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How We Implemented an Analytical Support Clinic to Strengthen Student Research Capacity in Zambia

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INTRODUCTION

Global inequalities in the distribution of healthcare and health research spending are well known. Sub-Saharan Africa is home to the highest incidence of under-five mortality (UNICEF 2012) and maternal mortality (WHO 2013), highest HIV/AIDS prevalence (UNAIDS 2013), and the shortest life expectancy (WHO 2013) of any region in the world. Yet, despite having 13% of the global population, only 0.6% of worldwide gross expenditures on research and development occur in the region (WHO 2010). There is reason for optimism, however, as 46 countries who signed the Ouagadougou Declaration have committed to allocating at least 15% of national budgets towards healthcare spending and at least 2% of their healthcare budgets to “reinforce national health research systems and create centres of excellence”(WHO 2010; Kirigia 2008). A key element of useful health research is quality epidemiologic study design and biostatistical analysis. In the past, African epidemiologists and biostatisticians were few in number, particularly outside of South Africa, and overworked (Gezmu 2011). As stated by Dr. Myron Essex, ‘In sub-Saharan Africa, biostatistics is the area that I am aware of in the greatest need of training, more so than laboratory sciences or even straight epidemiology or infectious diseases’ (Gezmu 2011). This scarcity of epidemiology and biostatistical support limits the research outputs of African academic institutions (Rowlands 2000; Schubert 2009).

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At many North American and European academic institutions, biostatistical clinics have emerged as a way for investigators and graduate students to access biostatisticians informally for support in study design and analysis (Hill 2012, Zeger 2008). Biostatistics clinics can take on a variety of formats including, but not limited to, one-on-one meetings between statistician and client; meetings of one senior biostatistician supervising one or more biostatistics graduate students or junior biostatisticians for the mutual benefit of the junior biostatistician and the client; or small group meetings where multiple biostatisticians listen to the client's brief presentation and then provide input. In any of these formats, the meetings may be held privately for each client or may be open for other clients to listen and learn in a sort of town hall approach. Biostatistical clinics are an effective way for a biostatistics department to provide service to the institution's academic community while also raising the department's profile. In many cases, biostatistics clinics in the United States are key components of institutional Clinical and Translational Science Awards (CTSAs) from the National Institutes of Health (NIH), whose goals are to strengthen institutional research capacity, in part through enhancing career development opportunities and developing more systematic institutional mechanisms to support research (Zeger 2008, Rosenblum 2011).

Although many institutional websites include descriptions of their biostatistics clinics, very little has been published in the peer-reviewed literature regarding the development, implementation, lessons learned, and outputs from these clinics. Even less has been reported on the use of biostatistics clinics in the African context. In this article we describe the development of a functional analytical support clinic at the University of Zambia School of Medicine, to support faculty members and students in study design, methodology, data management, and analysis. Our services reflected perceived needs and included biostatistics, epidemiology, as well as social/behavioural science. We describe the steps taken to establish the clinic, challenges faced, and initial utilization.

The University of Zambia

The University of Zambia (UNZA) is the oldest and largest public university in Zambia. UNZA School of Medicine (SOM) began training doctors in 1968 and opened its first postgraduate registrar training programmes in 1982 with Masters of Medicine (MMed) degrees in Medicine, Pediatrics, Obstetrics and Gynaecology, and Surgery. The MMed degree, earned during the registrarship, remains the prerequisite qualification for clinical specialization for most specialties in Zambia. A Masters in Public Health degree was established in 1995, followed by the MMed in Orthopaedic Surgery in 1996. Since 2008, UNZA has greatly expanded postgraduate training, with the addition of six new clinical MMed degrees plus a Masters of Clinical Pharmacy, and Masters of Science programmes in Pathology, Microbiology, Parasitology, Physiotherapy, Nursing, Physiology, Anatomy, Biochemistry, Clinical Neuropsychology, HIV Medicine, and Pharmacology. Each Masters candidate is expected to complete an original research dissertation, with many proposals involving primary data collection and analysis.

Basis for the Analytical Support Clinic

In 2008, UNZA SOM conducted a needs assessment with supporting partner Vanderbilt University to assess the research needs among students in the MMed clinical specialty training programmes. The needs assessment, conducted for planning purposes, noted that MMed students were insufficiently equipped to conduct quality clinical research in fulfilment of their dissertations. As a result, many MMed students extended their duration of study beyond the expected four years in order to complete their dissertations. In 2010, with support from the Vanderbilt Institute for Global Health, UNZA SOM started a research methods course for MMed students that runs during the 2nd year of each four-year MMed programme. The course was initially focused on study design and developing the various sections of a research dissertation. Basic epidemiology and biostatistics components were added in subsequent years, and the course has been adapted for Masters of Science programmes within the UNZA SOM.

Anecdotally, the course resulted in improvements in the quality of dissertations in the School, including increase in publication, mainly in the *Medical Journal of Zambia*. Nonetheless, students continued to have challenges in study design and data analysis. Most supervising faculty members lacked biostatistics expertise and experience, and creation of new Masters programmes further stretched the existing epidemiology and biostatistics expert resources. In response to these continuing needs, the Analytical Support Clinic was devised as a way for graduate students and faculty members at UNZA SOM to gain epidemiologic and biostatistical support on demand.

WHAT WE DID

Setting up the Analytical Support Clinic

In 2010, UNZA SOM successfully competed for a 5-year Medical Education Partnership Initiative (MEPI) award, jointly supported by the President's Emergency Plan for AIDS Relief (PEPFAR), NIH, and the Health Resources and Services Administration (HRSA). The MEPI objective was to expand the scale and enhance the quality of medical training in sub-Saharan Africa, with special attention towards capacity-building to replace foreign expertise in PEPFAR-supported clinical and public health activities.

UNZA SOM has used the MEPI platform to support a multi-pronged set of initiatives to strengthen medical education and research capacity at UNZA and its affiliated institutions. From the outset of UNZA SOM's MEPI programme, the analytical support clinic was identified as a vehicle for strengthening research capacity at the institution by facilitating expanded faculty and postgraduate student research outputs and providing training support for new Masters degree programmes in departments with insufficient or overstretched faculties. In addition, with support from Wellcome Trust's Southern Africa Consortium for Research Excellence (SACORE), UNZA SOM concomitantly established a Research Support Centre to provide research administrative support services to faculty and students.

The Analytical Support Clinic was piloted in September 2012, with School-wide advertising for a full day "first-ever" Analytical Support Clinic. The Clinic, which is housed in the Research Support Centre, converted its format to one hour per week every Friday afternoon,

and has continued to meet weekly regardless of whether or not classes were in session. Extra sessions were occasionally added on a different day to accommodate requests from particular departments or trainees.

Staffing

Initial staffing consisted of a PhD epidemiologist (CM) from the UNZA Dept. of Public Health; a PhD biostatistician (PM) from the Centre for Infectious Disease Research in Zambia (CIDRZ), a local partner and MEPI collaborator with UNZA SOM; a PhD bioethicist with a research background in mixed qualitative and quantitative methods; and an MSc biostatistician who is now pursuing a PhD in health economics. A clinician-scientist (BA) seconded to UNZA SOM from MEPI partner Vanderbilt University was added to the consultation team to help address the needs of a large number of students who were presenting with study design questions for clinical research studies. In the early planning stages, the clinic intended to employ multiple analytical software programmers under the guidance of statisticians from the faculty of the Department of Public Health. However, this plan was reconsidered, and the focus was shifted to having the statisticians/epidemiologists teach students how to conduct their own analyses in order to transfer skills and build wider capacity.

The clinic runs for 60 to 90 minutes each week, depending on the week's demand. Clients may sign up in advance or may be seen as walk-ins if time allows. Two or 3 consultants attend each session and typically space themselves around a conference table, each working with different clients. Clients awaiting their turn are encouraged to listen to ongoing discussions while they wait in order to learn from other clients' problems. If a client presents a question to one analyst that would be better addressed by another analyst, then the client is typically referred to the appropriate analyst to be seen at the same session when possible. The amount of time allocated to each client is dependent upon the number of clients in the queue as well as the complexity of the problem presented.

Client visits

Sign-in sheets were reviewed from 61 sessions of the Analytical Support Clinic between August 31, 2012 to November 30, 2013. Although not all client visits were documented, the sign-in sheets provide a representative list of the typical problems presented in the Clinic. We served 109 clients making 197 client visits to the Clinic (Table 1), and 88 of 197 (44.7%) were repeat visits. Despite the stated goal to also facilitate faculty publications, only 2 (1.8%) of those requesting help were UNZA faculty members. At least 69.7% of clients were postgraduate students, while 6.4% were undergraduates or medical students, and 22.0% were students who did not specify their level of schooling. Students attended the clinic from 13 out of 15 departments within the School of Medicine.

Reasons for attending the Clinic were nearly equally divided between the proposal development (46.7%) and data management/analysis (42.1%) phases. The most common reasons for seeking help were data analysis and interpretation (36.5%), study design questions (26.9%), and sample size calculation (21.8%). Repeat visits were most frequently for data management and analysis questions (56/88, 63.6%). Several students noted that they

were able to better learn statistical analysis in the Clinic rather than in prior classroom settings because of the tutorial-style teaching and the increased relevance of the data analysis when they had their own project data.

Early successes and challenges

Deficiencies in research knowledge and skills are common among biomedical postgraduate trainees in various parts of the world (Windish 2007; Polychronopoulou 2011; Bookstaver 2012). We have demonstrated that an Analytical Support Clinic can attract a steady stream of clients, primarily postgraduate students, at an African public medical school. In particular, we have shown the feasibility and potential value of such a Clinic for supporting student researchers in Masters degree programmes. A list of practical tips and pitfalls to avoid in setting up a Clinic is included in Table 2. The special attention provided one-on-one or in a small group is an excellent supplement to the School's postgraduate research methods course. The epidemiological and biostatistical expertise also complements the content-specific mentorship that each student already receives from his or her primary mentor.

Other models for biostatistical and epidemiology training exist, including journal clubs (Ahmadi 2012), short course training (K-RITH 2014) or didactic research methods course (Ljung 2012), all of which are used in our institution. However, the Clinic model is a practical one that facilitates students' learning while they are immersed in the design and conduct of their own research proposals. By supporting the students' hands-on learning during their required dissertation research, we have engaged them in an active learning process that encourages life-long development and utilization of research skills (Jiusto 2006).

NEXT STEPS

Despite the original MEPI goal of providing support to both students and faculty members in order to increase their research outputs, faculty utilization of the Analytical Support Clinic has been minimal. Faculty members tend to be extremely busy with teaching and clinical responsibilities. Those who are engaged in funded research often have project biostatisticians to manage and analyze their data. The UNZA SOM is currently planning a faculty survey to identify specific faculty research deficiencies and needed resources. The survey results will be used to guide the Analytical Support Clinic regarding how it can support faculty research.

The initial staffing included a PhD bioethicist with significant qualitative research experience. The demand for his expertise was sporadic, with most clients requesting assistance for purely quantitative research, so he stopped attending regularly. However, occasional students still present with qualitative study questions. The Clinic plans to designate one Clinic session per month for the bioethicist to be present for qualitative consultations on a pre-scheduled appointment basis.

One concern that has arisen has been the way that Departments utilize the Analytical Support Clinic. Although most students present to the clinic after having worked through several iterations of their project proposals with their advisors, a minority of students come

to the clinic seeking help without having received significant input from their research advisors. The Analytical Support Clinic is intended to provide specific epidemiologic and biostatistical supplementation where advisors may be limited in those particular areas, but it is not intended to replace the guidance of students' primary advisors. When students seek an inordinate amount of their advice from the Clinic consultants, this should be viewed as a red flag that a department might be understaffed or lack faculty research experience. Only a few such cases have been noted, and we do not believe that high rates of utilization from particular departments reflect departmental deficiencies; rather they may well represent the high value that the department places on the services provided by the Clinic. Anecdotally, the Clinic has received positive feedback from many postgraduate supervisors for the Clinic's work of helping postgraduate students with areas in which the supervisor lacks expertise, usually biostatistics.

Although students from 13 of the School's 15 departments have utilized the Clinic's services thus far, conversations with some graduate students and faculty members suggest that many are still unaware of the existence of the clinic or the services that the Clinic provides. This suggests that wider sensitization is needed and might lead to an increase in clinic attendance. Thus far, the Clinic has not yet measured outcomes demonstrating the effect of the clinic on graduation rates, graduation delays, and student publication rates. The UNZA SOM is currently collecting data on these outcomes.

The Clinic's consultants have recognized specific questions recurring, such as how to calculate a study's sample size. In order to optimize consultants' time and allow students to utilize self-guided methods prior to their consultation, the Clinics' analysts have worked with the School to strengthen the Research Resources link on the UNZA SOM website (<http://unza.zm/medicine/>). Easy links to useful articles and sample size calculators give students some additional resources to review before or after they attend the Clinic, thus optimizing the face-to-face time with the consultant analysts. The list of links will continue to be expanded as additional recurrent questions and high-yield resources are identified during Clinic sessions.

One of the chief concerns of any successful externally-funded programme is long-term sustainability. Currently, the consultants receive salary support or consultative fees from the MEPI programme to support their involvement in the Clinic. The Clinic will have to transition to a new model when support from the MEPI grant concludes. The current location of the Clinic in the Research Support Centre is a strength, as it encourages utilization by all departments within the School. The UNZA SOM plans for the Clinic to remain in the Research Support Centre, with direct support from the SOM and interdisciplinary staffing from clinical departments and the Department of Public Health. Because of their expertise in Biostatistics and Epidemiology, the faculty from the Department of Public Health have been significantly involved. Consultants from partner non-governmental organizations (NGO) could stay involved through their appointments as voluntary Honorary Lecturers. One such consultant (PM) who is integral to the Clinic operations has left an NGO to join the University's Public Health faculty full time. As the Clinic continues to increase in popularity and further outputs are evaluated, such as dissertations completed on time and manuscripts published, UNZA will hopefully have

additional impetus to direct resources towards its continuation and expansion. It will be important for the Clinic administration to continue to track these outputs as a means of demonstrating the Clinic's impact.

In order to optimize the time of the consultants in the Clinic, the School should set explicit priorities for various research outputs. For example, if increased faculty publication rate is highly desirable, then one-on-one sessions with faculty members should be prioritized, and undergraduate and graduate students might be seen in larger group sessions to optimize consultants' time. This will be further guided by the forthcoming faculty survey. On the other hand, if strengthening institutional mentorship capacity for postgraduate students is a higher School priority, then it might be wise to move towards three way consultant-student-advisor model for clinic visits, which would allow consultants to supplement student mentorship while also transferring specific skills to faculty members for use in mentoring their future students. This would require the students' supervisors to be available for the meetings, which is not always feasible based on diverse faculty time commitments.

CONCLUSIONS

Although biostatistical clinics are offered in a variety of academic settings, little detail has been published around the development and use of such clinics. Our experience with the Analytical Support Clinic at the UNZA SOM suggests that this could be an important vehicle for strengthening postgraduate research. The Analytical Support Clinic has been well-received by postgraduate students and supervisors alike.

Many institutions in sub-Saharan Africa struggle with graduation delays due to the challenges students have in meeting the graduation research requirements. Supervisors at many of these institutions lack either the time or research expertise to guide their students in study design or analysis. The Clinic approach can supplement the mentorship of students' department supervisors, particularly providing specific epidemiologic and biostatistical expertise and practical teaching. However, our Analytical Support Clinic has thus far had little impact on faculty research productivity. Further data need to be collected to demonstrate the benefits of the Clinic. Sustainability beyond the period of the MEPI grant must be demonstrated for this programme to be considered a long-term success.

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Practice Points

- An analytical support clinic is a good model for supporting students and faculty members with their epidemiology, biostatistics and research study design questions.
- Although not a substitute for quality postgraduate research supervision, the analytical support clinic can play a valuable role by providing supplementary expertise in areas outside of a primary supervisor's skill set.
- By catering to all departments within the school, the analytical support clinic can have the potential for wide-reaching institutional impact.
- The monitoring of recurring questions in clinic allows for organizers to identify which resources would be most useful for broader dissemination to students via the institution's website.
- Institutional commitment is necessary in order to ensure sustainable long-term success of such a programme.

Table 1

Client visits to UNZA SOM Analytical Support Clinic

Number of visits by each client, n (% of clients)	n = 109
1	68 (62.4)
2	26 (23.9)
3 – 5	11 (10.1)
>5	4 (3.7)
Rank of clients, n (% of clients)	n = 109
Faculty member	2 (1.8)
Postgraduate student	76 (69.7)
Undergraduate student	7 (6.4)
Student, level not specified	24 (22.0)
Type of problem, n (% of visits) *	n = 197
Proposal development	92 (46.7)
Sample size	43 (21.8)
Study design or methodology	53 (26.9)
Analysis plan	26 (12.2)
Data management and analysis	83 (42.1)
Data management	14 (7.1)
Data analysis and interpretation	72 (36.5)
Discuss analytical theories unrelated to specific study	1 (0.5)
Not recorded	21 (10.7)

* Percentages total greater than 100% due to multiple problems at each visit UNZA SOM = University of Zambia, School of Medicine

Table 2

Top tips and pitfalls to avoid when starting an Analytical Support Clinic

Tips	Notes
Pick a day/time and stick to it	Attendance will increase when people know that they can just drop in, even during school holidays.
Be flexible with appointment scheduling	If demand is high, then pre-scheduled appointments may be necessary. If demand is not as high, then allow walk-ins.
Arrange a team of experts with complementary skills	We included quantitative and qualitative methodologists/statisticians and a health economist, and we added a clinician scientist to the team when that gap became evident.
Keep track of the questions and problems encountered	We used our data to guide us in updating the School of Medicine's webpage to include specific research resources online.
Be willing to try different formats	We have used a one-to-one approach encouraging "eavesdropping" by other clients. Depending on the demand and available expertise, other approaches may be more suitable.
Pitfalls to Avoid	
Don't advertise just once	Resending emails and re-posting flyers will increase attendance.
Don't wait for the perfect team in order to start	African universities would all like to have more experts on faculty. However, you can start a clinic with just a few skilled consultants (or even one dedicated one).
Start tracking outcomes right away	If you are able to demonstrate an increase in published papers or on-time graduation rates, then University leaders will take notice.
Determine the level and types of demand in advance	We knew that there would be significant demand among postgraduates. However, we assumed that there would also be faculty demand, which did not turn out to be the case.