney	65.13
Hospital for Sick Children (SickKids)	531		Stanford University	63.55
University of Manitoba	489		University of Barcelona	61.08

Table 10. Top 10 Institutional collaboration partners, by number of publications and by citation impact
Data source: InCites

Collaboration between WCHRI authors

Without a properly disambiguated author list, collaboration between WCHRI authors is difficult to measure. However, an attempt was made to quantify this type of collaboration by restricting the dataset to publications involving University of Alberta authors, and then counting the number of WCHRI authors on each paper. By this method, **63.23%** of papers show collaboration between at least two WCHRI-affiliated authors. A small set of papers (3.66%), seem to indicate collaboration between a WCHRI author and another (non-WCHRI) UAlberta researcher, possibly from before the WCHRI author became affiliated with the University, or else where that affiliation is not indicated in the author's address as published.

Level of collaboration	Percent of publications
1 WCHRI author	14.28%
2 WCHRI authors	21.30%
3 WCHRI authors	8.73%
4 or more WCHRI authors	33.20%
non-UAlberta address	3.66%

Table 11. Collaboration rates between WCHRI-affiliated researchers
Data source: Web of Science Core Collection

Collaboration map

Mapping the co-author relationships help illustrate the high degree of collaboration within this research institute.

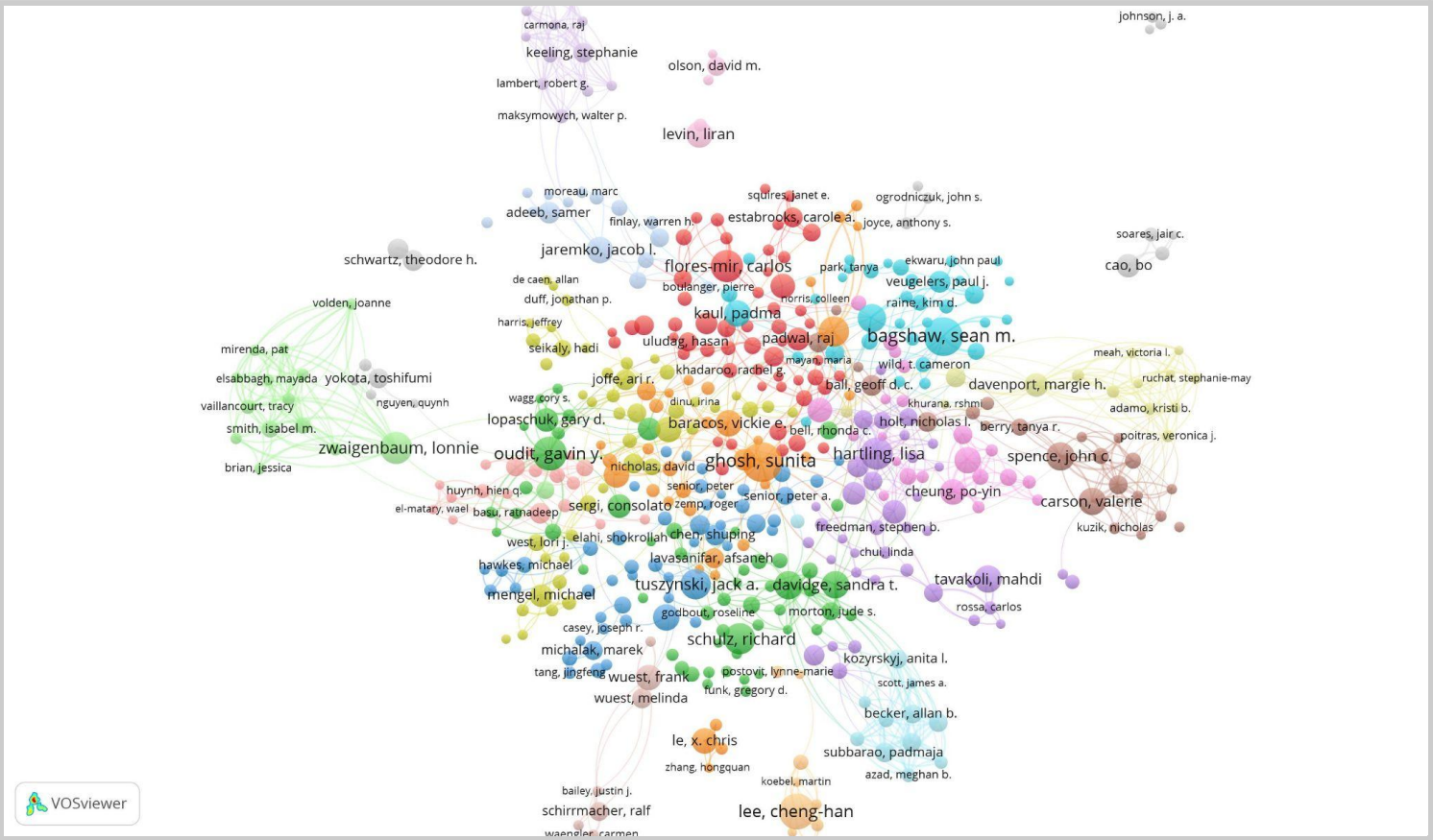

Figure 2. Co-author map of WCHRI collaborations