

Measuring the impact of access to published medical research in the developing world

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Abstract:

Research4Life is a public-private initiative in which a partnership of UN entities, scientific publishers, university libraries, and technical partners have come together with the aim of reducing the knowledge gap between developed and less developed countries by providing the latter with affordable access to critical scientific research from over 48,000 books and journals.

Research4Life's oldest programme, HINARI, which focuses on bringing peer-reviewed biomedical research to both academic researchers and practising physicians, was launched in 2001 and in recent years has begun to consider ways in which it can assess the practical impact it has had on its intended beneficiaries.

In 2011, Research4Life launched a user experience competition, asking users to share how HINARI, and the other Research4Life programmes in the fields of agriculture and the environment, had improved their work, life and community. A subsequent booklet of case studies celebrated the stories behind some of these competition entries, providing insights into how access to the results of peer-reviewed research from Research4Life publisher partners was 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.

In the wake of the enthusiastic reception given to this booklet, Research4Life commissioned external consultant Information Power to develop a broader view of HINARI's impact, via the medium of an extensive online survey of known and potential users of the service.

The request to complete the survey was distributed by a number of HINARI publisher partners to relevant authors, Table of Contents alert subscribers, and others in the more

than 100 HINARI eligible countries, areas, and territories in the developing world. In addition the survey was circulated to the Association for Health Information and Libraries in Africa (AHILA) with a request to forward it to their library users. In total, invitations to participate in the survey were sent to over 60,000 individuals.

This paper explains why Research4Life decided to undertake this project, outlines some of the issues addressed in developing an effective survey, and looks at what the results of the survey reveal about HINARI's users, how the service is used, and the positive impacts that access to the research material has had. It reveals how the results of the survey suggest a number of avenues for further research and also reports on some of the constraints experienced by HINARI's developing world users that prevent optimal use of the material made available. These constraints fall into a number of categories – those which could be resolved by local librarians, those which could be addressed by Research4Life partner publishers, those which could be addressed by Research4Life itself, and those which can only be addressed with the deployment of significantly greater resources than are available to any of the stakeholders in the current information distribution ecology.

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 countries¹. 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 115 low or middle income countries, areas and territories fulfilling criteria from four indicators: Total GNI (World Bank figures), GNI per capita (World Bank figures), United Nations Least Developed Country (LDCs) List and Human Development Index (HDI). Seventy-one countries, areas and territories are "Group A" countries, with less advanced development, and institutions there receive free access. Institutions in 44 "Group B" countries, areas and territories, with more advanced development, pay US \$1,500 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 accessing through their institutions include researchers, university faculty, post-graduate and undergraduate students, librarians, medical practitioners and agricultural extension educators.

ASSESSING THE IMPACT OF RESEARCH4LIFE

It is clear from a number of key metrics of Research4Life's growth over the last 13 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 Research4Life online library now makes available up to 48,000 scientific publications from more than 200 publishers to more than 7,900 organizations, including universities, medical schools and teaching hospitals, research institutions and government offices.

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

In a posting² to the Society for Scholarly Publishing blog, The Scholarly Kitchen, Phil Davis looks at the complementary merits of case studies and statistical analysis ("Statistics and Storytelling") as tools for measuring impact. Research4Life decided that it would like 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.

IMPACT ASSESSMENT VIA CASE STUDIES

Developing a programme of case studies, although very time-consuming and logistically complex, was nevertheless conceptually relatively simple. In 2011, Research4Life launched a user experience competition, asking users to share how HINARI, and the other Research4Life programmes in the fields of agriculture and the environment, had improved their work, life and community. A subsequent booklet of case studies³ celebrated the stories behind some of these competition entries, providing insights into how access to the results of peer-reviewed research from Research4Life publisher partners was 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. Over the ensuing four years we have developed a series of articles following up on some of the users featured in the original booklet, examining the continuing value they have derived from use of our content and the progress they have made since our original studies. So far we have published updates on how Research4Life access has impacted positively on patient care⁴, research support⁵, and evidence based government policy⁶.

Meanwhile part of our case studies philosophy embraces the conviction that it is vital to highlight the important role played by librarians in the developing world in building institutional capacities and aiding in vital research. From information literacy training to building infrastructure and outreach, librarians are critical to building a healthy research culture in the developing world and they are often the "unsung heroes" in the research ecosystem. Thus it was that in 2013 Research4Life commissioned a further series of case studies, "Unsung Heroes, Stories from the Library"⁷ – narratives from individuals around the world revealing their role in the trends, challenges and opportunities facing research communities in the developing world.

IMPACT ASSESSMENT VIA STATISTICAL ANALYSIS

Original plan – a bibliometric analysis

Working out a way to complement our published case studies with a statistical analysis demonstrating Research4Life's impact has proved much more difficult, however. 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 2009⁸ 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 research⁹ 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 in mind, Research4Life consulted with a team of specialist bibliometricians and analysts among its library and publisher partners to see if it would be possible to develop a specification for a more rigorous attempt to measure statistically the impact of access to Research4Life content in terms of quantity and quality of research output.

We suggested a bibliometric approach which would focus on Research4Life's oldest and largest programme, HINARI (Programme for Access to Research in Health). It 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). The proposed bibliometric approach would involve:-

- identifying a number of institutions that had registered for HINARI at least four years ago (and 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 had been a significant increase in the production of research articles
 - there had been a significant increase in the number of cited references in these articles
 - article reference lists included more citations to HINARI journals
 - the median age of article references had decreased
- identifying a number of institutions that had 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 had not registered for HINARI and who did 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.

After extensive research and consultation we reluctantly concluded that a valid bibliometric analysis which could isolate the impact of HINARI from other confounding variables was simply not feasible for a number of reasons:-

- There is no available time series data for developing country research-producing institutions that would allow us to record changes in the number of biomedical postgraduate researchers, or changes in the levels of funding for research made available to these institutions or separately to individual researchers working out of them.
- Establishing whether researchers at institutions who do not have systematic access to HINARI journals via HINARI might have similar access via other means would be an impossibly 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.
- The suggestion to examine whether the median age of article references decreases after researchers at an institution gain access to HINARI was put forward by a representative of one of the major search engines at an academic conference, but on closer examination the evidence suggests (as instanced in one of our own 2011 case studies of a Burkina Faso researcher) that, without access to the up to date research literature which HINARI provides, researchers were submitting papers for publication whose most recent references were so old that the papers were inevitably rejected for publication. This would mean that, pre-HINARI access, there would be unlikely to be a sufficiently large body of published research from any given institution to allow a median article reference age trend to be measured.

Revised Plan – Impact Assessment via a Survey

So after further deliberation, we decided to adopt Professor Raymond Wolfinger's maxim that "The plural of anecdote is data" and build a set of impact statistics via the medium of a number of broad surveys. Target groups we would aim to reach with our surveys would include researchers, research funders, research administrators, physicians, trainers, and librarians.

For our first project we agreed that we would survey users of our HINARI programme and explore, inter alia, frequency of access to HINARI content, which content is accessed and for what purpose, and how this access has impacted on:-

- clinical practice and patient care
- the ability to write successful research proposals
- the quality of research undertaken and the efficiency with which it is carried out
- research output
- individual jobs, roles, and careers
- individual departments and institutions.

Methodology

Stage 1: Survey development

The core of this first stage was the development of the detailed text of the survey, in other words what questions to ask. Our starting point was to return to our original case studies, look at what examples of impact they contained, and then frame these as questions, thus developing the survey as a way of quantifying this impact across many more institutions and individuals. In this way the survey becomes essentially an attempt to take the sort of insights revealed by these case studies and get some idea of how representative they are within the developing country research and clinical practice environment.

An important challenge we had to address was that some of the questions were very specific to certain roles. In particular there was a raft of questions that dealt very specifically with impacts on research and another that dealt very specifically with impacts on clinical practice. We decided to address this by offering a “Not applicable” option to these core impact questions rather than attempting to structure the survey so that it suppressed questions based on a preliminary interrogation about respondent job function, to minimise the risk that respondents with a strong focus on one role but with some small but significant experience of another role might be denied the opportunity to record the impact of HINARI on the latter. Although the tables and charts in the subsequent published report document all the resulting N/A responses, when extracting data for the purposes of illustrating the impact on specific roles we sometimes omit the N/A data in order to give a clearer picture of the impact on specific subsets of the respondents.

The draft text of the survey went through many iterations as it was circulated for comment among the market research experts who comprised our specially recruited survey advisory team and among Research4Life’s permanent marketing and communications teams¹

Stage 2: Survey Pilot

Before launching the survey to some 60,000 recipients, we were advised to test it with a few specially selected respondents to check that it was clear and covered all major potential impacts and variables which might correlate with impact.

So we piloted the draft survey with 30 individuals (both researchers and physicians) who had recently been on HINARI training workshops and we also shared it with the members of the Research4Life Communications and Marketing Committee. The core pilotees were selected on the basis that they were already familiar with and supportive of the HINARI programme and were asked to give a final “user based” critique of the survey to check that we had captured the important issues and to report if they found any questions unclear, ambiguous, or frustrating in that they could not respond appropriately.

We received 8 responses (from respondents in Samoa, Mozambique, Senegal, Albania, Botswana, and from two Research4Life Communications team members) and made a number of modifications to the survey as a result of this feedback:-

¹ All advisory teams are recruited from appropriately qualified volunteers among the Research4Life partners

- We added a question on training so that we could assess how significant training was in terms of generating awareness of HINARI as well as comparing the level of HINARI impact between those who have received training and those who have not.
- We added an option that gave respondents the opportunity to reveal if they had used the knowledge gained after accessing content via HINARI to organise or participate effectively in a journal club.
- We added nurse/midwife to the list of positions respondents could indicate that they held at their place of work.

We also received a number of comments and requests for additional questions to be incorporated into the survey - about user interface issues, access constraints, etc. This made us realise that we should do more to emphasise from the start (by calling the survey a HINARI Impact Survey not a HINARI User Survey) that this was very deliberately a relatively short focussed survey to capture the impact that access to HINARI has had on respondents as health professionals, researchers or teachers, rather than a wider ranging review of the user experience of HINARI, which is currently being addressed by us in a much more ambitious and elaborate project comprising longer surveys and a series of face to face interviews with end users, librarians, and technical support staff.

Overall, however, we were pleased that the overriding response from our pilotees was reassuring and positive. As one pilot respondent from Botswana said:-

I had a look at the survey and feel that it is very good. It has good questions that are direct and easy to answer. The English was great (not too basic and not too complicated) and the format fine. I felt that it went through the important issues.

Stage 3: Survey Despatch

The finally agreed version of the questionnaire was set up on Survey Monkey. A link to the survey was distributed by a number of HINARI publisher partners to their authors, personal subscribers to journals, Table of Content alert subscribers, sample issue requesters, Pay Per View purchasers, and others. Individuals were qualified to receive the invitation to participate in the survey if they were recorded as being resident in any of the then 116 HINARI eligible countries, areas, and territories in the developing world and were registered as having an interest in biomedical research or clinical practice. The invitation was also distributed to members of the Research4Life User Group, a forum organised and moderated by the Information Training and Outreach Centre for Africa (ITOCA). In addition the survey was circulated to the Association for Health Information and Libraries in Africa (AHILA) with a request to forward it to their library users. The survey was available from 27 February to 18 April 2014. Total English language distribution was approximately 63,000.

Survey Results – What We Learnt

The survey attracted a total of 1034 responses, which formed the basis of the published analysis¹⁰, although further responses continued to arrive after the survey had officially closed and many of the free form comments in these provided the Research4Life team with further useful insights, even though they did not make it in to the published report.

Respondents came from 105 countries. 25% of responses came from the top four countries - Nigeria, Peru, Ukraine and Bangladesh - while 50% of responses came from the top 13 countries. See Table 1.

TABLE 1 Question 14: In which country do you mainly work?:

| Answer Options | Response Percent | Response Count |
|----------------|------------------|----------------|
| Nigeria | 10.1% | 92 |
| Peru | 6.5% | 59 |
| Ukraine | 4.8% | 44 |
| Bangladesh | 4.7% | 43 |
| Ethiopia | 4.2% | 38 |
| Sudan | 3.4% | 31 |
| Viet Nam | 3.4% | 31 |
| Kenya | 3.3% | 30 |
| Iraq | 3.1% | 28 |
| Algeria | 2.6% | 24 |
| Ecuador | 2.6% | 24 |
| Sri Lanka | 2.4% | 22 |
| Guatemala | 2.1% | 19 |
| Morocco | 2.0% | 18 |
| Ghana | 1.9% | 17 |
| Nepal | 1.7% | 15 |
| Uganda | 1.7% | 15 |
| Bolivia | 1.5% | 14 |
| Tanzania | 1.5% | 14 |
| Albania | 1.4% | 13 |
| Cameroon | 1.2% | 11 |
| Macedonia | 1.2% | 11 |
| Myanmar | 1.2% | 11 |
| Zambia | 1.2% | 11 |
| Colombia | 1.1% | 10 |
| Tunisia | 1.1% | 10 |
| Côte d'Ivoire | 1.0% | 9 |
| El Salvador | 1.0% | 9 |
| Georgia | 1.0% | 9 |
| Mozambique | 1.0% | 9 |
| Burkina Faso | 0.9% | 8 |
| Cambodia | 0.9% | 8 |

We left a free form space for “Other country” and the 52 entries here mainly consisted of countries which were in fact on the survey’s drop down menu, or were variants of their official names. Others used this field to explain that they had recently moved from a HINARI eligible developing world country to a more developed country, or listed several countries in which they worked.

There was an interesting difference between the number of respondents who were certain that their institutions have access to HINARI (492) and the number who had ever accessed HINARI (694). 70% of respondents left an email address indicating that they would like to

participate in any more detailed research we may conduct. An exploration of the reasons for this difference may be one line of enquiry worth pursuing.

In terms of frequency of use, it is interesting to note that nearly two thirds of “users” access content via HINARI at least once a week. Given that “users” are defined as those who have ever used HINARI, it is conceivable that the proportion of *current* users who access content via HINARI at least weekly may be higher than two thirds.

The answers to the question “Approximately when did you first use HINARI?” were unexpectedly encouraging in that the responses would seem to suggest that the HINARI user base is growing at a fairly constant annual rate. See Table 2.

TABLE 2 Approximately when did you first use HINARI?

| Answer Options | Response Percent | Response Count |
|--------------------------|------------------|----------------|
| Less than a year ago | 9.4% | 60 |
| One year ago | 6.6% | 42 |
| Two years ago | 11.3% | 72 |
| Three years ago | 13.3% | 85 |
| Four years ago | 10.6% | 68 |
| Five years ago | 12.1% | 77 |
| More than five years ago | 36.8% | 235 |
| <i>answered question</i> | | 639 |
| <i>skipped question</i> | | 397 |

The survey’s feedback on training is consistent with HINARI’s own expressed concern that it does not have access to sufficient resources to respond to all requests for training that it receives. See Table 3.

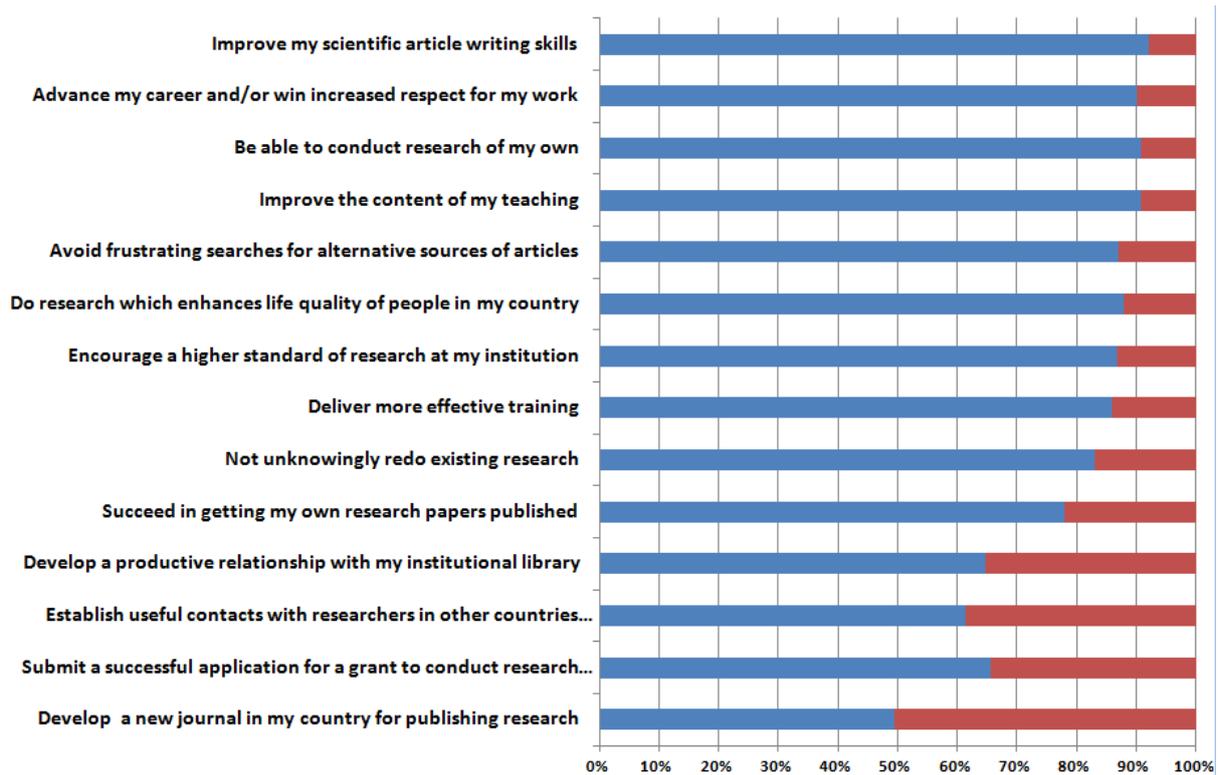
In addition a significant proportion of the free form responses to the final question of the survey are pleas for more in person or online training in the use of the HINARI information resources.

TABLE 3: Have you received any training in the use of the HINARI service?

| Answer Options | Response Percent | Response Count |
|---|------------------|----------------|
| No | 65.5% | 405 |
| Yes - in a dedicated training workshop | 10.5% | 65 |
| Yes - by a librarian at my place of work | 11.2% | 69 |
| Yes - informally by a friend or colleague | 14.6% | 90 |
| Yes - in some other way (please specify) | | 41 |
| <i>answered question</i> | | 618 |
| <i>skipped question</i> | | 418 |

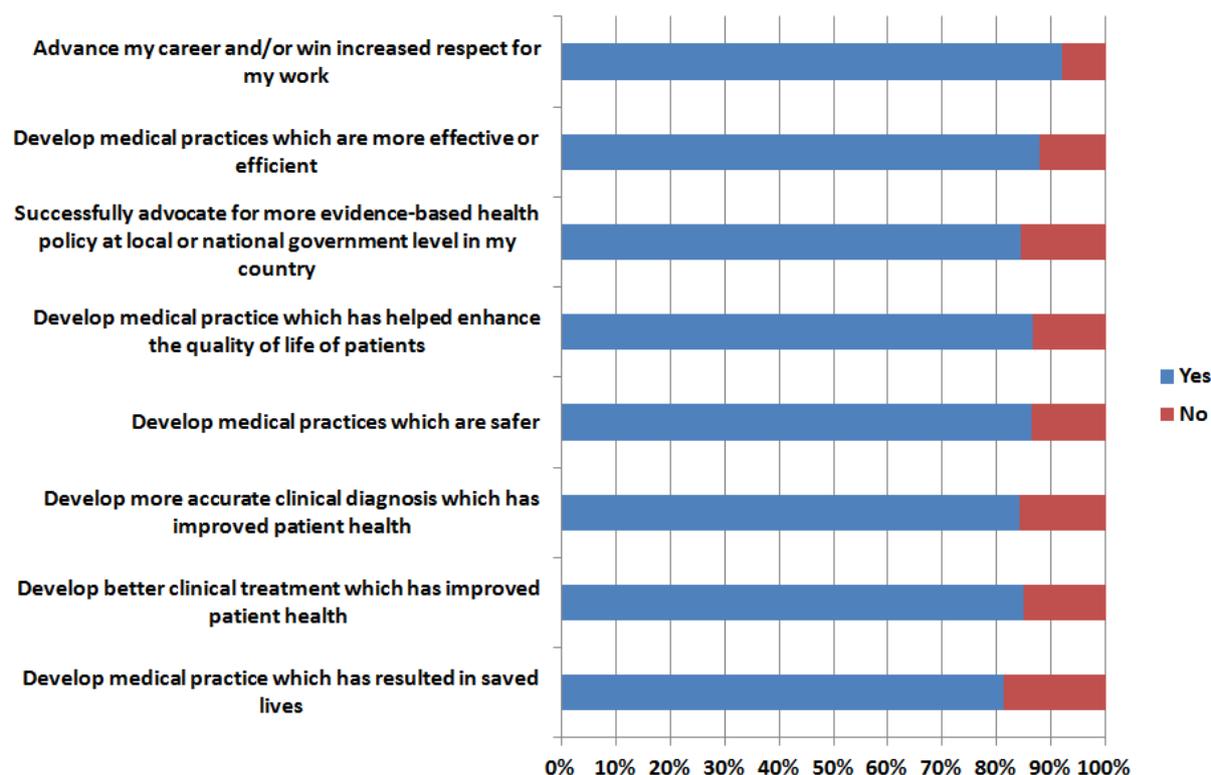
The core of the survey, however, consisted of a number of questions which sought to gather information about the ways in which access to HINARI content had positively impacted the working lives of respectively researchers and practicing clinicians. See Figs 1 and 2 below, where the N/A responses have been omitted so that the results reflect only the responses of researchers and physicians respectively .

Fig 1 Researchers: Having access to previous research via HINARI, has helped me:



n = 393-523

Fig 2 Physicians: Having access to previous research via HINARI, has helped me:



n = 380-471

These were encouraging responses for HINARI, even if one assumes that none of the “No” responses might more accurately have been designated “Not Applicable”.

Many of the responses to these questions suggest that there would be a significant amount of additional insight to be gained by approaching those participants who have provided positive responses with a series of more in depth enquiries.

The final question offered the opportunity for a free form response and asked “Do you have any further comments about the importance of having access to research via HINARI?”

As might be expected from the generally encouraging responses to the survey questions about specific impacts of HINARI access, this question solicited a significant number of testimonials to the value of the programme.

Other responses to this question fell into a number of categories:-

1. Those which could be addressed by Research4Life itself, if it could attract more funding. For example there were many requests for HINARI to conduct more promotion of the service and training in its use and a request to provide a more sophisticated search interface than is currently offered.

2. Those which could be addressed by a collaboration between Research4Life and partner publishers or potential partner publishers. For example there were requests for more local content, especially in the French language, more content from established “Northern hemisphere” publishers, and requests for more effective transitional arrangements when a country moves out of eligibility or when a publisher decides to withdraw from the scheme in a particular country in favour of direct bilateral arrangements.
3. Those which could be resolved by local librarians. The main issue shared here was a regret in some cases that institutional passwords giving access to the content were not readily shared with all eligible users.
4. Those which could only be addressed with the deployment of significantly greater resources than are available to any of the stakeholders in the current information distribution ecology. The key issue here was an acknowledgement that optimal use of HINARI is often subverted by poor technological infrastructure, especially unreliable and slow internet access, vulnerable power supplies, and lack of sufficient computer hardware

Taking Our Impact Research Further

Our survey offered respondents the opportunity to share an email contact address if they would like to participate in any more detailed research we may conduct on the future direction of the HINARI programme. Over 700 respondents expressed an interest in this opportunity by providing contact details and we hope, resources permitting, to return to all or some subsets of these respondents, both to flesh out some of their stories but also to test out ideas for developing new services and functionality within the Research4Life environment.

There is also scope for further mining of the detailed data which the survey delivered, for example looking at the extent to which impact levels correlate with some of the recorded variables like training, length of time as a user, or frequency of use and we plan to pursue a number of other analyses along these lines.

Meanwhile a far more ambitious investigation into the user experience of all of the Research4Life programmes (referred to earlier) has just been completed, involving face to face fieldwork and longer surveys exploring in greater detail how our users operate within the wider information discovery and access environment and we hope to be able to share its discoveries and conclusions in due course.

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