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Recommendations concerning the use of bibliometric indicators in the assessment of publications of individual researchers

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- **When interpreting a bibliometric analysis at the individual level the reviewer should always consider certain background information on the person and his/her published work**
  - the person's active research period and the number of publications
  - which subject area the person is active within
  - whether the person's work has been published mainly in general or narrowly focused subject-specific journals
  - that good bibliometric indicators can frequently identify good quality, but not necessarily the reverse
  - whether the person has been mainly responsible for the essential work
  - whether a large share of the highly cited papers may be considered to be reviews or some other type of published article that, as a matter of course, can be expected to receive more citations than regular, original articles
  - possible occurrence of negative citations or a high level of self-citation
- **An appropriate bibliometric set-up for evaluation of individual researcher publications is as follows**
  - Number of publications
  - Total of Journal Impact Factors
  - Number of publications amongst world's 5% most cited publications, field adjusted
  - Average citation for the 5, 10 or 15 most highly cited publications
  - Average Journal Impact Factor (JIF) for the individual's 5, 10 or 15 articles with the highest JIF
  - Field-adjusted Journal Citation frequency (JCf), on average, for the individual's 5, 10 or 15 articles with the highest JCf
- **An analysis with tiering instead of indicator values is preferable since the difference between individuals in terms of indicator value must be relatively large to have real significance.**
- **Where bibliometric measures shall be used for assessment of single individuals or groups, then these should either give their approval or be encouraged to send in the material themselves.**

In recent years, there has been a clear increase, both nationally and internationally, in the use of bibliometrics. It has now become an established method for, through statistical analyses of publication data, the quantitative and qualitative analysis of research output. On larger quantities of publications, high bibliometric indicators have been shown to correlate with high appraisals from expert panels. The methods, however, are less suitable for the assessment of individuals or smaller groups. It is unusual for these to achieve a publication quantity sufficient for the results to be reliable and stable.
At Karolinska Institutet/SLL there is the possibility for all employees to order analyses from the organisation's own bibliometric system. The purpose of the bibliometric system is

- to provide surveys of Karolinska Institutet's/SLL's research output as well as tools for comparing it with the rest of the world
- to enable one as individual researcher to enhance one's impact
- to supply background data to assist resource allocation for departments/clinical departments within Karolinska Institutet/SLL

With good knowledge of the limitations existing at the level of the individual, certain bibliometric measures can also be used to supplement visual inspection of an individual's publication lists. Since it may be difficult for researchers themselves to find these measures for their published papers in databases such as Thomson Reuters Web of Science, there is an advantage for them in being able to obtain data instead from the bibliometric system, even if the majority of measures can be produced also from a more publicly accessible system.

Indicators can be used at the individual level

Where bibliometric measures are to be applied to the assessment of individuals or groups, these shall either give their approval or be encouraged to send in the material themselves.

Where it is intended to call in bibliographic measures from individuals within Karolinska Institutet/SLL, these measures are recommended

- Number of publications[*]
- Total Journal Impact Factor[†]
- Number of publications amongst the world's 5% most cited, field adjusted[‡]
- Average citation count for the 5, 10 or 15 most highly cited publications[§]
- Average Journal Impact Factor (JIF) for the individual's 5, 10 or 15 articles with highest JIF[†]
- Field-adjusted Journal Citation frequency (JCf), on average, for the individual's 5, 10 or 15 articles with JCf[‡]

[*] From the bibliometric system it is possible to obtain publications available in Web of Science and Medline 1995 and later that have been verified in the bibliometric system by the author.
[†] Only available for journals covered by Thomson Reuters Web of Science. The impact factor is regenerated yearly for each individual journal and, within Karolinska Institutet, the standard applied is the last known impact factor for the journal the article is published in.
[‡] Can only be obtained for publications verified in Karolinska Institutet's own bibliometric database, based on data from Thomson Reuters Web of Science from 1995 and later.
[§] One should be aware that citation figures can be obtained from only a handful of citation databases and that the data differs between these. For Karolinska Institutet/SLL, the Web of Science from Thomson Reuters is currently the first choice.

The composition of the above indicators provides a balance between those measures made at the journal level and article level, those measures dependent on size and those independent of size as well as field-adjusted measures and 'raw' citation figures, thereby illuminating several aspects of the individual's pattern of publications.
It is not appropriate to calculate the average values for the entire sum of publications of individual researchers, since this would give an undesirable incentive for publication and verification. On the other hand, it may be of interest to look at the average for the individual's 5, 10 or 15 highest indicator values for each individual indicator to identify whether the researcher has the potential to produce e.g. very well cited publications. When the link between peer review and bibliometric measure at the individual/group level is studied it is shown, moreover, that the extra information that can be deduced from the average values for the entire number is small.
Whether one should use 5, 10 or 15 publications in the sample for average value indicators depends on the expected number of publications in the person's publication list. Unless very productive researchers are concerned, 5 is usually an appropriate number.

For a more complete bibliometric picture it is also possible to supplement this with one or more measures

- Total number of citations for the individual's articles [**]
- Average field-adjusted citation percentile (Perc Cf) for the individual's 5, 10 or 15 articles with highest Perc Cf[††]
- Total field-adjusted citation percentile (Perc Cf) for all the individual's analysed articles[††]

In certain cases one might wish for indicators for individual publications in a person's list. A suitable measure, in that case, is the number of citations and known Journal Impact Factors for the journal that the article is published in. Reviewers should only take the bibliometric measures into account after a traditional review of the CV and publication list has been made, since the intention with a bibliometric element in an assessment of individuals should be to come up with information complementary to that which is already known through the application.

H-Index
The h-index is a measure that has attracted attention and whose primary purpose is to illustrate an individual researcher's impact. It has the advantage that it is relatively simple for the individual researcher to find but, on the other hand, it is hard to interpret correctly. There is an in-built bias in favour of researchers with long careers and within highly cited fields of research. Moreover, the value is stable, or indeed increases, even for those persons who are no longer being published or who, in recent years, have had a low number of citations for their

[**] One should be aware that it is possible to obtain citation figures from a handful of different citation databases and that the data differs between these. At Karolinska Institutet/SLL the Web of Science from Thomson Reuters is the first choice at present.
[††] Can only be obtained for publications verified in Karolinska Institutet's bibliometric database based on data from Thomson Reuters Web of Science from 1995 and later.

production. While certain attempts have been made to enable the indicator to take account of these factors, the advantages of a combination of the more advanced bibliometric measures outweigh these at present.

Period subject to analysis

The bibliometric system contains data from 1995 and later and cannot, therefore, cover the entire active period for more experienced researchers. However, what is desired most often is an overview of the most recent years. A 10-year period is normally suitable at the individual level for the number of publications analysed to be sufficient in number. For more productive researchers, however, a 5-year period may be relevant. The citation indicators do not offer a true and fair picture until a year at the earliest after publication and several indicators are consequently left out for the most recent 1-2 years.
The time interval from when articles from different journals are published until they appear in the Web of Science databases varies very greatly between different journals. It is, therefore, in most cases, inappropriate to include the current year even where other indicators are calculated.

Document types for analysis

There is an international consensus that Articles and Reviews, above all, shall be included in bibliometric citation analyses and that in field-adjusted indicators these shall each be treated separately.[‡‡] This also characterises the standard for analyses supplied from the bibliometric system.

Analysis with tiering

The difference between individuals in indicator value must be relatively large to mean anything, since the indicators here include a larger share of so-called statistical noise than in higher aggregation levels. There is support in bibliometric research for the principle that high indicator values indicate good quality but not for low values indicating low quality. Furthermore, there is some support for the possibility of differentiating “excellent” research from merely “good” using bibliometric methods, but low bibliometric indicators offer no possibility of predicting whether an expert panel will regard the research as valuable or not. Accordingly, it is not meaningful to look at exact indicator values or to look at the lower end of the scale for indicator values. On the other hand, something that can give added value, over and above the traditional review, is to highlight which individuals are found at a high level per indicator within their context. For assessments within Karolinska Institutet it is, for example, appropriate to look whether the researcher’s indicator value belongs to the 10% or 25% highest amongst all Karolinska Institutet researchers.

[‡‡] In different databases, or in the contact between researchers and database host, there is not always agreement as to whether a publication is an original article or e.g. a letter. For certain indicators several document types can be allowed without negative consequences but for average values one should always limit oneself to these document types: Article and Review. For e.g. the indicator showing Total Citations, the publication type Letter may also be relevant. However, one should be aware that even published items that in journals are shown as a letter (e.g. in Physical Review letters or Nature) are, as a rule, classified in the databases as an original article and thereby counted as such in bibliometric analyses.

Factors that influence the evaluation of bibliometric analysis results

In the evaluation of a bibliometric analysis at the individual level, one must always take into account

- the person's active research period and the number of publications – a large number of publications offers greater scope for obtaining high values, also on measures of mean value
- which subject area the person is active in – the citation pattern varies sharply between different disciplines. Journal categories and/or MeSH terms for the publications can give some guidance as to the area for the researcher in question.
- whether the person has been published mainly in general or narrowly focused, subject-specific journals (since this affects the balance between JCf and JIF)
- that good bibliometric indicators can frequently identify good quality, but not necessarily the reverse
- whether the person has been mainly responsible for the essential work
- whether a large share of the highly cited articles may be considered to be reviews or some other type of published paper that, as a matter of course, can be expected to receive more citations than regular, original articles
- possible occurrence of negative citations[§§] or a high rate of self-citation

These factors are only partly taken into account, or not at all, where existing bibliometric methods are used.

Hans-Gustaf Ljungren

Dean
Board of Research
Karolinska Institutet

Jan-Inge Henter

R&D Director
Karolinska University Hospital

[§§] A negative citation is where the article citing the researcher for some reason contradicts what stands in the cited article.