

Modelos alternativos para avaliação da Atividade Científica:

Impacto Social da Ciência

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“Tópicos em Estudos Sociais da Ciência, Tecnologia e Sociedade”

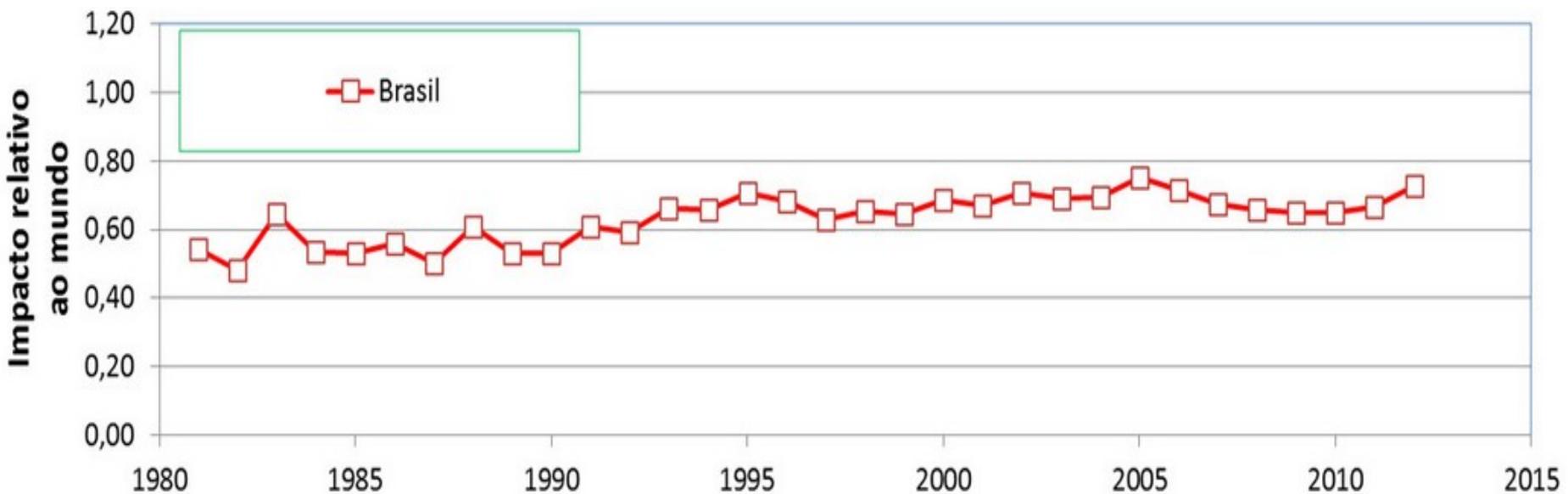
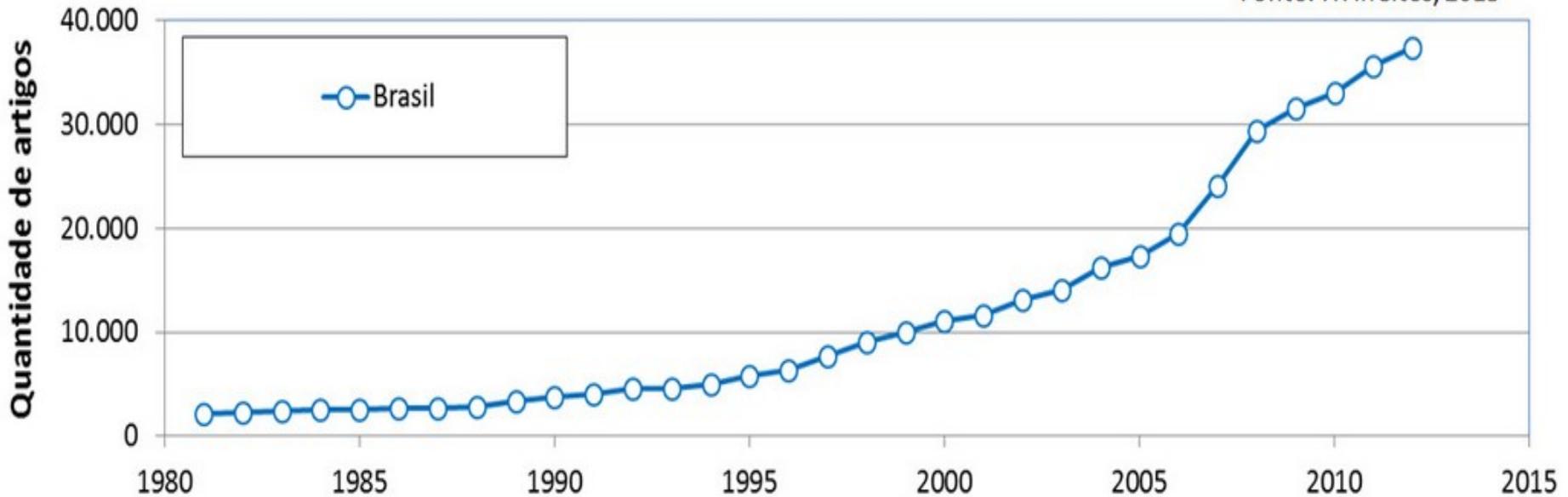
Programa de Pós-Graduação em Informação e Comunicação em Saúde (PPGICS/Icict)

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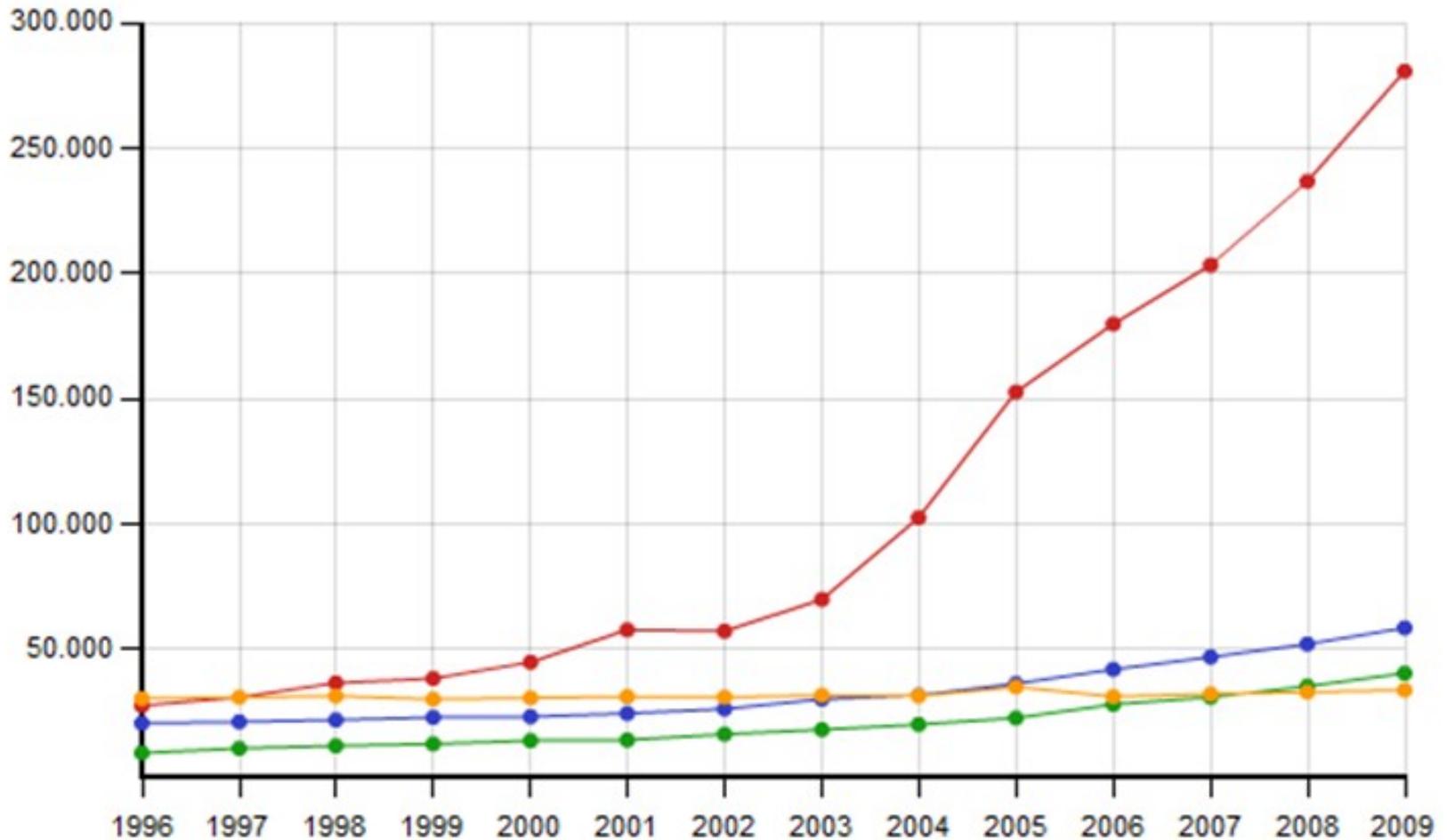


Crescimento das Publicações Científicas

Fonte: TR InCites, 2013

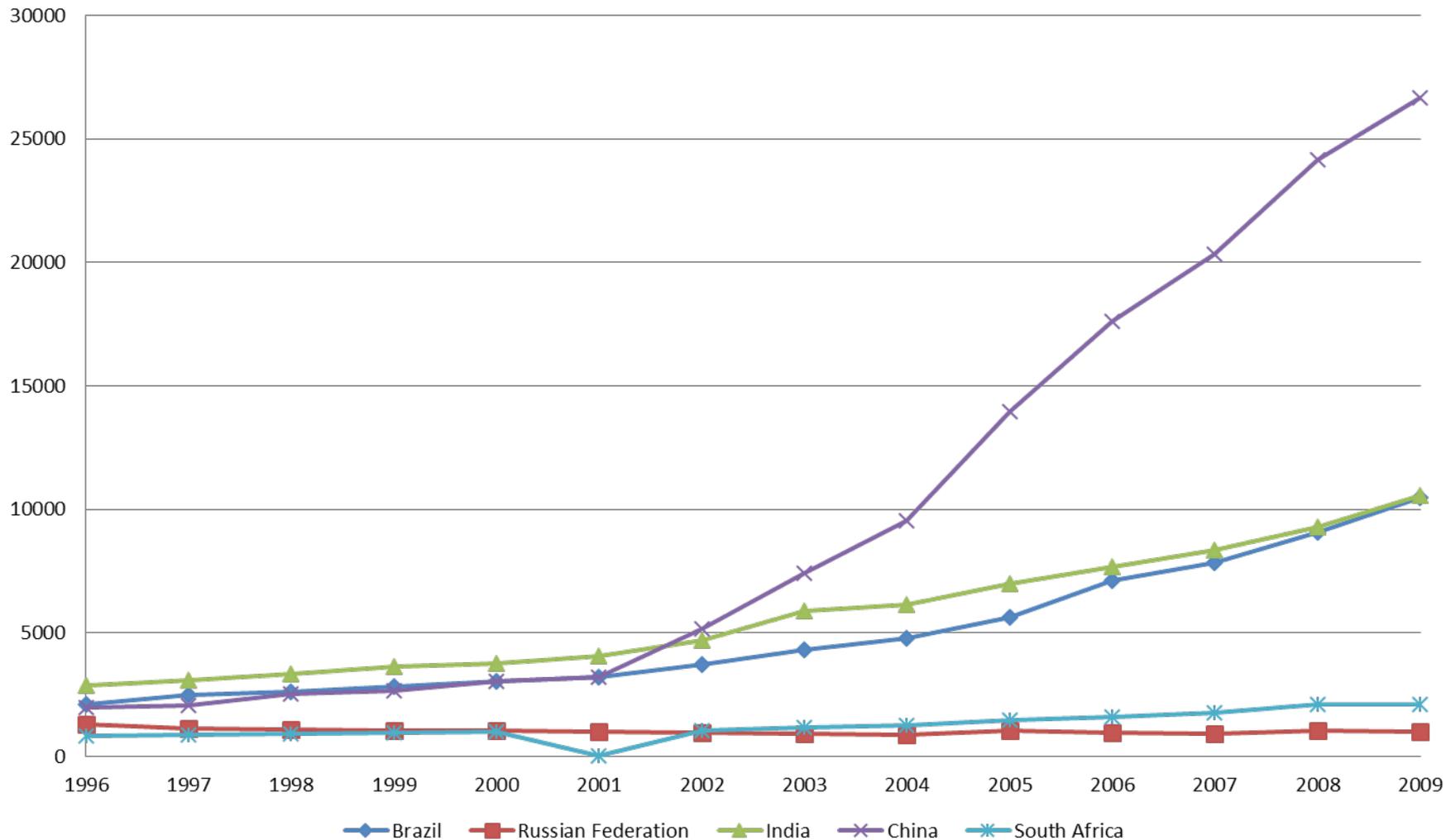


Publicações Científicas -

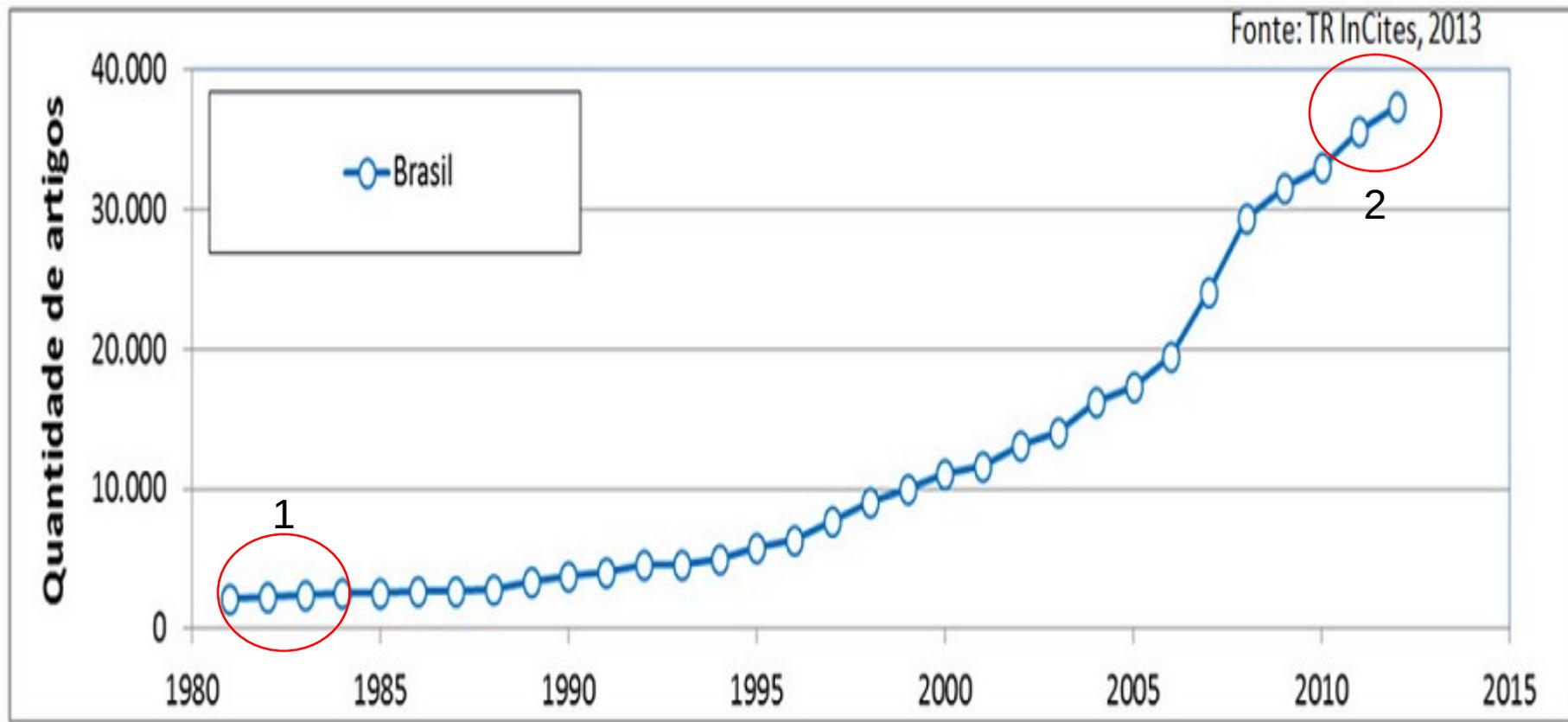


Publicações Científicas - BRICS

Medicina



Crescimento das Publicações Científicas



- Momento 1 – Estimular o Crescimento da Produção Científica
- Momento 2 – Avaliar os Efeitos/Impactos da Produção Científica

Ciência

- “Science is our best effort to learn from experience, but it remain unclear how experience can deliver knowledge”
- (Broadbent, 2014)

10 types of Scientist – not all science jobs are the same

(Research Council-UK)

- Explorer
- Investigator
- Developer/Translational
- Service provider/operational
- Monitor/regulator
- Entrepreneur
- Communicator
- Teacher
- Business/Marketing
- Policy maker

Tipos de Pesquisa de Saúde

Biomédica

Biologia Molecular, Microbiologia,
Imunologia, Genética, Biotecnologia

Clínica

Medicina, Farmácia, Odontologia,
Nutrição, Enfermagem

Populacional

Epidemiologia, Demografia, Ciências
Sociais, Ciências Ambientais

Sistemas de Saúde

Saúde Coletiva, Política, Economia, Ciências
Sociais, Economia, Epidemiologia
Administração

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Social / Environmental

Behavioral/ Psychological

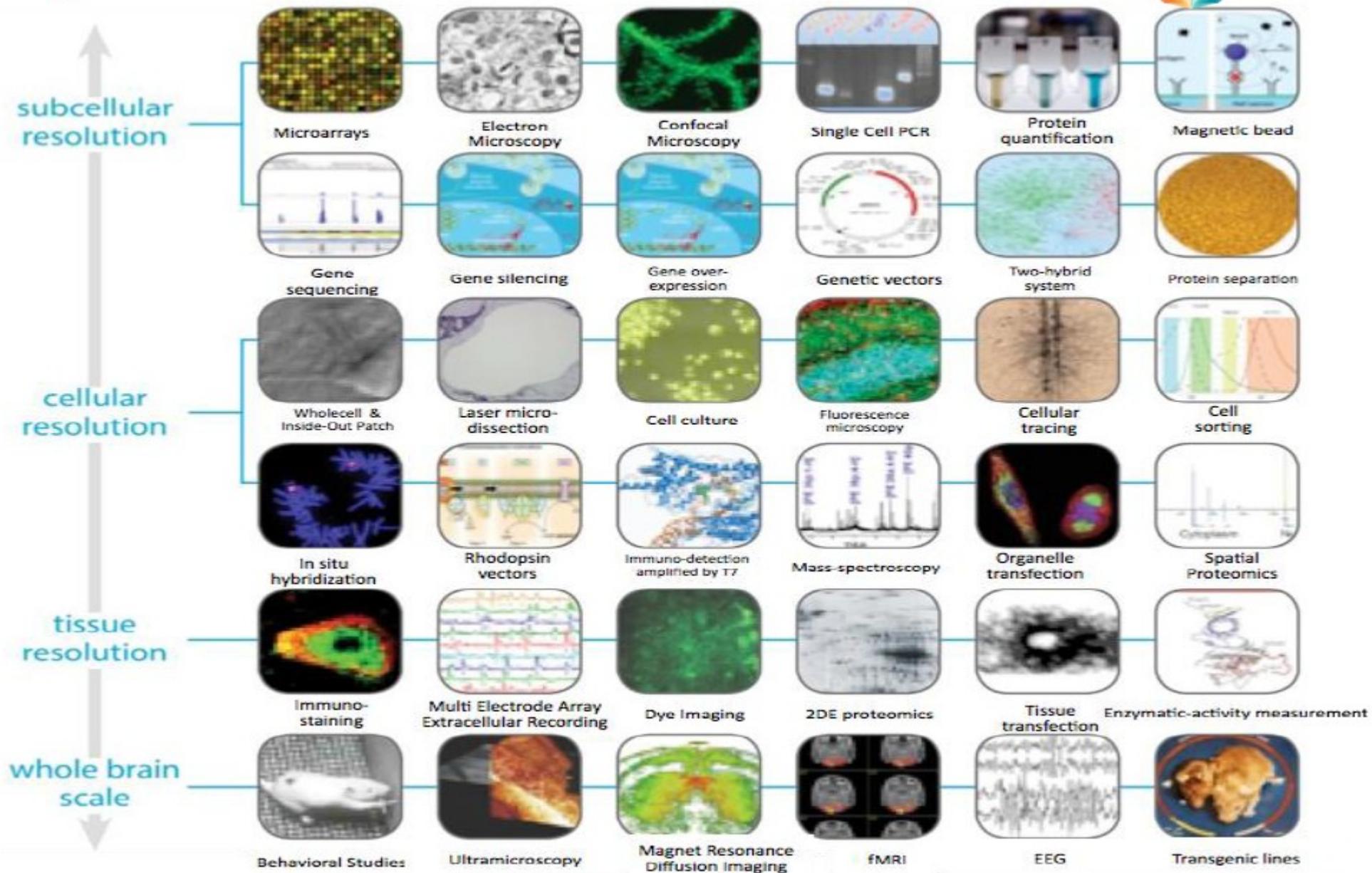
Organ Systems

Cellular

Molecular

FIGURE 1. Levels of analysis in health research.

NEUROSCIENCE METHODS

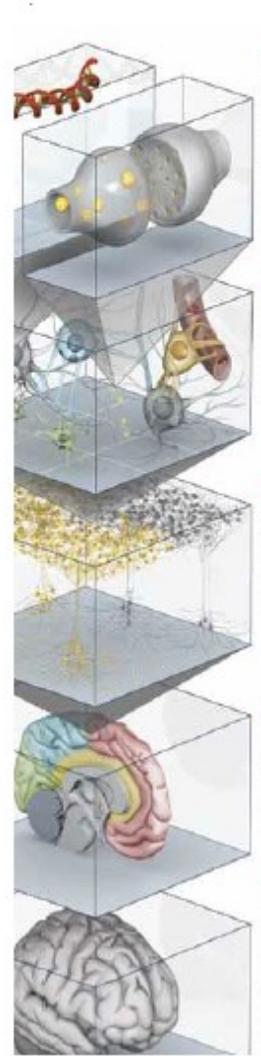


Reality check

1. Data and knowledge is growing exponentially
2. Data and knowledge is increasingly fragmented
3. Benefits for society seem to be decreasing (diagnostic accuracy, treatments, drugs)
4. Economic burden increasing rapidly to unsustainable levels

What we lack

1. No integration plan
2. No data curation plan
3. No plan to link across levels
4. No plan to transfer knowledge from animal to human
5. No plan to go beyond symptom-based classification of diseases



Molecular
A century of research with the first step under a microscope into a digital facial component molecule assemble a cell in the essential step the transmission chemical signals.

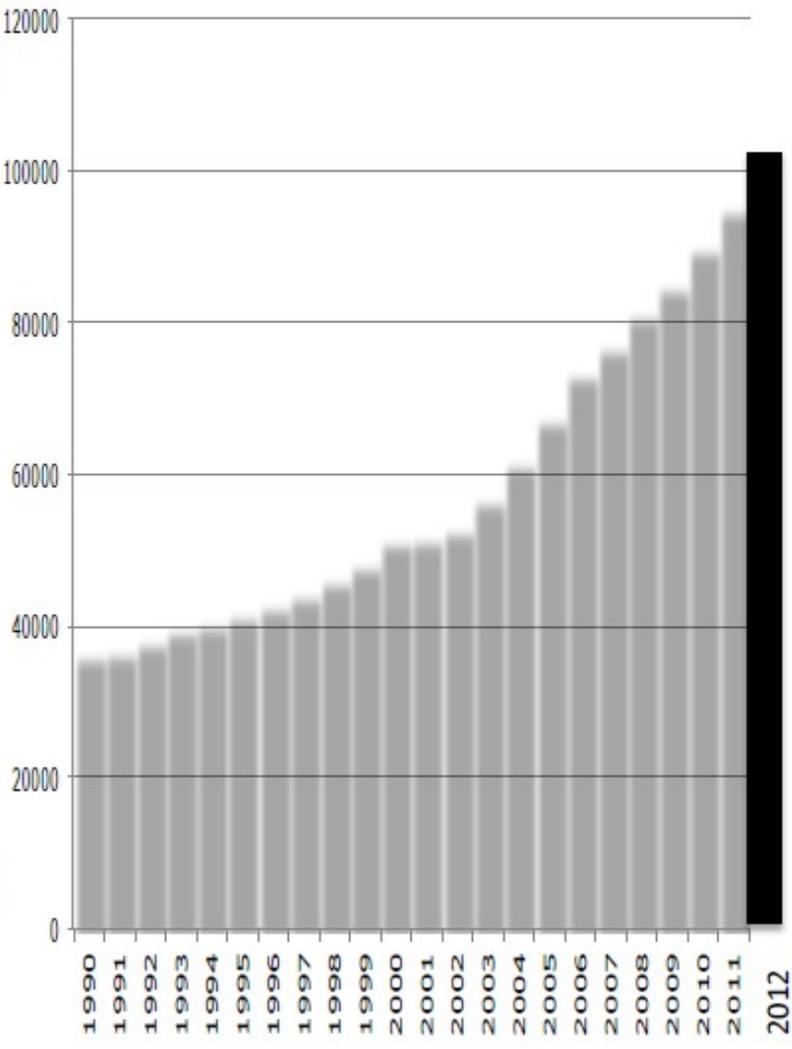
Cellular
A brain-in-a-box have to capture neurons and non cells, including the shapes of their dendrites that receive and send signals.

Circuits
A model of the interactions between different groups among neighboring neurons furnish clues to the complex brain disorders such as autism and schizophrenia.

Regions
Major neural subregions such as the amygdala (for emotion) or hippocampus (for memory) in the frontal lobes (executive functions) can be inspected and interact with one another.

Whole Org
An in silico brain for the actual organ the computer can simulate the effects as scientists do to test out a gene in mice avoid the lengthy and expensive process of animal testing.

Number of Peer Reviewed Publications on the Brain /yr

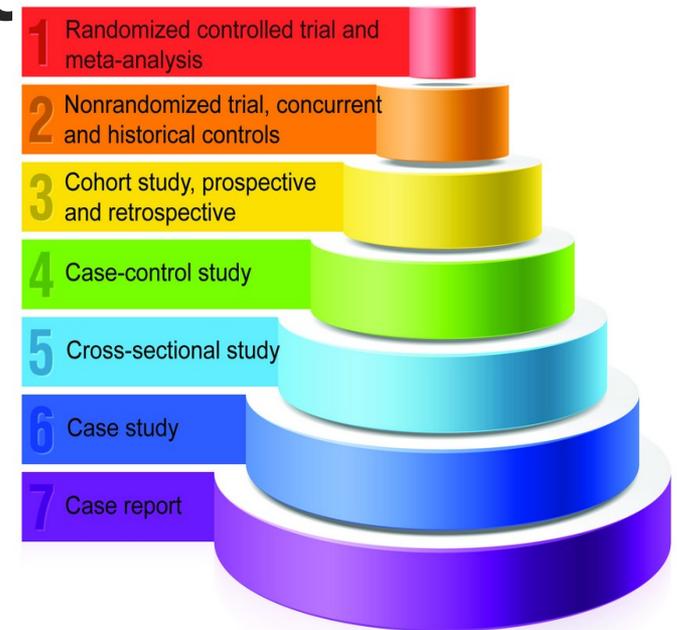


Produção do Conhecimento Científico em Ciências da Saúde: Muitos desafios

- 1- Reduccionismo vs Holismo
- 2- Dificuldades na Integração dos diferentes níveis de Conhecimento
- 3- Dilemas entre “testar hipóteses” (hypothesis-driven research) ou “explorar dado” (exploratory research)?

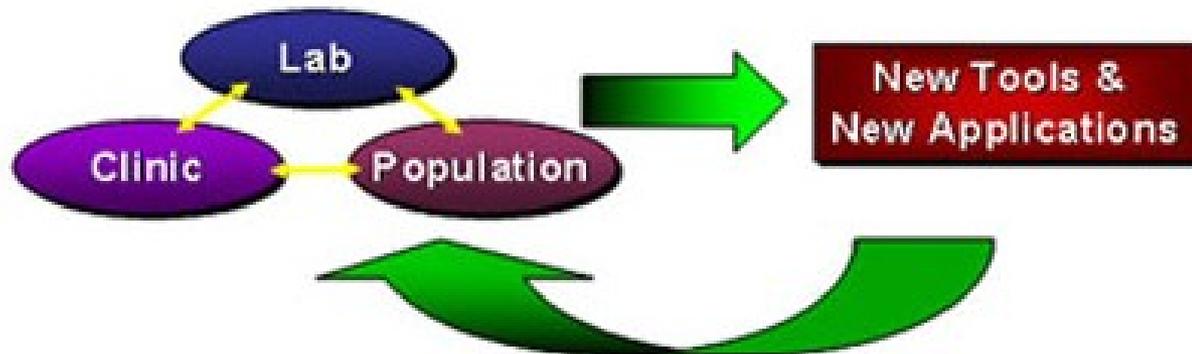
Medicina/ Cuidado a Saúde/ Saúde Pública Baseada em Evidências

Uso consciente,
explícito e judicioso
da melhor
evidência atual na
tomada de decisões
sobre o cuidado de
pacientes ou ações
de saúde pública



Pesquisa Translacional em Saúde

Transformar descobertas científicas resultantes de estudos laboratoriais, clínicos ou populacionais em aplicações que reduzam a incidência, morbidade e



Versão atualizada “Bed” “Bench” and “Bush”

Ciência e Avaliação

- Apesar de nem sempre oferecer soluções imediatas para problemas relevantes das sociedades humanas, existe um crescente entendimento da importância das ciências no mundo contemporâneo, mesmo nas sociedades ditas em desenvolvimento.
- Crescente participação nos investimentos públicos

Razões Para Avaliar em Ciência

- Conhecimento da Situação – Estimular o Desenvolvimento Científico
- Ranqueamento (selecionar os melhores) (Indivíduos/Grupos/Instituições)
- Planejamento-Gestão-Alocação de Recursos, em especial de Financiadores Públicos ou Privados
- Conhecimentos sobre os Efeitos/Impactos

Avaliar os Efeitos/Impactos da Produção Científica

- Bibliométricos – efeitos na dinâmica do conhecimento
- Não Bibliométricos – efeitos “sobre a sociedade” (“societals”)

As Bases Bibliográficas

- Para facilitar a sua organização e localização, estes artigos passaram a ser indexados em sistemas bibliográficos (recentemente adicionaram-se os mecanismos de busca, a exemplo do Google Acadêmico).
- Mais tarde aparece uma outra possibilidade que seria a de registrar não somente os artigos, mas também aqueles artigos que foram citados.

Fontes usadas para medir citações

(calcular Fator de Impacto, índice-h etc)

- ISI WEB OF KNOWLEDGE
- SCOPUS
- GOOGLE ACADÊMICO

Medindo o Mérito e a Excelência Científica - Emergência da CIENTOMETRIA

- Publicações
- Fator de Impacto das Revistas
- Citações (número; índices)

- As vantagens e os mitos da bibliometria – O uso ilimitado do Fator de Impacto e outros índices bibliométricos
- Enquanto tenham diferenças, são partilhados pelos diversos Campos Científicos
- A publicação científica e as mudanças do “open access”.

A Publicação Científica

- Publico ou pereço! O quanto preciso publicar?
- Quero/Devo/Consigo publicar em revistas de alto impacto!!
- Em que língua publicar? Português, inglês ou?
- Como este Editor @&%\$#@ pôde rejeitar meu 'fantástico' artigo?

A Publicação Científica

- Não há dúvida de que uma das similaridades mais marcantes entre todos os Campos Científicos é o fato de que a transmissão dos estudos realizados seja feita através de relatos escritos com a síntese do trabalho conduzido, incluindo os métodos utilizados, os resultados e as implicações destes.
- Estas publicações são feitas na forma de relatórios, livros e capítulos de livro e, mais frequentemente, de artigos publicados em revistas científicas.

A citação

- Uma outra característica dos relatos científicos é o de citar outros relatos para construir relações com os conhecimentos que antecede

Fator de Impacto

- Em termos matemáticos, em um dado ano o FI de um periódico é calculado como o número médio de citações dos artigos que foram publicados durante o biênio anterior. Por exemplo, o FI de um dado periódico em 2009 pode ser calculado como se segue:
- *sendo* A = o número de vezes em que os artigos publicados em 2007 e 2008 foram citados por periódicos indexados durante 2009
- *sendo* B = o número total de "itens citáveis" publicados em 2007 e 2008 ("itens citáveis": geralmente artigos, revisões, resumos de congressos ou notas, não sendo computados editoriais ou cartas ao editor)
- *então*, o **fator de impacto** de 2009 = A/B

Índice-h

- O **índice h**, ou *h-index* em inglês, é uma proposta para quantificar a produtividade e o impacto de pesquisadores baseando-se nos seus artigos (*papers*) mais citados.
- Em palavras, o **índice h** é o número de artigos com citações maiores ou iguais a esse número.
- Exemplo : um pesquisador com $h = 5$ tem 5 artigos que receberam 5 ou mais citações; uma revista com $h = 45$ tem 45 artigos entre os seus artigos publicados com 45 ou mais citações; e assim por diante.

Maurício Lima Barreto^{I,II}Erika Aragão^{III,III}Luis Eugênio Portela Fernandes de Sousa^{I,II}Táris Maria Santana^{II}Rita Barradas Barata^{IV}

Diferenças entre as medidas do índice-h geradas em distintas fontes bibliográficas e engenho de busca

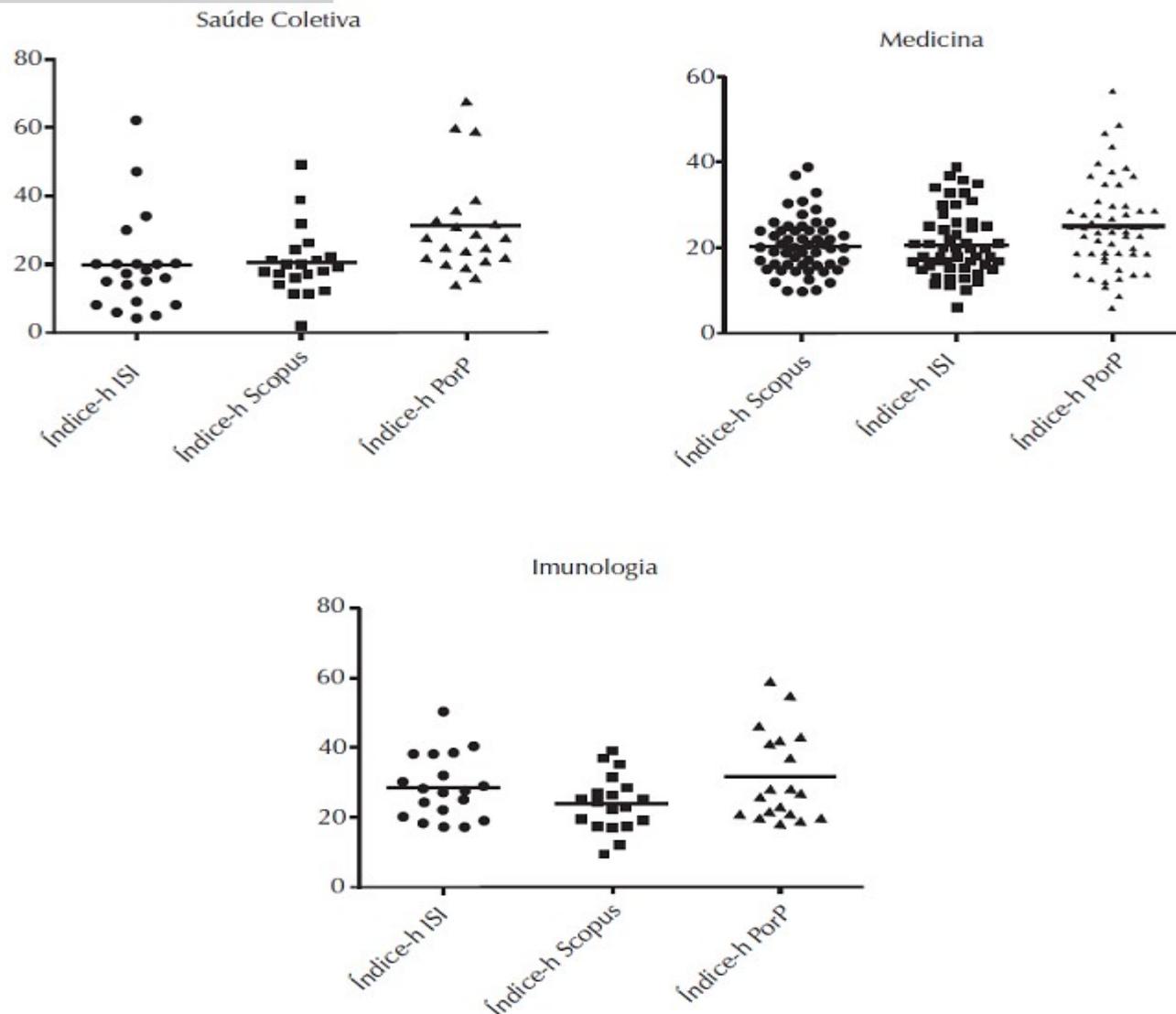


Figura. Índices-h e medianas estimados nas bases *Web of Science*, *Scopus* e *Google Acadêmico* (calculado pelo *Publish-or-Perish*) de pesquisadores 1-A do Conselho Nacional de Pesquisa e Desenvolvimento Tecnológico do Brasil (CNPq) das áreas Saúde Coletiva, Medicina e Imunologia.

Maurício Lima Barreto^{I,II}Erika Aragão^{III,III}Luis Eugenio Portela Fernandes de Sousa^{I,II}Táris Maria Santana^{II}Rita Barradas Barata^{IV}

Diferenças entre as medidas do índice-h geradas em distintas fontes bibliográficas e engenho de busca

Tabela 2. Mediana dos índices-h de pesquisadores 1-A do CNPq das áreas da Saúde Coletiva, Medicina e Imunologia estimados em diferentes fontes (*Web of Science*, Scopus e Google Acadêmico) e (a) p-valores da comparação de diferentes fontes e (b) p-valores da comparação de diferentes áreas para cada fonte.

a) Fonte	Área	p ^a
	Saúde Coletiva	
<i>Web of Science</i>	17,0	0,008
Scopus	19,0	
Google Acadêmico	28,0	
	Medicina	
<i>Web of Science</i>	18,0	0,001
Scopus	20,0	
Google Acadêmico	24,5	
	Imunologia	
<i>Web of Science</i>	27,0	0,145
Scopus	24,0	
Google Acadêmico	27,0	
b) Áreas	Fontes	p ^a
	<i>Web of Science</i>	
Saúde Coletiva	17,0	0,001
Medicina	18,0	
Imunologia	27,0	
	Scopus	
Saúde Coletiva	19,0	0,157
Medicina	20,0	
Imunologia	24,0	
	Google Acadêmico	
Saúde Coletiva	28,0	0,120
Medicina	24,5	
Imunologia	27,0	

^a Teste de Kruskal-Wallis

General Recommendation

1. Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions.

For funding agencies

2. Be explicit about the criteria used in evaluating the scientific productivity of grant applicants and clearly highlight, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.
3. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.



13 de Maio 2013

For institutions

4. Be explicit about the criteria used to reach hiring, tenure, and promotion decisions, clearly highlighting, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.
5. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.

For publishers

6. Greatly reduce emphasis on the journal impact factor as a promotional tool, ideally by ceasing to promote the impact factor or by presenting the metric in the context of a variety of journal-based metrics (e.g., 5-year impact factor, EigenFactor [8], SCImago [9], *h*-index, editorial and publication times, etc.) that provide a richer view of journal performance.
7. Make available a range of article-level metrics to encourage a shift toward assessment based on the scientific content of an article rather than publication metrics of the journal in which it was published.
8. Encourage responsible authorship practices and the provision of information about the specific contributions of each author.



13 de Maio 2013

9. Whether a journal is open-access or subscription-based, remove all reuse limitations on reference lists in research articles and make them available under the Creative Commons Public Domain Dedication [10].
10. Remove or reduce the constraints on the number of references in research articles, and, where appropriate, mandate the citation of primary literature in favor of reviews in order to give credit to the group(s) who first reported a finding.

For organizations that supply metrics

11. Be open and transparent by providing data and methods used to calculate all metrics.
12. Provide the data under a licence that allows unrestricted reuse, and provide computational access to data, where possible.
13. Be clear that inappropriate manipulation of metrics will not be tolerated; be explicit about what constitutes inappropriate manipulation and what measures will be taken to combat this.
14. Account for the variation in article types (e.g., reviews versus research articles), and in different subject areas when metrics are used, aggregated, or compared.



13 de Maio 2013

For researchers

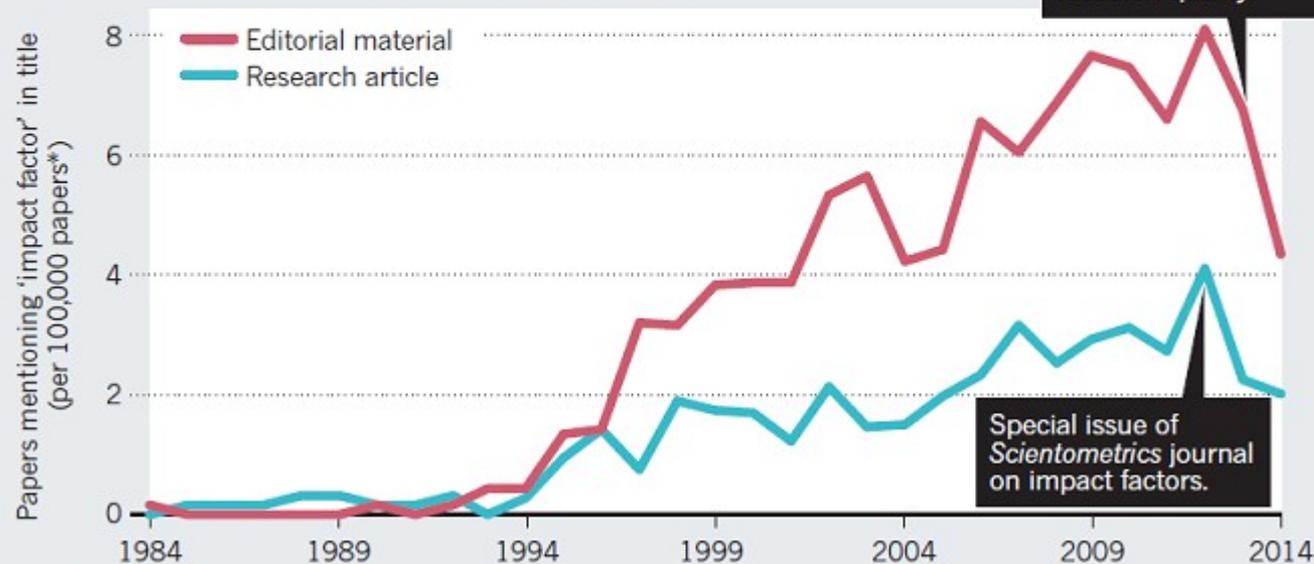
15. When involved in committees making decisions about funding, hiring, tenure, or promotion, make assessments based on scientific content rather than publication metrics.
16. Wherever appropriate, cite primary literature in which observations are first reported rather than reviews in order to give credit where credit is due.
17. Use a range of article metrics and indicators on personal/supporting statements, as evidence of the impact of individual published articles and other research outputs [11].
18. Challenge research assessment practices that rely inappropriately on Journal Impact Factors and promote and teach best practice that focuses on the value and influence of specific research outputs.

The Leiden Manifesto for research metrics

IMPACT-FACTOR OBSESSION

Soaring interest in one crude measure — the average citation counts of items published in a journal in the past two years — illustrates the crisis in research evaluation.

1 ARTICLES MENTIONING 'IMPACT FACTOR' IN TITLE



The Leiden Manifesto for research metrics

1. **Quantitative evaluation should support qualitative, expert assessment.**
2. **Measure performance against the research missions of the institution, group or researcher.**
3. **Protect excellence in locally relevant research.**
4. Keep data collection and analytical processes open, transparent and simple.
5. Allow those evaluated to verify data and analysis.
6. **Account for variation by field in publication and citation practices.**
7. Base assessment of individual researchers on a qualitative judgement of their portfolio.
8. Avoid misplaced concreteness and false precision.
9. Recognize the systemic effects of assessment and indicators.
10. Scrutinize indicators regularly and update them

The metric tide (A maré das métricas)

“As métricas precisam ser escolhidas com cuidado e devem sempre complementar e apoiar o julgamento de especialistas, em vez de substituí-lo”,



Recommendations

- The research community should develop a more sophisticated and nuanced approach to the contributions and limitations of quantitative indicators
- Data providers, analysts and producers of university rankings and league tables should strive for greater transparency and interoperability between different measurement systems.
- Publishers should reduce emphasis on journal impact factors as a promotional tool, and only use them in the context of a variety of journal-based metrics that provide a richer view of performance.
- There is a need for greater transparency and openness in research data infrastructure. A set of principles should be developed for technologies, practices and cultures that can support open, trustworthy research information management.
- The research system should take full advantage of ORCID as its preferred system of unique identifiers.
- .

Recommendations

- Further investment in research information infrastructure is required.
- Research funders need to increase investment in the science of science policy.

- Indo além da Bibliometria

altmetrics: a manifesto

NO ONE CAN READ EVERYTHING. We rely on filters to make sense of the scholarly literature, but the narrow, traditional filters are being swamped. However, the growth of new, online scholarly tools allows us to make new filters; these altmetrics reflect the broad, rapid impact of scholarship in this burgeoning ecosystem. We call for more tools and research based on altmetrics.

As the volume of academic literature explodes, scholars rely on filters to select the most relevant and significant sources from the rest. Unfortunately, scholarship's three main filters for importance are failing:

- Altmetrics is the study and use of scholarly impact measures based on activity in online tools and environments. The term has also been used to describe the metrics themselves—one could propose in plural a “set of new altmetrics.” Altmetrics is in most cases a subset of both scientometrics and webometrics; it is a subset of the latter in that it focuses more narrowly on scholarly influence as measured in online *tools and environments*, rather than on the Web more generally.



ResearchGate

- **ResearchGate is a social network site for academics to create their own profiles, list their publications, and interact with each other. Like Academia.edu, it provides a new way for scholars to disseminate their work and hence potentially changes the dynamics of informal scholarly communication.**
- “RG Score is calculated based on the publications in your profile and how other researchers interact with your content on ResearchGate”.
- “The RG Score takes **all** your research and turns it into a source of reputation.”



Connecting Research
and Researchers

Open Researcher and Contributor ID

What is ORCID?

ORCID is an open, non-profit, community-based effort to provide a registry of unique researcher identifiers and a transparent method of linking research activities and outputs to these identifiers. ORCID is unique in its ability to reach across disciplines, research sectors, and national boundaries and its cooperation with other identifier systems.

Não – Bibliométricos

(efeitos/impactos sobre a sociedade)

- A bibliometria parte do fato de que as publicações e citações, apesar de diferentes padrões, é comum a todos os campos científicos.
- Porém, as ciências diferem no que diz respeito a outros tipos de efeitos

Não – Bibliométricos

(efeitos/impactos sobre a sociedade)

- É um movimento de priorizar a noção de “mérito científico” para “impactos/efeitos sobre a sociedade”
- Os efeitos não bibliométricos tem sido mais postulados do que demonstrados

Benoît Godin
and
Christian Doré

Table 2: Impact of Science

Science

- Knowledge
- Research activities
- Training

Technology

- Products and processes
- Services
- Know-how

Economy

- Production
- Financing
- Investments
- Commercialisation
- Budget

Culture

- Knowledge
- Know-how
- Attitudes
- Values

Society

- Welfare
- Discourses and actions of groups

Policy

- Policy-makers
- Citizens
- Public programs
- National security

Organisation

- Planning
- Work organization
- Administration
- Human resources

Health

- Public health
- Health system

Environment

- Management of natural resources and the environment
- Climate and meteorology

Symbolic

- Legitimacy/credibility/visibility
- Notoriety

Training

- Curricula
- Pedagogical tools
- Qualifications
- Graduates
- Insertion into the job market
- Fitness of training / work
- Career
- Use of acquired knowledge

Evaluating the Benefits from Health Research and Development Centres

A Categorization, a Model and Examples of Application

Hanney et al, Evaluation, 2000

- a) *Knowledge*
- b) *Benefits to future research and research use:*
 - i) the better targeting of future research;
 - ii) the development of research skills, personnel and overall research capacity;
 - iii) a critical capability to utilize appropriately existing research, including that from overseas;
 - iv) staff development/educational benefits.
- c) *Political and administrative benefits:*
 - i) improved information bases on which to take political and executive decisions;
 - ii) other political benefits from undertaking research.
- d) *Health sector benefits:*
 - i) cost reduction in the delivery of existing services;
 - ii) qualitative improvements in the process of service delivery;
 - iii) increased effectiveness of services, e.g. increased health;
 - iv) equity, e.g. improved allocation of resources at an area level, better targeting and accessibility;
 - v) revenues gained from Intellectual Property Rights.
- e) *Broader economic benefits:*
 - i) wider economic benefits from commercial exploitation of innovations arising from R&D;
 - ii) economic benefits from a healthy workforce and reduction in working days lost.

Figure 1. Categories of Payback

Source: Adapted from Buxton and Hanney, 1996

Research Excellence Framework

The Research Excellence Framework (REF) is the new system for assessing the quality of research in UK higher education institutions.

The [results](#) of the 2014 REF were published on 18 December 2014.

REF2014
Research Excellence Framework

The research of **154**
UK universities was assessed

They made **1,911** submissions including:

- **52,061** academic staff
- **191,150** research outputs
- **6,975** impact case studies

The **overall quality** of submissions was judged, on average to be:

★★★★ **30%** world-leading (4*)

★★★ **46%** internationally excellent (3*)

★★ **20%** recognised internationally (2*)

REF 2014 - key links

2014 REF [Results and submissions](#)

[Evaluation of the 2014 REF](#)

[REF Manager's report](#) (March 2015)

[Panel overview reports](#) (Jan 2015)

[EDAP's report](#) on equality and diversity (Jan 2015)

[Key facts](#) leaflet about the REF

REF impact case studies

A searchable online [database](#) and an initial analysis of [REF impact case studies](#) are available.

Societal impact evaluation: Exploring evaluator perceptions of the characterization of impact under the REF2014

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The relative newness of ‘impact’ as a criterion for research assessment has meant that there is yet to be an empirical study examining the process of its evaluation. This article is part of a broader study which is exploring the panel-based peer and end-user review process for societal impact evaluation using the UK’s national research assessment exercise, the Research Excellence Framework (REF) 2014, as a case study. In particular, this article explores the different perceptions REF2014 evaluators had regarding societal impact, preceding their evaluation of this measure as part of REF2014. Data are drawn from 62 interviews with evaluators from the health-related Panel A and its subpanels, prior to the REF2014 exercise taking place. We show how going into the REF exercise, evaluators from Panel A had different perceptions about how to characterize impact and how to define impact realization in terms of research outcomes and the research process. We conclude by discussing the implications of our findings for future impact evaluation frameworks, as well as postulating a series of hypotheses about the ways in which evaluators’ different perceptions going into an impact assessment could potentially influence the evaluation of impact submissions. Using REF2014 as a case study, these hypotheses will be tested in interviews with REF2014 evaluators post-assessment.

The Evaluation Scale: Exploring Decisions About Societal Impact in Peer Review Panels

Gemma E. Derrick¹ · Gabrielle N. Samuel¹

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Abstract Realising the societal gains from publicly funded health and medical research requires a model for a reflexive evaluation precedent for the societal impact of research. This research explores UK Research Excellence Framework evaluators' values and opinions and assessing societal impact, prior to the assessment taking place. Specifically, we discuss the characteristics of two different impact assessment extremes – the “quality-focused” evaluation and “societal impact-focused” evaluation. We show the wide range of evaluator views about impact, and that these views could be conceptually reflected in a range of different positions along a conceptual evaluation scale. We describe the characteristics of these extremes in detail, and discuss the different beliefs evaluators had which could influence where they positioned themselves along the scale. These decisions, we argue, when considered together, form a dominant definition of societal impact that influences the direction of its evaluation by the panel.

Although the results presented here may provide a guide to interpret the REF2014 impact evaluation results, this is not its primary goal. Instead, the results discussed in this article aim to use the process of impact assessment as a way of understanding the range of tensions faced by evaluators regarding the assessment of societal impact, in the absence of prior experience or methods of benchmarking this measure.



Crédito de la imagen: Nerdilandia.com

26/10/15

Mauricio L. Barreto

De un vistazo



- Índices bibliométricos se vuelven fundamentales para evaluación científica y medición del impacto
- Pero poner peso de la evaluación en cuantificación de publicaciones y citas no es suficiente
- Urge idear nuevas medidas de evaluación y concebir fines no bibliográficos para actividad científica

- Cambiar la forma de evaluar la actividad científica sería una valiosa contribución a la búsqueda de sentido y utilidad del conocimiento que producimos. Sin embargo, hay que decir que esta no es una tarea fácil ni rápida, que requiere desarrollar nuevas formas de concebir fines no bibliográficos para la actividad científica y a continuación idear nuevas medidas de evaluación.

- Colocar todo el peso de la evaluación —sea individual o colectiva— en la cuantificación de las publicaciones y citas es una estrategia que se está agotando. Añadir los efectos y beneficios que el conocimiento pueda tener, o que de hecho tiene en la vida de las personas y de las sociedades, cambiaría el énfasis de estas evaluaciones. La cuestión central radica en cambiar la lógica de lo que queremos, lo que se hace y lo que podemos hacer con la ciencia que producimos. Creo que es la forma de cambiar la dirección del debate sobre el productivismo y convertirlo en un debate útil sobre los significados del trabajo científico.

- Cambiar la forma de evaluar la actividad científica sería una valiosa contribución a la búsqueda de sentido y utilidad del conocimiento que producimos. Sin embargo, hay que decir que esta no es una tarea fácil ni rápida, que requiere desarrollar nuevas formas de concebir fines no bibliográficos para la actividad científica y a continuación idear nuevas medidas de evaluación.
- Un aspecto importante a tener en cuenta es que los diversos campos de la ciencia son bastante diferentes respecto de sus efectos. Y, en lo que concierne a la evaluación, esto se convierte en un problema: ¿cómo comparar campos científicos que generan efectos tan diferentes?

- Los esfuerzos para elaborar nuevos modelos de evaluación científica son parte de una empresa más grande que, para muchos, se necesita con urgencia. Sin embargo hasta el momento apenas si se ha propuesto, y requiere desarrollarse y probarse.
- La misión de la investigación y de los investigadores debe ser ayudar a cambiar el medio (sea social, económico, cultural o ambiental) en el cual vivimos, y la evaluación científica debe constituirse en un instrumento que nos ayude a entender cómo contribuye a esa misión el trabajo científico.

OBRIGADO!