Cross-Sectional Survey of Genetics and Genomics Training in Africa

Summary
The survey aimed to assess the current status of Genetics and Genomics Training across the continent and provides baseline data for the recently established African Genomic Medicine Training Initiative (AGMT). A link to the survey form distributed to the Genomic Medicine Mailing list and to other key stakeholders across the continent. 78 responses were captured and 33 were used for this analysis after removing duplicates and incomplete forms. Nineteen countries were represented in this survey.

The main findings are:

- Only 41% of the sampled institutes provide training in Genetics and Genomics
- Current training in genetics and genomics:
  - is provided mainly to medical students and lab technologists.
  - do not include professional development courses
- Training has been terminated in some institutes due to lack of trainers and resources
- Challenges faced in establishing training courses in Genomics and Genetics include
  - Lack of expertise in curriculum development,
  - interest from potential trainees
  - lack of funds, time and resources
- A Computer Science Department highlight the need to make Genomics and Genetics attractive to computer science students

Suggested solutions from the survey include:

- Forging partnerships with private or better equipped organisations
- Increase acceptance and awareness of Genetics and Genomics
- Supporting and Encouraging Institutes
- Building Capacity through Training
- Online training through the support of H3ABioNet

Based on this survey, we conclude that the vision and mission of the AGMT are in alignment with the training needs of the continent in Genetics and Genomics.
Introduction

The African Genomic Medicine Training Initiative was established by the African Bioinformatics Education Committee (ABEC: http://www.h3abionet.org/training-and-education/african-bioinformatics-education-committee) in collaboration with the Human Genetics Department at the University of Cape Town. The AGMT aims to help pave way for the integration of Genomic Medicine into mainstream healthcare in Africa by increasing training in Genomic Medicine for healthcare workers in Africa. To facilitate quality training in Genetics and Genomics in Africa, we (members of The African Genomic Medicine Training Initiative) conducted a survey to examine the status of Genetics & Genomics education and training at African-based institutes. This work presents results from this survey. While this report is not as comprehensive as previous studies conducted in other countries or continents (Maradiegue, Edwards, & Seibert, 2013; Plunkett-Rondeau, Hyland, & Dasgupta, 2015), the survey provides a snapshot of training in Genetics and Genomics across Africa and forms part of the AGMT’s formative assessment.

Method

A form was designed in REDCap and a link to the survey was distributed to the African Genomic Medicine Training Initiative Mailing list and to other key stakeholders across the continent. 78 responses were captured and 34 were used for this analysis after removing duplicates and incomplete forms.

Results and Discussion

Description of Sampled Institutes

Most responses were from academic institutes (77%) (see Figure 1a). The “Other” category included independent research institutes (Public health research, a research institute and a Clinic). Departments included clinical research/academic departments and a clinic. Responses were captured from 19 countries (see Figure 1b). Only 41% (14) of the departments provide regular training in Genetics and Genomics, 15 institutes do not provide regular training and 4 did not respond to this question. The oldest training programme in Genomics and Genetics has been running since 1990 while the newest is scheduled to start in 2017.
Figure 1a: Type of Institute

- Academic: 77%
- Commercial: 6%
- Non-profit: 0%
- Other: 17%
- Parastatal: 0%

Figure 1b: Countries Represented in the Survey

Key: Figure 1b
1. Angola: Texas Children’s Hospital
2. Botswana: University of Botswana
3. Cameroon: The University of Yaounde
4. Ethiopia: Jigjiga University
5. Ghana: Noguchi Memorial Institute for Medical Research
6. Ghana: University of Ghana School of Medicine and Dentistry
7. Kenya: Kemri, Welcome Trust, Kilifi
Types of Trainees, Topics and Methods of instruction
Most of the institutes provide training in Genomics and Genetics offer training to students (particularly medical students and lab technologists) as illustrated in Figure 2.
Most of the institutes use lectures and observations or practicals. The “Other methods” category included tutorials and videos (see Figure 3). None of the institutes provided a professional development course (see Figure 4).

Figure 2: Types of Trainees

Figure 3: Method of Instruction
Topics covered by the different institutes include basics in DNA replication, mutational analyses, application of genetics and genomics and even African population genetics.

**Terminated and New Courses Genetics**

Five respondents indicated that a Genetics or Genomics course had been terminated at their institutes. A reason captured from one of the respondents was: "yes, because of lack of available lecturers".

Ten respondents indicated an intention to start programmes in Genomics, Genetics, Bioinformatics, Biostatistics, Genomic Medicine and Precision Medicine. A three day course, a professional development and masters course were also highlighted. Possibility of support from H3ABioNet was also highlighted towards establishing a new course. A few quotes on the possibility of establishing new courses are highlighted below:

"Yes, a three day course on Precision Medicine in Africa".

"We plan to develop a genomic medicine course for professional development of health care professionals and ultimately a full Masters".

"Yes. In fact we plan on opening an eLearning platform and establishing an H3ABioNet node for Ethiopia via discussions with H3ABioNet".

Interestingly, a respondent from a computer science department was not sure whether Genetics and Genomics should be taught in their department: "Maybe in the future but we are in the CSE department"
Challenges and Needs

Several themes emerged when respondents were asked about challenges and needs they encounter. These included lack of support from management, finance, equipment and resources, expertise, time and lack of interest of computer science students. The most common theme was lack of expertise followed by lack of resources. A few responses suggested plans or ways to mitigate their challenges/needs such as increasing interest amongst potential trainees by highlighting potential benefits of learning genetics and genomics.

“If we intend to offer such courses in the Computer Science (CSE) department, we have to show students the prospects of learning such topics to our CSE students”.

Table 1: Emerging themes and illustrative quotes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Illustrative quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of expertise in curriculum development, genomics and genetics</td>
<td>“Deciding on the level at which to teach/train. Deciding the appropriate content and structure. Having a balance between activities to encourage active learning and building knowledge. Finding time to do it well”</td>
</tr>
<tr>
<td></td>
<td>“lack of expertise”</td>
</tr>
<tr>
<td></td>
<td>“the challenges are - lack of human resources; financial resources; to pay lecturers from other institutions or countries to come and assist our”</td>
</tr>
<tr>
<td></td>
<td>“lack of skills &amp; expertise”</td>
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<tr>
<td></td>
<td>“I am not really in the position to provide such training.”</td>
</tr>
<tr>
<td>Lack of interest from potential trainees</td>
<td>“Lack of interest from CSE students”</td>
</tr>
<tr>
<td>Lack of funds and resources</td>
<td>“The University has frozen new programs due to lack of funds…”</td>
</tr>
<tr>
<td></td>
<td>“Doing practical demonstrations due to lack of finance and equipment for use in large classes”</td>
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<td></td>
<td>“reliability of the internet”</td>
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</tbody>
</table>

Suggested Solutions to Improving Genetics & Genomics Training

Most of the comments highlighted potential solutions towards improving training in Genomics in Africa. Solutions included forging partnerships with private or better equipped organisations and increased online training.

Table 2: Suggested solutions and illustrative quotes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Illustrative quote</th>
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<tbody>
<tr>
<td>Forging Partnerships</td>
<td>“The university would do well by twinning with some well equipped laboratories so that we could be able to exchange students as we capacitate the future scientists.”</td>
</tr>
<tr>
<td></td>
<td>“What do you think partnering with private organization/companies in training nurses in Africa on Genetics/Genomics”</td>
</tr>
</tbody>
</table>
| Increase acceptance and awareness of Genetics and Genomics | “There therefore a need for capacity building both from human and infrastructure point of view to popularize genetic and genomic field. The issue of etc also strengthening as cultural or social, legal and ethnic influences have a negative impact on the acceptance of the use of genetic information in non-confidential circumstances.”
“We want publicity and awareness in our institution. Getting graduate students in the biological sciences to embrace genomics study” |
| Supporting and Encouraging Institutes | “The H3Africa initiative is a very welcome development and institutes that do not traditionally offer modules or programs in Genomics and Bioinformatics should be highly encouraged and supported to do so.” |
| Building Capacity through Training | “I think young people (physicians) who are interested in this relatively young field of genetics and genomics should be trained through scholarship programs (Phd scholarships) so that they will become mentors for others in their respective institutions”. |
| Online training | “Is it possible to have on line training on the same?”
“We want publicity and awareness in our institution. Getting graduate students in the biological sciences to embrace genomics study”. |

Conclusion

The survey provides a broad overview of the current status of Genomics and Genetics training in Africa, highlights challenges and possible solutions. A quote which sums up an approach the Genomic Medicine Training Initiative has adopted to help address training challenges in Genetics and Genomics in Africa is as follows: “We can change African genomics capacity if we work together...”