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Building capacity for public and population health research in Africa: the consortium for advanced research training in Africa (CARTA) model

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Background: Globally, sub-Saharan Africa bears the greatest burden of disease. Strengthened research capacity to understand the social determinants of health among different African populations is key to addressing the drivers of poor health and developing interventions to improve health outcomes and health systems in the region. Yet, the continent clearly lacks centers of research excellence that can generate a strong evidence base to address the region's socio-economic and health problems.

Objective and program overview: We describe the recently launched Consortium for Advanced Research Training in Africa (CARTA), which brings together a network of nine academic and four research institutions from West, East, Central, and Southern Africa, and select northern universities and training institutes. CARTA's program of activities comprises two primary, interrelated, and mutually reinforcing objectives: to strengthen research infrastructure and capacity at African universities; and to support doctoral training through the creation of a collaborative doctoral training program in population and public health. The ultimate goal of CARTA is to build local research capacity to understand the determinants of population health and effectively intervene to improve health outcomes and health systems.

Conclusions: CARTA's focus on the local production of networked and high-skilled researchers committed to working in sub-Saharan Africa, and on the concomitant increase in local research and training capacity of African universities and research institutes addresses the inability of existing programs to create a critical mass of well-trained and networked researchers across the continent. The initiative's goal of strengthening human resources and university-wide systems critical to the success and sustainability of research productivity in public and population health will rejuvenate institutional teaching, research, and administrative systems.

Keywords: *research capacity development; post-graduate training; public health; population studies; sustainability; institutional support; networks and partnerships; sub-Saharan Africa*

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More than any other part of the world, Africa can no longer afford to ignore the profound impact of ill-health, diseases, and premature deaths (1, 2). Globally, the region bears the greatest burden of disease and this is increasingly complicated by rapid socioeconomic, political, and environmental changes. Globally, 9 out of every 10 children who die from malaria and half of all children who die from diarrheal disease are from sub-Saharan Africa. Further, 72% of all deaths in the region are from communicable diseases including HIV/AIDS, tuberculosis, malaria, respiratory infections, and from complications related to pregnancy and childbirth.

To address the rising burden of diseases, improve health systems, and attain better health, the continent needs strong public health research capacity. Countries with a weak population and public health research capacity have limited capacity to identify and prioritize their health needs and, hence, are unable to develop and implement effective interventions to promote well-being. Strengthened capacity to understand the determinants of health in relation to gender, ethnicity, cohorts, and communities among different African populations holds the key to effective interventions to improve health outcomes and health systems in the region. It is now generally accepted that Africa's progress depends on her 'ability to understand, interpret, select, adapt, use, transmit, diffuse, produce, and commercialize scientific and technological knowledge in ways appropriate to [her] culture, aspirations, and level of development' (3, p. iv). Further, Fonn (4) has argued that the research conceptualized, conducted, analyzed, and published by Africans holds the key to meeting the development needs of the continent. Yet, the continent clearly lags behind the rest of the world in terms of: the numbers of centers of research excellence that can generate quality ideas to tackle its myriad socioeconomic and health problems, national investments in research and development, and scientific productivity (5, 6).

In 2004, Africa produced less than 1% of scientific publications globally; only 0.2% of online content in 2002; and only 0.6% of global Gross Expenditure on Research and Development (GERD) in 2000, with South Africa accounting for 90% of the GERD south of the Sahara (5, 7). A recent review of the Social Sciences by UNESCO indicates that Africa contributed only 0.4% of journal articles that were included in the Thomson Social Science Citation Index (SSCI) between 1980 and 2007 and 1.6% of the articles in the SSCI between 1998 and 2007 (8). There appears to have been little change in the past three decades; if anything, Africa's share in global expenditure on research and development has continued to decline.

The great need for strong health research capacity in Africa has created enormous opportunities for innovative interventions. These currently include many outstanding masters, doctoral, and postdoctoral training programs offered to scientists from low and middle income countries to enhance their research competencies; 'learning by doing' programs that offer developmental or seed grants, hands-on training in ongoing research programs, or mentorship programs that complement formal academic degree offerings; and north-south and south-south research partnerships focusing on training individual researchers and strengthening research collaborations so that outputs are greater than the sum of individual efforts (9).

Their important contributions notwithstanding, these interventions have generally failed to create a critical mass of well-trained and networked researchers across the continent; increase research productivity; support university-wide systems critical to success and sustainability in research and training in Africa; address issues related to inadequate local training and poor retention of human resources for research, research leadership, and information access; and strengthen the interfaces between research producers and users (10). Combined, they have also failed to create centers of research excellence on the continent and to institutionalize and systematize research in the day-to-day work of planners, managers, and policy makers (11).

The Consortium for Advanced Research Training in Africa (CARTA)

Against this background, the recently launched Consortium for Advanced Research Training in Africa (CARTA) offers an opportune framework for building sustainable health research capacity in Africa. The Consortium brings together nine academic and four research institutions from West, East, Central, Southern Africa, and select northern universities and training institutes. CARTA's program of activities comprises two primary, interrelated, and mutually reinforcing objectives: to strengthen research infrastructure and capacity at African universities, and to support doctoral training through the creation of a collaborative doctoral training program in population and public health.

CARTA recognizes that health and research capacity-building are prominent, interlinked features of development, broadly defined. The risk factors for chronic diseases, such as diet, physical inactivity, smoking, sexual behavior, and environmental conditions associated with poverty are common worldwide, reflecting changing lifestyles linked to industrialization, urbanization, and the economic and political forces of globalization. Context-specific, multidisciplinary research, and strong local research and training institutions are needed to strengthen

health systems and ensure their responsiveness to social determinants of health. Against this backdrop, CARTA's overarching goal is to build a vibrant African academy able to lead world-class multidisciplinary research that impacts positively on public and population health. CARTA seeks to make a difference by building local research capacity to understand the determinants of population health and effectively intervene to improve health outcomes and health systems. To achieve its mission, CARTA aims to: foster the development of multidisciplinary research hubs at African universities, facilitate high-quality research on policy-relevant priority issues, create networks of locally trained internationally recognized scholars, and enhance the capacity of African universities to lead globally competitive research and training programs. High-quality doctoral training will address the present lack of research expertise in disciplines relevant to health. Linking population and public health training with ongoing research will increase the number and quality of professionals able to design, implement, and evaluate public health policies and programs. Policy-relevant research is needed to develop health interventions and measure their impact, address social determinants of health, understand failing health systems, and make sense of the inability of many health technologies to deliver their expected impacts in Africa. CARTA is neither disease-focused nor discipline-specific, but brings together diverse methodological and disciplinary approaches to context-specific health and development issues facing Africa. This resonates well with the current emphasis on multidisciplinary research as the key to addressing Africa's health and development needs.

The CARTA partnership

The Consortium brings together (a) academic and research institutions with extant and longstanding relationships and memoranda of understanding and (b) a variety of related disciplines essential to enhancing health, well-being, and livelihoods in Africa. These allow CARTA to build multidisciplinary research capacity in public and population health. Currently funded by the Wellcome Trust (under the African Institutions Initiative), the Carnegie Corporation of New York, the Bill and Melinda Gates Foundation, the Ford Foundation, and the Department for International Development (under the DelPHE Programme), CARTA has raised 60% of the US\$20 million it needs to fully implement its program of activities over the next 5 years. CARTA is led jointly by the African Population and Health Research Center (APHRC), Kenya, and the School of Public Health, University of the Witwatersrand (Wits), South Africa; these institutions have already collaborated successfully for the past 5 years. The APHRC provides a productive research environment, with a multidisciplinary team of well-qualified researchers from across sub-Sa-

haran Africa. Wits provides the institutional capacity of an internationally rated, research-led, postgraduate-oriented African university. Both institutions are internationally recognized as leaders in research and training, have championed the cause of higher education in Africa, have facilitated several partnerships and initiatives that strengthen collaborations among different universities and research organizations, and have strong systems of accountability. The African-led nature of CARTA and its focus on sustainable, measurable changes in research capacity and output are in tandem with the current emphasis on homegrown and intellectually sound solutions to the problem of sustainable capacity for research for health and development in Africa.

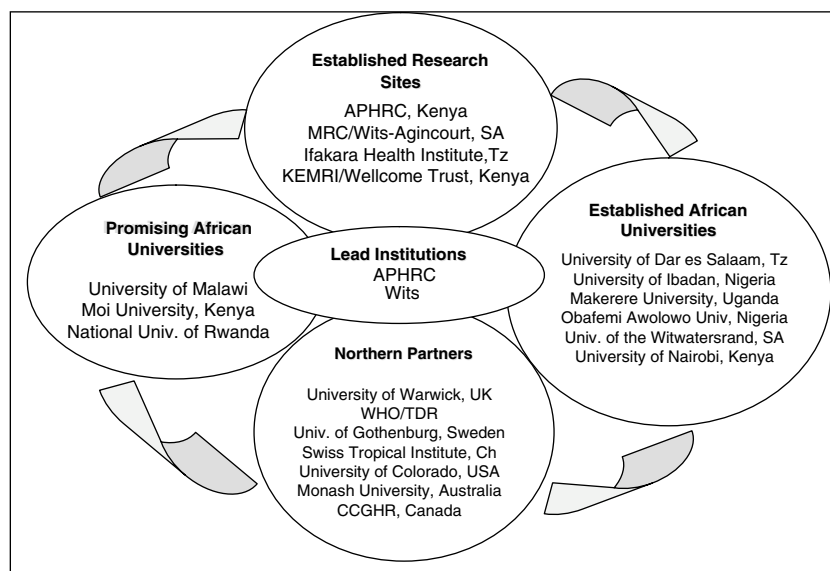
CARTA comprises a balanced mix of institutions: established African universities with a history of producing PhD graduates in public and/or population health; promising African universities that aspire to develop multidisciplinary PhD programs and research agendas and that are committed to building their institutional capacity; established, well-managed African research institutions with longstanding research programs; and northern partners that have longstanding research and/or training collaborations with African counterparts, a demonstrable record in equitable relationships, and a commitment to Africa. They bring experience in establishing and running successful PhD programs, ability to mentor both students and PhD supervisors, and skills in building institutional research and training capacity. Fig. 1 illustrates CARTA's institutional membership.

CARTA's program of activities

Strengthening university research capacity, infrastructure, and research agendas

University faculty and administrative staff play a key role in graduate training and research management. Yet, many of them lack opportunities to learn from best practices around the world and often work in isolation from each other. CARTA aims to strengthen human resources and university-wide systems critical to the success and sustainability of its program. CARTA will hold workshops targeted toward: (a) librarians, (b) graduate program coordinators including deans, (c) bursars, and (d) registrars. Each group will attend one workshop; thus, we envisage four workshops over the first 4 years. Broad topical areas for these workshops include:

- (1) Information retrieval including relevant multidisciplinary literature searching, management of electronic resources, and e-publishing.
- (2) Higher education management training including efficient enrollment, monitoring and reporting procedures, identification of grant and fellowship



Note: Tz=Tanzania; SA=South Africa; Ch=Switzerland; CCGHR=Canadian Coalition for Global Health Research

Fig. 1. CARTA's member institutions.

opportunities for students and staff, generic professional skills training, and counseling and support services.

- (3) Effective student supervision, grant-writing, research management and administration, development and management of research partnerships, effective leadership, support for publication and current debates in social and health sciences.
- (4) Development of institutional policies and processes to support research including the establishment of institutional review boards where they do not exist, research and publication policies, and university-wide guidelines on management of externally funded research grants.
- (5) Strategic financial planning; interpretation of financial information; conducting reviews and evaluation for cost-reduction opportunities; preparation and reconciliation of accounts; budgetary controls, forecasting, and monitoring of cash flow; etc.

To promote the capacity of university academic and research faculty to train, supervise, and mentor graduate students, win research grants, conduct high-quality research, and manage collaborative research projects, CARTA will hold workshops to ensure supervisors and mentors have a clear understanding of, and commitment to, the goals of the CARTA program, as well as benefit from a collegial presentation of best practices in doctoral supervision and mentoring. These workshops will be developed and facilitated by local and international experts in doctoral supervision and mentoring. The joint development of Joint Advanced Seminars (JAS) modules will improve institutional capacity through local staff

working with experts to develop the curriculum and deliver the courses.

To keep pace, African research and training institutions urgently require information, communication, and computing infrastructure; supplementary sources of electric power supply; and physical facilities, especially for hosting graduate seminars. CARTA is already making seed investments to address these needs.

Model regional collaborative doctoral training program

Strong doctoral programs are generally characterized by experienced faculty actively engaged in funded research, adequately motivated students and a stimulating institutional environment. A key element of the CARTA model is the selection of cohorts of candidates from various disciplines relevant to population and public health. Each cohort will be fully funded through CARTA. To build capacity concurrently within affiliated African universities, CARTA will initially recruit, on a competitive basis, fellows who are junior faculty at these institutions. CARTA is committed to ensuring gender and regional equity in the selection of its fellows. Fellows are expected to be substantially relieved of regular teaching and administrative responsibilities for the duration of their candidature. This will ensure that fellows progress through the program and thus complete their training in good time. All CARTA fellows are expected to obtain a PhD or equivalent degree at the end of the 4-year fellowship.

Central to the training program of fellows will be a series of residential JAS designed to enhance skills and knowledge; guide and propel the fellows through the research process; and provide a foundation for building

networks of researchers, peers, and mentors. Fellows will receive training on how to fully harness bibliographic resources and databases, retrieve web-based information, and benefit from list-serves and web-based lectures. Residential training offers an advantage for the program in that students will be able to focus fully on specific program tasks, learn collaboratively, interact with local and international facilitators, and develop and consolidate professional networks.

The JAS will be offered once-annually for 4 years to each cohort, and will build skills and conceptual depth from year to year. Each JAS will run for 3–5 weeks. Specific topics to be covered will minimally include the following:

- (1) JAS-1 will build critical thinking, technical skills, and other core research competencies, and introduce students to the essential concepts and seminal articles of the disciplines brought together under CARTA.
- (2) JAS-2 focuses on data management and analysis. Fellows will learn to use software packages for qualitative and quantitative data management and analyses. Practice sessions will use real research data and current software packages for hands-on training.
- (3) JAS-3 will focus on data presentation, the doctoral dissertation, and scientific writing and communication skills to facilitate results dissemination and policy engagement.
- (4) JAS-4 will address professional development including skills necessary to raise and manage research funds, grant-writing and research management, development of courses, management of large class sizes, and supervision of graduate students. JAS-4 will also be designed to serve as an opportunity for senior fellows to practice mentoring junior fellows through the discussion and laboratory sessions, software training, and general information sharing.

JAS activities will expose fellows to fundamental research concepts and facilitate their acquisition of necessary research skills. Bringing fellows together at each JAS will create a network of the next generation of African researchers, who are able to develop and lead research projects that expand the frontiers of knowledge and contribute to well-being. Since they will generally come from related but different disciplinary backgrounds, fellows will develop, over the four years, a common research language and a strong understanding of their interrelatedness, and thus, engage more readily in collaborative and multidisciplinary research.

During each JAS, different training modes will be used to facilitate student learning including formal lectures, open discussions, group work, assigned readings, tests,

and examinations. Fellows will also be affiliated with external supervisors who will support and mentor local supervisors where necessary. While we will apply rigorous criteria for the selection of our fellows to ensure their success, any fellows not performing well will be given further independent mentoring. Following each JAS, fellows will return to their respective universities to continue with their doctoral work. During the period between the JAS series (inter-JAS period), we will implement a set of activities to keep fellows actively engaged and in continual communication with peers and mentors. We have established a CARTA website that will house reading materials, links to relevant online resources and tools, and other documents and information that fellows need to stay engaged with facilitators and meet clearly defined objectives and outputs. Also during the inter-JAS period, fellows will attend regional or international scientific conferences; use CARTA materials and approaches to run training sessions for other students at their local institutions; and may spend up to a semester as an intern at one of our Northern partner institutions. Deploying their skills in their research projects during the inter-JAS period will equip fellows with experience needed to advance appropriately to the next JAS and also transfer some of the key skills they have acquired to peers at their home institutions. Further, as part of CARTA's effort to strengthen the teaching and other skills of African university faculty, local supervisors will also attend the JAS. The first cohort of CARTA fellows has been selected while the first JAS will take place in March 2011. Fig. 2 illustrates the fellows' progression milestones.

Conclusion: the difference CARTA will make

Underlying the concept of CARTA is the recognition that individual African universities and countries lack the requisite human and financial resources and infrastructural capacity to deal single-handedly with the challenges facing PhD training. CARTA makes a difference by offering a well thought through approach for rebuilding and strengthening the capacity of African universities to produce locally trained and skilled researchers and scholars. The initiative's focus on the local production of networked and high-skilled researchers committed to working in sub-Saharan Africa, and on the concomitant increase in local research and training capacity of African universities and research institutes addresses the inability of existing programs to create a critical mass of well-trained and networked researchers across the continent. Our focus on university-wide systems offers a potential solution for ensuring the sustainability of the CARTA intervention within each participating institution and to provide a basis for individuals to pursue a research and academic career in Africa. CARTA provides a novel approach to confront issues of inadequate local training –

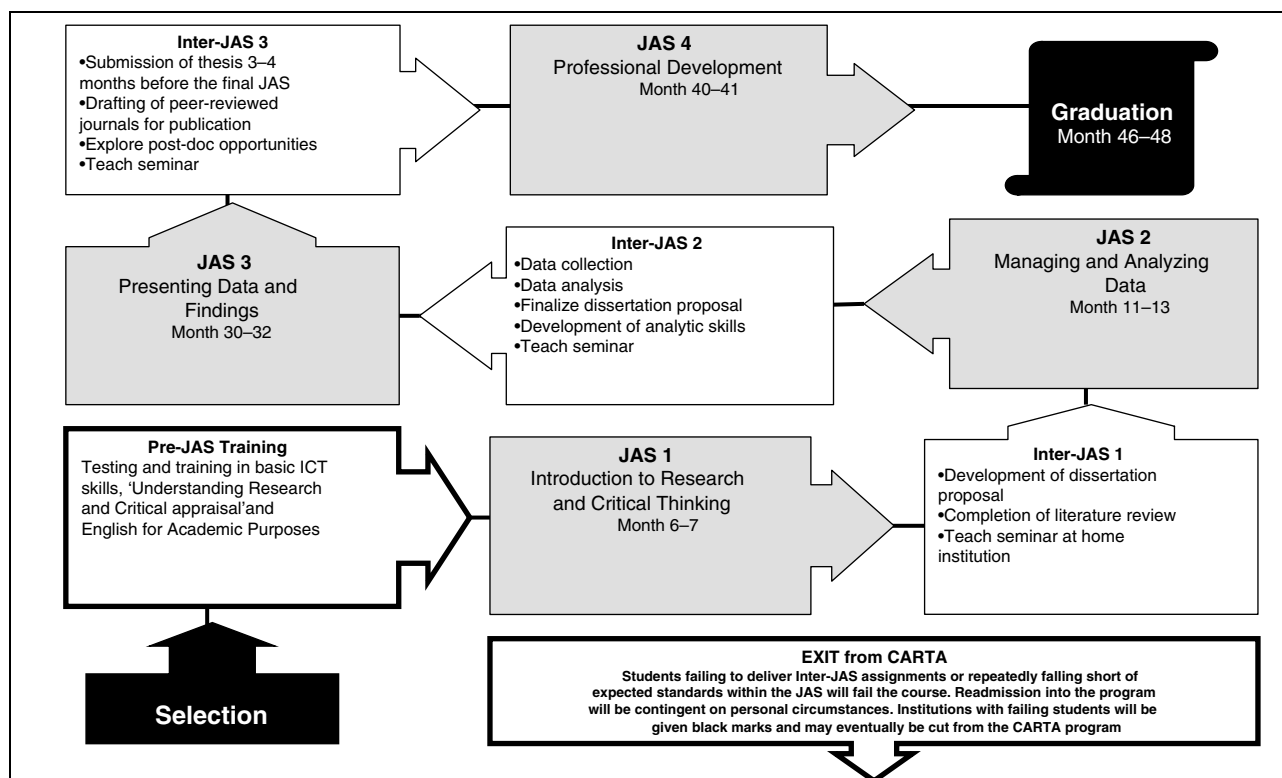


Fig. 2. Fellows' progression milestones.

the JAS curriculum and the CARTA approach to PhD training will be available to each participating university to incorporate as they see fit for PhD students who are not part of the CARTA program. The CARTA approach also systematizes engagement with policymakers that augurs well for the relevance and use-value of the research undertaken.

CARTA also addresses the increasing neglect of African university administrators and faculty in extant initiatives on the continent. The initiative's goal of strengthening human resources and university-wide systems critical to the success and sustainability of research productivity in public and population health will rejuvenate institutional teaching, research and administrative systems, and improve the skills of faculty and administrative managers in graduate-level teaching and successful higher degree supervision, mentoring, grant application skills, research management, and the use of ICT resources for knowledge management, dissemination, and information retrieval.

In all, CARTA addresses important areas of local need and should produce well-prepared scientists and enriched institutional environments that together will strengthen doctoral training and research at participating institutions and nurture and sustain African researchers in the region. While the focus is on public and population health, success at this phase is expected to motivate expansions of the CARTA model to other disciplines.

Conflict of interest and funding

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