



## **Developing quantitative and qualitative assessments of the impact of the provision of access to peer-reviewed medical research to developing world researchers and practitioners**

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### **Abstract:**

*It is 10 years since Research4Life's HINARI programme first leveraged the resources of the World Health Organisation, Yale University Library, and six leading medical publishers to provide developing world institutions with free or low cost access to a body of the world's most important published medical research. During that time the programme has proved hugely successful, as judged by such metrics as number of participating publishers, number of contributed journals and other information resources, and number of institutions registering for access.*

*Efforts to measure the impact on recipient communities of the newly available research have been undertaken on two fronts – bibliometric analysis and the collection of individual testimonies and case studies. Methodological challenges have prevented what bibliometric analyses that have been conducted so far from reaching firm conclusions about impact. With these methodological issues firmly in mind, Research4Life has gathered a team of specialist bibliometricians and analysts among its library and publisher partners to develop a specification for the most rigorous attempt yet to measure the impact of access to Research4Life content in terms of quantity and quality of research output.*

*In addition to developing statistical analyses however, we have also taken seriously the narrative power of true stories as a powerful indication of the impact that our programmes have had in the field. This paper summarises some of these case studies (now collected together in a published booklet) and the background to how they were developed, as well as providing an introduction to our plans for a bibliometric impact analysis.*

## **Keywords**

*Research4Life, HINARI, medical research, research access, research impact, developing countries, scientific literature, LMICs*

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## **Introduction**

The Research4Life initiative comprises four programmes, operating online portals that provide low-income countries with free or low-cost access to the world's scientific literature in health(HINARI), agriculture (AGORA), applied sciences (ARDI), and the environment (OARE). These programmes have been developed and sustained to address the lack of access to research publications that is widespread in the world's developing countries, and that constitutes one of the key factors limiting scientific activities in those countries<sup>1</sup>. Through these programmes, researchers in participating institutions have access to the same information as their peers in developed countries, supporting their contributions to the evolving body of global research. Each of the four Research4Life programme portals enables users from registered institutions to search publishers' databases, view abstracts of publications, and download the complete texts of these publications.

Research4Life participation is open to a wide range of organizations and users in 106 low or middle income countries, areas and territories. 78 countries, areas and territories with a per-capita GNI of \$1,600 or less, or a Human Development Index of less than 0.63, comprise "Group A" countries, where institutions receive free access. Institutions in 28 "Group B" countries, areas and territories, with per-capita GNI between US \$1,601 and US \$5,000, or an HDI between 0.63 and 0.67, pay US \$1,000 per year for a subscription to the Research4Life content – an effective discount of over 99.9%.

Accessing organizations include universities; medical centres, hospitals and clinics; research institutes; government ministries and agencies; and non-governmental organizations, among others. Individual users include researchers, university faculty, post-graduate and undergraduate students, librarians, medical practitioners and agricultural extension educators.

HINARI (Programme for Access to Research in Health— [www.who.int/hinari](http://www.who.int/hinari)) was launched in 2002 and is led by the World Health Organization in collaboration with Yale University and the International Association of Scientific, Technical & Medical Publishers (STM) .

## **Assessing the Impact of HINARI**

It is clear from a number of key metrics of HINARI's growth over the last 10 years that the service has developed a degree of presence in the developing world research information environment that places it in a position to have significant impact. The HINARI online library now makes available over 16,000 scientific publications from more than 150 publishers to more than 5,000 organizations, including universities, medical schools and teaching hospitals, research institutions and government offices. A survey which formed part of a 2010 commissioned review of the user experience of the Research4Life programmes revealed that more respondents (24%) cite HINARI as a source for life-science and medical research than cite any other source, while more respondents (32%) cite HINARI as the source they use most frequently<sup>2</sup>.

But what have been the practical impacts of the availability and use of HINARI?

In a recent posting<sup>3</sup> to the Society for Scholarly Publishing blog, The Scholarly Kitchen, Phil Davis looks at the complementary merits of case studies and statistical analysis as tools for measuring impact. Research4Life has chosen to adopt a similar twin-pronged approach to examining the impact our programmes have had on our users, their research, their communities, and their countries' economic development and welfare.

### **Case Studies**

In 2011, Research4Life launched a user experience competition which asked users to share with us how our programmes had improved their work, life and community. The submitter of the entry judged to be the most impressive would be brought to London to present their story at the July 2011 Research4Life 10<sup>th</sup> Anniversary General Partners Meeting, held at the headquarters of the British Medical Association, a significant location since it was the venue at which HINARI was launched 10 years earlier.

Although we did not have at our disposal the resources to deploy the full panoply of procedures and approaches commonly recommended for full scale case study development<sup>4</sup>, we did present all those wishing to participate in the competition with a standard template which required them to provide the following information:-

- 1) A description of who you are, and your role in your institution/medical unit/university.
- 2) How did you find out about Research4Life?
- 3) How do you use Research4Life?
- 4) How has Research4Life changed the way you work or the way you do research?
- 5) What have been some of the outcomes of your being able to access Research4Life?
- 6) Did you make any discoveries or research breakthroughs based on medical or scientific evidence obtained through using Research4Life? If so, how have they affected your own research or how have you applied them in your job.
- 7) Has access to Research4Life encouraged you to do your own research and contribute this research to the body of medical knowledge? If so please give details, outlining any challenges you have faced and any achievements of which you are proud.
- 8) What kind of effect do you expect Research4Life to make on your research and the future of your work?
- 9) How has Research4Life impacted your community?

We received 60 entries, mainly in English but also in French and Spanish, from 27 countries, areas and territories including Bangladesh, Plurinational State of Bolivia, Bhutan, Burkina Faso, Cameroon, Colombia, Democratic Republic of the Congo, El Salvador, Ethiopia, West Bank and Gaza Strip, Iraq, Côte d'Ivoire, Kenya, Malawi, Mali, Morocco, Nepal, Nigeria, Peru, Rwanda, Senegal, Sudan, Ukraine, Viet Nam, Yemen, Zambia, and Zimbabwe. Entries were submitted with a variety of additional back-up material, including photographs, PowerPoint presentations, and an audio podcast, along with links to additional data on web sites.

As we watched the entries coming in, it became very clear that much effort and care had been put into constructing the detailed and informative narratives which described the impact of HINARI and the other Research4Life programmes on the entrants, their fellow researchers, patients, and entire communities. Accordingly we felt we owed it to the competitors to have their work assessed by a panel of judges with a mix of experience of the realities of life for medical researchers and practitioners in developing world countries, and

experience of the creation and distribution of peer-reviewed scientific research and how that research can be most effectively used. After much consideration we selected a panel of eleven judges. They represented the worlds of scientific research, university librarianship, academic publishing, and UN and other international development agencies, and came from a significant spread of countries - Congo, France, Germany, Mali, Mexico, United Kingdom, and United States of America.

Whilst all the judges could read and understand English, not all could read French and Spanish, so entries in these languages were translated and the translations distributed to all judges along with the originals. The judging process was mainly conducted via email exchange, which narrowed down the contenders to a consensus on the best eight entries. The final decision on the competition winner was made on the judges' only conference call. After much deliberation, the judges ultimately could not decide to select just one winner. There were two entries that spoke strongly to judges as especially inspiring and worthy of an opportunity to present their stories in London: Dr. Arun Neopane, Paediatrician, Shree Birendra Hospital, Kathmandu, Nepal and Mr. Mulugeta Bayisa, Physiotherapist and Professor, University of Gondar, College of Medicine and Health Sciences, Department of Physiotherapy, Ethiopia. Elsevier generously offered to pay the travel expenses for one of the winners to also to come and speak at the London meeting. Visa problems eventually meant that Mr. Bayisa was prevented from being physically present and instead gave his presentation via a recorded video. The presentation in person by Dr Neopane of his testimony to the power and impact of HINARI in his Nepalese hospital was a highlight of the Research4Life 10<sup>th</sup> Anniversary General Partners Meeting.



*Dr Arun Neopane at the Research4Life General Partners Meeting, London, 14 July 2011*

Although we could only declare two winners from the entries we received, we felt that the insights and testimonies contained in these stories deserved a wider circulation, both as a demonstration to our users (and potential users) of the positive outcomes that can be leveraged from access to, and effective use of, the latest peer-reviewed research literature and also as a means of demonstrating to our publisher and other programme partners the

practical value of their continued support and active participation in our programmes. Accordingly we commissioned and co-edited a booklet<sup>5</sup> which retells eleven of the original testimonies in a more journalistic style than the original competition entries, thanks to the expert skills of Green Ink, an organisation specialising in communicating science for sustainable development in natural resources and related fields. Green Ink took the basic competition entries, fleshing them out with additional information and photographs gleaned from email and telephone communication with the authors. The resulting case studies provide a wealth of insights into how access to the results of peer-reviewed research from Research4Life publisher partners is benefiting the health, well-being, and economic and social development of communities in the developing world, as well as contributing to greater environmental health and awareness. The examples indicate, inter alia, how access to research content via HINARI has:-

- allowed a practitioner in Ethiopia (Mr. Bayisa) to successfully treat a patient with a rare and serious condition, and helped his hospital to deliver more effective training to orthopaedic physicians
- enabled a Nepalese paediatrician (Dr. Neopane) to save children's lives through better treatment of diarrhoeal diseases, at the same time as developing his hospital's journal into a scientifically rigorous publication. It is interesting to note that a number of entries reported that access to Research4Life content had enabled improvements in local journals. It had been a concern, when HINARI was being developed in 2001, that access to our content could have a negative impact on local publishing. It has been reassuring to learn that, at least in some places, HINARI has had the opposite effect.
- helped a physician to improve the lives of HIV-infected children in Zambia. HINARI plays a major role in his work, allowing research that informs the development of policies and medical procedures that provide the best possible treatment. Access to HINARI has also allowed his team to obtain essential information about groups performing related research in similar settings, with every issue of just three of the journals accessed through HINARI – AIDS, Journal of Infectious Diseases, and Journal of Acquired Immunodeficiency – containing papers relevant to resource limited settings and his work.

One of the key policies he has developed through his HINARI-assisted research is that mothers with HIV should continue to breastfeed their babies until two years of age, if stable on anti-retroviral medications. This allows children to thrive with minimal risk of the infection.

- helped a researcher from Burkina Faso to develop better and more informed scientific writing skills, produce focused research that he can discuss with top researchers worldwide, compete more effectively for research funding, and deliver better teaching programmes
- allowed a Sudanese policy-maker to introduce evidence-based policy development designed to improve the Sudanese people's health in the long term. Using the published scientific research available through HINARI has made it much easier to convince other policy-makers at federal and state levels about the merits of his agency's proposals.
- enabled a midwife to improve maternity care in Zimbabwe and reduce maternal and neonatal mortality rates. Her ability to access evidence through HINARI has allowed the sharing of knowledge that is changing the way crucial activities – such as resuscitation of the newborn – are carried out. The charity she set up has already heightened awareness of the need for evidence-based practice. This has resulted in a growing number of midwives in Harare meeting with each other, as well as obstetricians, to see how a more

informed and evidence-based woman-centred approach to maternity care can be achieved, and to address the problem of women's lack of choice and involvement in making decisions on their own childbirth experience.

As can be seen from the above examples, access to HINARI content has resulted in clear improvements in practical patient diagnosis, treatment and care. From the competition entries it is clear that, in a number of countries, there is flourishing activity in evidence-based health care, policy making, advocacy (to decision makers and to the general public) and problem-based learning (in medical/nursing/etc. education as well as in post-graduate studies and continuing education), all of which would be impossible without HINARI.

Often this activity is entirely locally initiated, but in some cases it has been facilitated by international collaborating partners. For example, evidence-based medicine (EBM) experts from the University of Leicester (UK) and their colleagues have been working with the University of Gondor in Ethiopia. They have introduced an EBM practice module in the different health-related courses at Gondor (medicine, laboratory science, physiotherapy) in which they specifically teach how to use HINARI to find the evidence.

Other benefits highlighted by many of the respondents were a new found ability to develop informed and relevant research agendas, to create well-informed and successful research grant applications, to conduct research which would command increased respect from peer-reviewers and journal editors, and to establish newly credible relationships with the medical research community worldwide. A not inconsiderable by-product of all this was that the new knowledge and expertise which HINARI access was providing was able to be shared in a teaching environment, resulting in better prepared and better informed students, graduates, and clinical practitioners. Some respondents recounted how HINARI had also facilitated in-country distance learning – for example, a physician with HINARI available in his hospital was, as a result, able to pursue an advanced degree from a university in another part of the country. There were also indications that HINARI helps to reduce brain drain, as some respondents reported that, before having local access to HINARI content, it would have been impossible to pursue their particular studies in their own country. Another respondent explained how access to HINARI had freed up more resources to spend on conducting his research, because previously a significant portion of his research budget had had to be ring-fenced for the specific purpose of travelling to Europe simply to get access to relevant published recent research.

Apart from the direct benefits reported by researchers and practising clinicians, a consensus among the librarians who responded was that their role as facilitators of access to HINARI, and trainers in its use, had revalorized their role and work and significantly enhanced their status within their institutions.

### **Statistical Analysis**

With the above booklet published, we feel we have developed a convincing body of case study evidence of the impact that the growth and development of the HINARI programme has made over the last 10 years. This evidence has proved particularly satisfying for those individuals, some of whom made up our panel of judges, whose faith, enthusiasm, and energy were key to the creation of HINARI 10 years ago.

However, as indicated at the beginning of this paper, case studies are only one way of demonstrating impact. For many stakeholders, such anecdotal evidence, although powerful and persuasive, is most effective when supplemented with a more statistically based analysis. Appreciating this need, we are now in the early stages of developing a programme which will aim to use bibliometric analysis as a tool to see if there is evidence that access to

HINARI mediated content has affected research output and quality at participating user institutions.

This will not be a trivial exercise. Methodological challenges have prevented what bibliometric analyses that have been conducted so far in the realm of developing country content provision from reaching firm conclusions about impact. Research commissioned in 2009<sup>6</sup> by Research4Life revealed potential positive links between access to Research4Life content and growth in research output, but was not able to control for a number of other potentially relevant factors. Subsequent research<sup>7</sup> on the impact of access to journal literature in another developing world access scheme, The Essential Electronic Agricultural Library (TEEAL), made some progress on this front, but was not able to control for the level of usage of the journals in the scheme, nor could it guarantee that a control group of non-scheme institutions had not had access to the journals via an alternative distribution channel.

With these methodological issues firmly in mind, Research4Life has gathered a team of specialist bibliometricians and analysts among its library and publisher partners to develop a specification for the most rigorous attempt yet to measure the impact of access to Research4Life content in terms of quantity and quality of research output. Because it is the longest established and offers the largest amount of content, we have elected to focus our research on our HINARI programme.

After some deliberation and consideration of the challenges involved in teasing out the data needed about developing world research-producing institutions in order to control for factors other than HINARI access which may affect research output metrics (number of biomedical postgraduate researchers, research funding levels, etc.) we agreed that our methodological approach would involve:-

- identifying a number of institutions that have registered for HINARI at least four years ago (and have had significant use of its content) and, by examining their research output over the last 15 years, seek to measure whether, since the introduction of access to HINARI content:-
  - there has been a significant increase in the production of research articles
  - there has been a significant increase in the number of cited references in these articles
  - article reference lists include more citations to HINARI journals
  - the median age of article references decreases
- identifying a number of institutions that have registered for HINARI very recently (in the last 12 months) and gathering the same data on research article production over the last 15 years.
- Identifying a number of developing world institutions that have not registered for HINARI and who do not have formal institutional access to HINARI journals via any other means, and gathering the same data on research article production over the last 15 years.

Establishing that these institutions do not have systematic access to HINARI journals via other means will be quite a labour-intensive and laborious exercise involving ruling out access via alternate developing country schemes such as INASP or EIFL, as well as checking whether prior access may have been available via sister institutions or established personal connections. These procedures will of course need to be

undertaken also for the group of institutions which have registered for HINARI only in the last 12 months.

It is clear that, compared to the work involved in collecting practical case study evidence for the impact of HINARI, the challenges facing us as we attempt to gather parallel bibliometric evidence are many. We would welcome insight and ideas from others about the best criteria on which to construct our test and control groups and the most effective ways to identify as tightly as possible the external factors involved.

Meanwhile, in addition to the bibliometric study of research output from the selected institutions, we plan to add a formal survey element to our programme of impact assessment. Our survey will investigate a number of potential impacts of access to HINARI content at the studied institutions. It will examine a range of impacts in addition to research output and will look at how these affect a number of different constituencies including early career researchers and PhD students.

We look forward to sharing the results of our research in due course.

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