INDEPTH Network
Better Health Information for Better Health Policy

Strengthening Scientific Research Capacity, Data Management and Sharing

Introduction and Background
INDEPTH is a global Network of health and demographic surveillance systems (HDSSs) in low- and middle-income countries (LMICs). Established in 1998, its key mission is to harness the collective potential of members to provide a better empirical understanding of health and social processes, and to apply this understanding in the alleviation of health and social problems. As at December 2012, 47 HDSSs located in 21 countries in Africa, Asia and Oceania are run by members of INDEPTH. The individual sizes of the surveillance populations range from close to 10,000 to over 300,000 people with a total population of close to 3.5 million people worldwide covered at household level.

From inception 15 years ago, INDEPTH has played an increasingly important role in promoting and supporting the work of its member centres through the co-ordination of multi-centre comparative research. During its first decade of existence, INDEPTH placed considerable emphasis on enhancing technical and methodological development; exchanges between centre leaders, scientists, operational staff and data managers; the generation and publication of comparable data on population health patterns; and, providing support to research and technical working groups through workshops. Indeed, workshops and annual general meetings have been important in bringing together centre-based scientists and external collaborators.

Driven essentially by the INDEPTH scientific research agenda, it supports INDEPTH’s broader strategic plan that sets out its future directions. As such, it is informed by the needs of member centres and aims to:

- Achieve greater involvement of member centres and their researchers at all stages by making use of, and further strengthening, the existing research capacity through better targeted efforts.
- Give particular preference to the training of a younger generation of HDSS scientists/researchers so as to ensure sustainability of the centres.
- Strengthening of member centres’ capacity to package and disseminate their findings to policy makers.
- Strengthen capacity of member centres to share data by enhancing capacity not only to generate high quality data but also the capacity to better process and manage the data before sharing.
A. The INDEPTH Scientific Development and Leadership Programme (iSDLP)

The Scientific Development and Research Leadership programme is the flagship of INDEPTH’s capacity strengthening initiatives. Embedded into this programme are several components including: MSc. course in Population-based Field Epidemiology, short courses and other new areas of training.

1. The MSc. Programme in Population Field-Based Epidemiology at University of the Witwatersrand in Johannesburg, South Africa

Established in 2005 in partnership with the School of Public Health, University of the Witwatersrand (Wits), in Johannesburg, South Africa, this successful programme is built around an 18-month Masters’ training in Population Field-Based Epidemiology. The programme consists of two main components: one year of coursework and six months of practical training on the conduct of a research project in a field setting at one of three HDSS learning centres (Navrongo in Ghana; Africa Centre in South Africa; and Ifakara in Tanzania). The main aim of the field attachment component is to demonstrate application of the scientific process from the conceptualization of a research project to the analysis, interpretation and dissemination of the study findings and includes submission of a research report. Since inception of this programme, INDEPTH has funded a total of 36 students for an average of 5 funded students per year. The completion rate of the programme has also been very impressive with all but one of the INDEPTH funded students having successfully completed the programme and graduated.

Table 1: Distribution of INDEPTH funded Students at Wits University by HDSS and country

<table>
<thead>
<tr>
<th>HDSSs represented</th>
<th>Country</th>
<th>No of Females</th>
<th>No of Males</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dodowa</td>
<td>Ghana</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Filabavi</td>
<td>Vietnam</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gwembe</td>
<td>Zambia</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ifakara/Rufiji</td>
<td>Tanzania</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Iganga/Mayuge</td>
<td>Uganda</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Kilifi</td>
<td>Kenya</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Kintampo</td>
<td>Ghana</td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Kisumu</td>
<td>Kenya</td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Manhica</td>
<td>Mozambique</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nairobi*</td>
<td>Kenya</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Navrongo</td>
<td>Ghana</td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Niakhar</td>
<td>Senegal</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vadu</td>
<td>India</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 1 shows the summary of all INDEPTH funded students by country and HDSS as well as the male/female breakdown. In all, the funded students are from 10 countries and cover 15 member HDSSs. Females supported so far represent 22% of the total funded students which is encouraging given the process. Although INDEPTH makes conscious efforts to encourage the participation of female candidates as well as network-wide, we do not have any control over the situation until candidates have first been nominated by their respective centre leaders, applied to Wits and have been selected for admission based on University criteria.

More importantly, almost all have returned to their respective home (HDSSs) institutions and are actively contributing to the research output and publications at their respective centres. Discussions with centre leaders and senior colleagues of centres that have benefitted from this programme suggest that they all hold this programme in high esteem as valuable for enhancing the research capacity of their centres. Indeed, they are very satisfied with the improved skills and contributions of returning graduates. Many leaders are pushing to have their junior staff go through the programme. In view of the success of this flagship initiative, there is need for us to further strengthen this initiative. However, to overcome the difficulties faced by disadvantaged prospective students from some HDSSs (due to language difference and otherwise), we are exploring parallel/similar alternatives to ensure that non-Anglophone young scientists benefit from similar opportunities. One way to address this language disadvantage is to include support for language workshops or English upgrade for potential non-Anglophone students. Also, other emerging training institutions in francophone countries could eventually be strengthened and encouraged to develop the requisite training modules in order to serve as the francophone training hop.

**Developing a Research Data Management (RDM) track**

One key way to strengthen the existing MSc. programme at Wits is by developing a track for data management scientists. Indeed, maintaining large scale prospective databases, data archiving, and data sharing in clinical, health and population studies calls for well-trained data scientists with a sound understanding of scientific principles and processes in clinical and population-based studies. Hence, the current efforts in partnership with Wits to develop a new track in research data management (RDM) as a specialist qualification with specific reference to HDSS. This track will be embedded into the existing MSc. Population Field-based Epidemiology. Data scientists eventually graduating from the programme are expected to lead data management teams, guide data
management activities from data capture through processing to data analysis and publication including the development of data structures and the application of data management software. They will also be in a better position to interact closely and effectively with scientists throughout the various phases of a research project. To accommodate this new track, there are plans to increase the number of accredited INDEPTH HDSS learning centres affiliated to the University of Wits for the 6-month field-based component from three to five. Discussions related to the course planning and curriculum development for the MSc in Research Data Management has already been initiated with the Wits University authorities.

2. Doctoral Level Training
The foregoing Masters’ training provides a pipeline of junior scientists with a strong grounding in research and/or data management able to progress to doctoral level. As a medium and long-term strategy for strengthening scientific research leadership within the Network, creating career paths for young HDSS scientists and to ensure some element of sustainability, the Secretariat should also facilitate the movement from Masters to PhD level training. However, unlike the Masters’ training, PhD training involves higher costs. Building such long term training into projects and major working group activities is the way to handle cost until the time when funds shall be established and/or secured for PhD training. However, PhD training also entails significant opportunity costs to the member centres. In particular, resource constraint rural centres with limited human and financial resources may not be able to release staff for four years and/or at the same guarantee that the staff will return to their previous or positions commensurate with their training. So, going for a sandwiched programme type of training would perhaps ensure that students continue to contribute to their centres while on training as well as guarantee their position after training. But, not all centres have the capacity to provide high-quality supervision for PhD training. One way to tackle this issue is to consider partner programmes in African countries with Universities in the North providing joint supervision along with available site supervision. The other approach discussed in later sections includes the idea of introducing INDEPTH faculty of supervisors along with the proposed setting up of the INDEPTH training centre as well as postdoctoral fellowships.

3. INDEPTH Fellowship Programme
As part of the efforts to build a pool of skilled indigenous young scientists/researchers, the MSc training is complemented by an INDEPTH fellowship programme whereby young graduates with a Master level qualification in population field-based epidemiology, demography or related disciplines are identified (on request by the centre leader) and posted to member centres that lack adequate human resources to work for one year renewable. The provision of these fellows is another strategy to augment human resource capacities of member centres. The rationale behind this strategy is that by the end of their fellowship such individuals may develop interest in research and perhaps opt to stay and work at the centre. In fact, an initial assessment of the fellowship programme demonstrates that it
is has largely been successful as many of the previous fellows have taken on permanent employment with the centres where they were posted.

Plans to continue this programme is in order meanwhile extending this fellowship programme to include individuals who have just completed the PhD training is more useful and productive. Providing support for postdoctoral fellows, introducing visiting scholarships and sabbatical fellowships can serve as a strategy for nurturing/mentorship to the young researchers and as a way to boost the research-publication capacity at the member centres with weak research capacity. Visiting scholars could be either lecturers from national collaborating universities/research institutes or senior scientists from other HDSS who will spend time at the other HDSS mentoring young researchers, analyzing their data and producing joint publications. Of course, there is the element of high cost associated with postdoctoral fellowships/training but on the flip side, incorporating the post-doctoral training component would facilitate the absorption of young PhD graduates as well as help generate resources through grant writing for research that will increase the visibility and productivity of the respective member centres.

4. INDEPTH Small Grants Programme and Re-entry Grants for Wits graduates

As part of the strategy to place young graduates on a research career track as well as enhance their capacities to conceive and lead individual research projects, INDEPTH currently has the re-entry small grant programme for INDEPTH-funded MSc. graduates from Wits University. This small grant provides up to $5,000 per project to individual researcher(s). Eventually, this can be rendered more competitive and attractive by setting up a similar competition for fellows as well as raising the level of funding. For the wider network, there is the cross-centre small grant programme whose overall goal is to foster research collaboration and research training between INDEPTH members by providing seed grants of about US$25,000 per project. This programme enables members to undertake capacity strengthening activities that include but not limited to: promoting or sharing good practices, generating and sharing data, improving data quality, and standardization and/or harmonization of methods. It is through such modest grants that INDEPTH has been able to nurture several working groups, most of which have grown up to a point where they are able to raise their own resources to conduct their research with the Secretariat maintaining a coordination role. The plan is to continue providing these modest grants to researchers and thereby nurturing cross-sites innovative ideas.

B. Short-term Capacity Strengthening Activities

In the short term, INDEPTH’s effort to strengthen the capacity of member HDSSs will be mainly through carefully organized one-two week training workshops to address specific and general deficiencies in some research areas, improve data collection, management and analysis. This will also be complemented by demonstrative analysis, short courses that address specific issues of relevance to Network members as well as on-site specific training and technical support visits.
1. **Training Workshops**

Workshops are quick to mount and a primary vehicle through which INDEPTH usually conveys specific trainings and improved methodological developments to the wider membership. Examples of such recent workshops include the scientific writing that usually targets young scientists, data sharing and data linkage workshops. The Secretariat will continue to organize capacity strengthening workshops for various subgroups within the Network. Apart from the scientific writing workshops organized for young scientists, workshops will be organized for such other areas as longitudinal data analysis, data management, scientific communication, administrative and financial management, grant writing, etc. The objective of such workshops will be to deliver specific skills or update on new developments in the particular area of specialization.

2. **Demonstrative Analysis**

Another key short term strategy for strengthening the analytical capacities of scientists at Member HDSSs and at same time increasing INDEPTH’s scientific productivity is through demonstrative analysis. Demonstrative analysis involves a case where a researcher who has produced a strategically important research output using particular HDSS data, not only demonstrates to other colleagues what can be potentially achieved with their data but also provides guidance for the others to reproduce the research using their data. In addition to the comparative studies frequently pursued by working groups, commissioning a series of demonstrative analyses will definitely ensure a fuller utilization of the member HDSS data and enhance scientific productivity. Indeed, this is an ongoing practice with INDEPTH. A tangible example of this is the clustering of mortality analysis published as a Global Health Action supplement 1 (2010). The plan is to have at least one demonstrative analysis conducted per year.

3. **Short Courses**

Short courses which like workshops are quick to mount and responsive to local needs of HDSS centres, will also provide targeted training for existing scientists based at INDEPTH member HDSSs. INDEPTH Secretariat already has a track record of running successful short courses in Africa and Asia (longitudinal data analysis, grant writing, demographic methods and qualitative research methods). The shorts courses will be organized either as stand alone seminars or in collaboration with partner universities and research centres in Africa and Asia. A case in point is the short course on reproductive health that was organized in collaboration with the Institute for Population and Social Research (IPSR) at the Mahidol University.
4. Technical Support to existing and emerging HDSSs

Technical assistance to both new and existing member centres is one of the effective strategies useful in strengthening capacity of members. Evidently, all the centres are not at the same level in terms of capacities and training needs. Indeed, research capacities already exist at some member centres allowing for productive engagement in cross-site studies. Technical support to members is facilitated by resource persons drawn from the Secretariat or from well-established member centres. Furthermore exchange visit between member centres will be encouraged to facilitate sharing and transfer of knowledge which is not only key to career development of technical staff but also vital for institutional collaboration. Technical support to members covers but not limited to the areas like the starter and resource kits, general support for setting up new HDSSs, data management and quality control support including documentation, migration from FoxPro to SQL, migration from HRS platform to OpenHDS, transition from paper capture to paperless data capture, etc.

5. Mentorship programme for data quality and analysis

As part of our efforts to assist INDEPTH members, we have adopted a strategy of identifying experienced scientists to visit HDSSs (that express the need) as mentors for a week. During this time at the centres, the mentors are interact with the centre directors and scientists, review their work plan, strategic/business plan, troubleshoot, identify opportunities and challenges, and suggest/recommend a way forward. The mentors’ reports should provide the Secretariat with pointers to how the centres can be assisted as well as serve the respective centres on how to improve their performance.

6. The iSHARE support

The INDEPTH Network’s Sharing and Access Repository (iSHARE), is a standardized and centralized data access platform for multiple participating HDSSs. The repository provides researchers with opportunities for better pattern identifications on existing data sets. It also enables members of the Network to share data amongst themselves more effectively for cross and multi-centre analysis. This data sharing initiative of the INDEPTH Network has been driven principally by a belief that the data collected are a public good and should be used to produce the greatest public health benefits. An external evaluation of iSHARE recommended that INDEPTH make use of this platform to enhance wider access of its research data. Consequently, the iSHARE model has been integrated into the Strategic Award proposal and this portion has been funded by the Wellcome Trust. In the proposal, the data management component hinges on the deployment of a hardware and software system – a “Centre-in-a-Box” (CiB) to participating Centres. The initiative for Centre-in-Box (CiB) is taken up as an augmentation to iSHARE for strengthening the IT capacity at HDSS centres with centralized and remote support. The CiB is conceptualized as a boxed solution with plug-n-play preconfigured computer working at HDSS centres to facilitate the entire HDSS data life-cycle. The objective is to support data management operations, metadata management, security of data and analytic report generations. Following training by the iSHARE team, Centres will use these systems to extract and
document their analytical datasets. Also, as internet access increasingly becomes standard, problems of reading and understanding the contents of data files become acute. Resolving these problems requires standards for documenting data, as well as standard formats for both data and documentation that can be read and displayed by computers and software anywhere in the world. To define a documentation standard we used Data Documentation Initiative (DDI) version 2.1.

C. Young Scientist Programme

One of INDEPTH’s long standing commitments is the training of, and strengthening the research capacities of the next generation of scientists from low-and-middle income countries and thereby increased scientific productivity of member centres. While in all the preceding efforts we will give special attention to young scientists, there is still a need to have more targeted efforts towards increasingly nurturing generation of young scientists to ensure the sustainability of the member centres. The “young scientists” are encouraged to apply for travel grants to attend the INDEPTH scientific conference (ISC) by submitting an abstract for a scientific presentation. If a submission is accepted for a “young scientist” presentation, the authors are required as a condition for the award to submit a full paper at least a month before the conference to the Secretariat. An individual that meets the defined criteria and these requirements is admitted as an INDEPTH “Young Scientist” and automatically qualifies to participate in a scientific writing workshop usually organized after the conference. So, in addition to the sponsorship to the ISC, the young scientists were offered a follow-up training on scientific writing or a pre-conference workshop. The ultimate objective of the scientific writing workshop is to strengthen the capacity of INDEPTH member centres to publish their research.

Also, given that young researchers with access to HDSS data have enormous potential to launch their careers as independent investigators without requiring excessive grant funding, we are also planning to be organizing a series of comprehensive workshops or seminars to train them in addressing some of the key challenges in identifying novel research questions, developing a research protocol, drafting compelling manuscripts, and identifying appropriate target journals for publication.

D. INDEPTH Training Centre and Faculty

The ultimate platform for facilitating the strengthening of scientific research and data management capacities of member centres and enhancing the productivity of INDEPTH in particular is embodied in the idea of setting up a training centre. As part of the efforts to build sustainable capacity in health research at member centres, we are currently planning on developing an INDEPTH Training Centre. The centre will organize a series of activities (including advanced courses, workshops and seminars)

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1 Young scientists as broadly defined are researchers aged 35 or less currently preparing for, or recent graduates with either M.Sc or PhD who have taken up a career with one of our member centres.
to strengthen member centres’ as well as house the Secretariat. Such a centre should be equipped with modern communication technology so as to incorporate the virtual classroom (distance learning and lectures) in our training and capacity strengthening efforts. This technology side will ensure that we not only deliver high level training to members but will also facilitate the use of highly qualified experts without most of the time having to move them away from their duty stations. This training Centre will encompass a multiple-source data archive for the training of young scientists from LMICs and INDEPTH member HDSSs in particular.

To be administered by the INDEPTH Secretariat and conducted by internationally-recognized scientists/facilitators both from South-based and North-based institutions, the training will be offered in response to the needs of HDSS centres. They will be designed to provide training from study designs, to analysis, and dissemination of research, and provide progression from basic to more advanced statistical analysis topics, including data manipulation and preparation; statistical computing; research design; demography and research skills. It is worth noting that INDEPTH in collaboration with other Northern partners is already in the process developing a set of training activities concerning adult health and the social determinants of health. This is under the framework of an EU funded coordinated action known as the INDEPTH Training and Research Centres of Excellence (INTREC).

**INDEPTH Faculty of Supervisors and Lecturers**

The SAC is already providing much support in the review of manuscripts, proposal and the scientific agenda of the Network. With the planned support for PhD level training of centre-scientists enrolled on sandwich programmes couple with the proposed training centre, there is the need for local resident supervisors and mentors assist in the supervision of current and future masters and PhD students. The said faculty of scientists will also be affiliated to the training centre offering the lectures for the much needed short courses.