Category of measure/indicator	Particular measure / indicator	What is it?	Key advantages	Key disadvantages
Volume measures	Number of publications (P)	The number of publications produced within a specified time period by an individual research group or institution	Basic measure of research output Data is easy to collect	Crude – gives no indication of impact, only of the level of activity
	Number of citations (C & Cs)	The total number of citations to all papers published by an individual, research group or institution (C); or the total number of citations with self-citations removed (Cs)	Provides basic information on impact Usually works well on a 5-year timescale for the life sciences	Not adjusted by field or journal set: cross comparison is difficult, since citation rates in some fields and journal sets are greater than others.
Journal impact measures	Journal Impact Factor (JIF)	A measure of research journal quality, based on the number of times that articles within a particular journal are cited by others on average	Provides a journal-based indicator of impact. Easy to understand and communicate. Data is readily available, whereas data for actual citation counts of articles often has to be purchased from commercial suppliers (particularly large-scale analyses) Regarded as a timely measure by bibliometricians, since it is based on publications from the most recent two years, and is recalculated annually.	Citation rates between journals and fields vary: comparison is hard. Sometimes criticised for relying on too short a time window for citations to accrue (typically, 5 years) Subject to manipulation by editors e.g. it often includes citations by authors to their own works (self-citations)

Citation-based indicators	Citation rate per paper normalised by journal set (CPP/JCSm)	Adjusts the average number of citations per paper by normalising against the citation rate of other journals in the same journal set	Describes whether a researcher, group, or institution is above or below the citation averages for the specific journals they publish in. Normalises by adjusting against the average citation rate for the journal set.	Does not provide an indication of the researcher, group or institution's performance *in a field.* This is important because researchers who publish primarily in high-impact journals will be disadvantages because it will be considerably harder for them to have a CPP/JCSm value much above 1, whereas it is considerably easier for researchers who publish most of their output in low-impact journals. So this measure is not usually used in isolation.
	JCSm/FCSm	Provides a comparative measure of journal impact against the field impact	Provides an indication of the ambition of a researcher, group or institution when it comes to submitting their publications.	Measures potential impact (based on the relative impact of the journals in which the researcher is publishing), rather than the actual impact achieved by the articles.
	Citation rate per paper normalised by research field (CPP/FCSm)	Adjusts the citation rate by the citation rates for all papers published in the journals in the same field	Normalises by adjusting against the average citation rate of the field, thus providing a robust comparative measure against other researchers in the same field.	

	Highly-cited papers	A measure of excellence based on identification of the top performing papers in a field (can focus on the top 50% , 20%, 10% or 1% of papers)	Identifies strongly performing individuals or institutions. Timely, since it can be calculated on a year-by-year basis rather than across a four to five year window.	Does not reflect performance across the full range of published outputs (many of which will be low impact)
Composite indicators	H-index	A composite measure assessing both the productivity and apparent impact of research papers	Convenient composite measure for individual researchers.	Works best for high-impact or senior researchers; is a poor indicator for early-career researchers, largely because it is dependent on publication volumes. Cannot deal with issues of attribution to specific grants, programmes or funders. Discipline norms have not yet been established, so it is not possible to normalise for different citation practices across fields.
Distribution-based approaches	Centile distribution	A measure of the distribution of publications across impact bands (i.e. top 50%, 20%, 10%, 1%)	Can combine HCPs while simultaneously mapping the distribution of all publications from a particular unit under study across impact bands.	

Table copied from Table 2.2 in Ismail, S., Nason, E., Marjanovic, S., & Grant, J. (2009). Bibliometrics as a tool for supporting prospective R\&D decision-making in the health sciences: Strengths, weaknesses and options for future development.Distribution. RAND Corporation.
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