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Rebalancing the Research Equation in Africa: Principles and Process

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Rebalancing the Research Equation in Africa: Principles and Process

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Abstract

Many examples of research excellence in Africa have been driven by partnerships led by the global North and have involved localised infrastructure improvements to support the best of international research practice. In this article, we explore a possible mechanism by which local research networks, appropriately governed, could begin to support national African research programmes by allying research delivery to clinical service. The article recognises that sustainable research effort needs a well-trained and mentored workforce, working to common standards, but which is practically supported by a much developed IT infrastructure throughout the continent. The balance of investment and ownership of such a programme will need to be shared between local and international funding, with the emphasis on developing global South-South collaborations and research strategies which address the environmental impact of medical research activity and mitigate the impact of climate change on African populations. Healthcare must be embedded in the post-COVID approach to research development.

Introduction

If the current pandemic teaches us anything, it is the value of global science applied for the common good. This has been achieved by international collaborative efforts of exceptional proportion with regard to SARS CoV2 vaccine development and it could be argued that this justifies the current research balance between the global North and South. Alternatively, it may be time to reappraise the balance of academic and industry partnerships, to create a new equilibrium of research governance, training, prioritisation and 'value creation' within Africa.

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13 Applying such principles to the research environment, we argue here for further development
14 of regional and national networks of research in Africa, to prioritise, lead and empower
15 research activity within institutions, working within a framework of enquiry aligned to specific
16 and heterogenic African demographics. The 'corporate' value of such networks will be judged,
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18 sustainable development of African leaders and researchers themselves: research leadership
19 through service, delivered through developmental mentorship support. This shift in balance
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21 exemplars of North – South equitable partnerships to a South – South axis. Although many
22 conversations on this topic have been recorded, none has effectively identified practical
23 vehicles to drive the required change (2).
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25 **The African Medical Research Environment**

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27 There are undoubtedly successful models of international partnership between the global
28 North and South. These have delivered clinically relevant research progress, most notably
29 around communicable disease (HIV-AIDS, TB, malaria and other parasitic and gastrointestinal
30 communicable diseases (3,4). There has been no shortage of recognition of the widespread
31 challenges facing African-led research and health researchers. (5) Such is the timeframe of
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49 The concept of local and regional networks is not new (6), but building a compelling rationale
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51 Post-COVID-19, several generational cohorts of clinicians will need to be supported to find
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53 its most basic, this will require redress of COVID-19's impact on the training and education of
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56 all doctors in facilitated mentored support, seizing the opportunity post-pandemic to combine
57 need for clinical service expansion and the desire to develop regional research networks: in
58 effect, providing a programme of integrated workforce development.
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3 Clinicians and laboratory scientists could be supported to engage in research either through
4 active academic or clinical service roles. Research-active clinicians and scientists would then
5 create, de facto, responsive 'functional research units'. This need for responsiveness cannot
6 be overemphasised and there are obvious parallels here with the requisite global
7 preparedness for the next pandemic (7). Successful delivery of this strategy will require
8 national leadership which champions personal/professional development and considers
9 'leadership through mentorship' as valid. Additionally, there needs to be clear separation
10 between development of an engaged clinician-researcher workforce and professional
11 regulation (professional standards, research accreditation and practice) through line
12 management, legal framework and oversight. Most significantly, re-engagement with doctors
13 and researchers at all levels, needs to demonstrate genuine care for and professional
14 investment in a workforce which is under extreme pressure. By adopting developmental
15 mentorship strategies, including peer-to-peer, or reverse mentorship partnerships, such a
16 framework for professional and personal reinvestment can be created.
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20 Engagement of all clinicians in elements of research activity, as well as the provision of defined
21 career pathways for clinician-researchers should embed research culture in clinical practice
22 and improve patient mortality outcomes (8). Supported transition to ground-up models of local
23 and regional research networks, will require rapid development of an infrastructure for training
24 support, without creating a burden of destructive bureaucracy (9). Use of e-portfolios to track
25 educational milestones and identify future training needs, would support the annual appraisal
26 and regular revalidation of all research-active individuals. The model set out by the Royal
27 College of Physicians (London) and taken up by the East, Central and Southern African
28 College of Physicians (ECSACOP) is an exemplar in the clinical context which could be
29 transferred to a research environment.
30

31 Local networks have potential to deliver much needed standardisation of research practice
32 through skills teaching: study design, grant writing, good laboratory practice, new technologies
33 and research governance. Laboratory accreditation and regulation would need oversight in
34 parallel with people development. Much of this can be delivered online. The validation and
35 assessment of people and processes will be vital for any transition to self-reliance and all of
36 this will require a robust and "fit for purpose" digital infrastructure.
37
38

39 **The Challenges of Cyber-infrastructure and Climate Change**

40
41 Adequate digital speed and bandwidth across the continent is fundamental to digital learning,
42 research support and monitoring. While public opinion surveys have confirmed the
43 acceptability of e-health strategies in several African countries, improving access, connectivity
44 and uptake to a reliable digital infrastructure is a prerequisite, if research and clinical services
45 are to be equitably accessed. The South African Research and Education Network
46 acknowledges this principle, although the delivery of its goals remains patchy (10). If existing
47 partners and sponsors in Africa are serious about transitioning to models in which local
48 research networks lead high quality African-centric research, collaborative funding strategies
49 need to deliver a sustainable cyber-infrastructure for the continent.

50 The next most important consideration is that of global warming. Establishing a research
51 infrastructure requires a sustainable 'green' framework, as well as developing a medical
52 research focus which mitigates the effects of climate change. The global South will incur the
53 health impacts of planetary warming disproportionately (11,12). These two strategic
54 approaches - cyber and climate - will be transformative for Africa.
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56

57 **National – International Co-ordination**

58 Local autonomy and research innovation needs to be balanced by independent national
59 prioritisation and oversight. The auspices of the African Union could be used to develop and
60 monitor national and regional research centres of excellence providing top-down oversight of

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3 governance and research ethics. Other bodies are well placed to encourage and monitor
4 training programs from the ground up. The Africa Research Excellence Fund (AREF) was
5 created to develop the next generation of research leaders through education, mentorship,
6 training and protected research fellowships to promote skills development, including, where
7 necessary, time in the global North (13). Successful examples of existing South-South
8 research collaborations are given in Table 2 (14,15).
9

10 **Summary**

11
12 The importance of shared research learning and scientific rigour in publication have been
13 highlighted during the recent pandemic. Acquisition and sharing of knowledge pertinent to
14 local and national health priorities has been a way in which positive steps towards 'normality'
15 have been taken. The opportunity to re-engage the clinical workforce in a re-invigorated
16 research approach for the African continent, transitioning from partnership-centric to nationally
17 prioritised agendas is obvious. If delivered through local and regional networks, research can
18 be newly supported and directed for the benefit of the workforce and for patient outcomes.
19

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21 Well-mentored and led, this will allow a transition from current pockets of research excellence
22 to functional regional research units which penetrate the wider clinical community. At a
23 national level, care will need to be taken to avoid inequity in South – South alliances, while
24 ensuring that the global South continues as an active partner with the global North. This should
25 involve African centres in multinational collaborative partnerships, which particularly
26 emphasise sustainable and digital infrastructure growth.
27

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30
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34

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41

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Table I. Summary of Exemplar International Partnerships Working as Part of Health Care Research in Africa

Country	Institution	Collaborators	Sphere of interest
USA	Centers for Disease Control and Prevention (CDC) https://www.cdc.gov/globalhealth/	32 African countries	Global health security, global health protection, HIV-AIDS, TB, malaria, parasitic diseases, amongst others
USA	Harvard Medical School - School of Public Health - https://www.hsph.harvard.edu/africa-health-partnership/	12 African countries	Variety of public health issues (chiefly in communicable diseases)
USA	Yale University - Africa Initiative https://world.yale.edu/africa	Links with 43 African countries but research and educational programs in 8 countries	Clinical medicine, palliative care, education and training, amongst others

USA	Johns Hopkins Center for Global Health https://hopkinsglobalhealth.org/faculty-research/project-map/	15 African countries	Both communicable and non-communicable diseases including HIV, TB and malaria
France	Institut Pasteur https://www.pasteur.fr/en/institut-pasteur/institut-pasteur-throughout-world/institut-pasteur-international-network	Institutes in 7 African Countries	Communicable diseases: biomedical research, public health activities, education, innovation and technology transfer
Switzerland	Swiss Institute for Tropical and Public Health https://www.swisstph.ch/fr/research-we-do/	Collaborations throughout Africa with focus on Cameroon, Ghana, Kenya and Uganda	Infectious and non-communicable diseases, society and health; environment; health systems and innovation
United Kingdom	Wellcome Trust https://wellcome.org/what-we-do/our-work/programmes-and-initiatives-africa-and-asia	Projects throughout Africa, but institutes in Kenya, Malawi and South Africa	TB, HIV, malaria, respiratory diseases, leadership, training amongst others
United Kingdom	Medical Research Council https://mrc.ukri.org/about/institutes-units-centres/list-of-institutes-units-centres/?filtersSubmitted=true&textSearch=Search+centres...&centreLocation=The+Gambia&centreLocation=Uganda	Projects throughout Africa with dedicated research units in Gambia and Uganda	All aspects of communicable and non-communicable diseases including vaccinology
European Union	European Union https://ec.europa.eu/info/research-and-innovation/strategy/international-cooperation/africa_en	Supports potential research projects throughout Africa through specific funding calls	All aspects of medical research, innovation and education including new calls for COVID-19 work
Germany	Federal Ministry of Education and Research (BMBF) https://www.bmbf.de/en/africa-strategy-of-the-federal-ministry-of-education-and-research-2280.html	Collaborations in 14 African countries	Both communicable and non-communicable diseases

GAVI (Global Alliance for Vaccines and Immunization) (international organisation based in Geneva, Switzerland)	https://www.gavi.org	Projects in 43 African countries Associated with WHO, UNICEF, Bill and Melinda Gates Foundation and World Bank	Established work with HIV and 12 vaccine programs but work on COVID-19 underway now.
USA	Bill and Melinda Gates Foundation https://www.gatesfoundation.org/Where-We-Work/Africa-Office/Focus-Countries	45 countries in Africa eligible for help but focus on 10 countries: Ethiopia, Nigeria, South Africa, Burkina Faso, Democratic Republic of Congo, Ghana, Kenya, Senegal, Tanzania, and Zambia	Multiple areas including TB, HIV, malaria, neglected tropical diseases, maternal and child health. Current attention on COVID-19

Note: Oxford and Cambridge Universities and the London School of Hygiene and Tropical Medicine, UK support a variety of international partnerships usually through indirect resourcing e.g. via Wellcome and other outside sources. They are therefore not included as direct resource providers in this table.

Table 2. Exemplars of South - South network collaboration in Africa

Study	Synopsis	Countries involved
THESUS-HF (14) - Sub-Saharan African Survey of Heart Failure: A prospective, multicenter, observational survey of patients with acute heart failure (AHF)	Of 1006 enrolled African patients, AHF was predominantly non-ischemic in cause: most commonly hypertension.	12 Centres in 9 countries: Mozambique, South Africa, Nigeria, Sudan, Kenya, Uganda, Cameroon, Sénégal, Ethiopia
CREOLE (15) - Comparison of Dual Therapies for Lowering Blood Pressure in Black Africans: single-blind, three-group trial	Of 728 black patients enrolled with uncontrolled hypertension: Amlodipine plus either hydrochlorothiazide or perindopril was more effective than perindopril plus hydrochlorothiazide at lowering blood pressure at 6 months.	University Hospital Centres in 6 countries: Uganda, Cameroon, Mozambique, Kenya, South Africa, Nigeria

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Contributors statement

AAS and CME developed the original idea. All authors, CME, AAS, SDT-R and TC undertook a literature search. CME wrote the manuscript with help from SDT-R and all authors contributed to and approved the final document.

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Abstract

Background: Many examples of research excellence in Africa have been driven by partnerships led by the global North and have involved localised infrastructure improvements to support the best of international research practice.

Objective: In this article, we explore a possible mechanism by which local research networks, appropriately governanced, could begin to support national African research programmes by allying research delivery to clinical service.

Summary: This article explores the concept that sustainable research effort needs a well-trained and mentored workforce, working to common standards, but which is practically supported by a much developed IT infrastructure throughout the continent.

Conclusions: The balance of investment and ownership of such a research programme needs to be shared between local and international funding, with the emphasis on developing global South-South collaborations and research strategies which address the environmental impact of medical research activity and mitigate the impact of climate change on African populations. Healthcare must be embedded in the post-COVID approach to research development.

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Applying such principles to the research environment, we argue here for further development of regional and national networks of research in Africa, to prioritise, lead and empower research activity within institutions, working within a framework of enquiry aligned to specific and heterogenic African demographics. The ‘corporate’ value of such networks will be judged, not just by the quality and impact of their outputs, but by the wider contribution they make to sustainable development of African leaders and researchers themselves: research leadership through service, delivered through developmental mentorship support. This shift in balance towards a nationally supported and overseen, network regulation, will help transition the best exemplars of North – South equitable partnerships to a more extensive South – South axis. Although there have been many discussions on this topic, none has effectively identified practical vehicles to drive the required change (2).

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6 for responsiveness cannot be overemphasised and there are obvious parallels here
7 with the requisite global preparedness for the next pandemic (7). Successful delivery
8 of this strategy will require national leadership which champions personal/professional
9 development and considers 'leadership through mentorship' as valid. Additionally,
10 there needs to be clear separation between development of an engaged clinician-
11 researcher workforce and professional regulation (professional standards, research
12 accreditation and practice) through line management, legal framework and oversight.
13 Most significantly, re-engagement with doctors and researchers at all levels, needs to
14 demonstrate genuine care for and professional investment in a workforce which is
15 under extreme pressure. By adopting developmental mentorship strategies, including
16 peer-to-peer, or reverse mentorship partnerships, such a framework for professional
17 and personal reinvestment can be created.

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31 Engagement of all clinicians in elements of research activity, as well as the provision of
32 defined career pathways for clinician-researchers should embed research culture in clinical
33 practice and improve patient mortality outcomes (8). Supported transition to ground-up
34 models of local and regional research networks, will require rapid development of an
35 infrastructure for training support, without creating a burden of destructive bureaucracy (9).
36 Use of e-portfolios to track educational milestones and identify future training needs, would
37 support the annual appraisal and regular revalidation of all research-active individuals. The
38 model set out by the Royal College of Physicians (London) and taken up by the East, Central
39 and Southern African College of Physicians (ECSACOP) is an exemplar in the clinical context
40 which could be transferred to a research environment.

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52 Local networks have potential to deliver much needed standardisation of research practice
53 through skills teaching: study design, grant writing, good laboratory practice, new
54 technologies and research governance. Laboratory accreditation and regulation would need
55 oversight in parallel with people development. Much of this can be delivered online. The
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3 validation and assessment of people and processes will be vital for any transition to self-
4 reliance and all of this will require a robust and “fit for purpose” digital infrastructure.
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8 **The Challenges of Cyber-infrastructure and Climate Change**

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11 Adequate digital speed and bandwidth across the continent is fundamental to digital learning,
12 research support and monitoring. While public opinion surveys have confirmed the
13 acceptability of e-health strategies in several African countries, improving access, connectivity
14 and uptake to a reliable digital infrastructure is a prerequisite, if research and clinical services
15 are to be equitably accessed. The South African Research and Education Network
16 acknowledges this principle, although the delivery of its goals remains patchy (10). If existing
17 partners and sponsors in Africa are serious about transitioning to models in which local
18 research networks lead high quality African-centric research, collaborative funding strategies
19 need to deliver a sustainable cyber-infrastructure for the continent.
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28 The next most important consideration is that of global warming. Establishing a
29 research infrastructure requires a sustainable ‘green’ framework, as well as
30 developing a medical research focus which mitigates the effects of climate change,
31 including efforts to recycle waste and to reduce use of scarce resources such as
32 water. The global South will incur the health impacts of planetary warming
33 disproportionately (11,12). These two strategic approaches - cyber and climate - will
34 be transformative for Africa.
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43 **National – International Co-ordination**

44 Local autonomy and research innovation needs to be balanced by independent national
45 prioritisation and oversight. The auspices of the African Union could be used to develop and
46 monitor national and regional research centres of excellence providing top-down oversight
47 of governance and research ethics. Other bodies are well placed to encourage and monitor
48 training programs from the ground up. The Africa Research Excellence Fund (AREF) was
49 created to develop the next generation of research leaders through education, mentorship,
50 training and protected research fellowships to promote skills development, including, where
51 necessary, time in the global North (13). Successful examples of existing South-South
52 research collaborations are given in Table 2 (14,15).
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Summary

The importance of shared research learning and scientific rigour in publication have been highlighted during the recent pandemic. Acquisition and sharing of knowledge pertinent to local and national health priorities has been a way in which positive steps towards 'normality' have been taken. The opportunity to re-engage the clinical workforce in a re-invigorated research approach for the African continent, transitioning from partnership-centric to nationally prioritised agendas is obvious. If delivered through local and regional networks, research can be newly supported and directed for the benefit of the workforce and for patient outcomes.

Well-mentored and led, this will allow a transition from current pockets of research excellence to functional regional research units which penetrate the wider clinical community. At a national level, care will need to be taken to avoid inequity in South – South alliances, while ensuring that the global South continues as an active partner with the global North. This should involve African centres in multinational collaborative partnerships, which particularly emphasise sustainable and digital infrastructure growth.

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AAS and CME developed the original idea together and then planned the work with SDT-R and TC. CME and AAS conducted a literature search with input from SDT-R and TC. CME reported the results and wrote the manuscript with help from AAS, SDT-R and TC. All authors contributed to and approved the final document. TC stands as guarantor for the work.

Competing Interests:

None declared.

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Table 1. Summary of Exemplar International Partnerships Working as Part of Health Care Research in Africa

Country	Institution	Collaborators	Sphere of interest
USA	Centers for Disease Control and Prevention (CDC) https://www.cdc.gov/globalhealth/	32 African countries	Global health security, global health protection, HIV-AIDS, TB, malaria, parasitic diseases, amongst others
USA	Harvard Medical School - School of Public Health - https://www.hsph.harvard.edu/africa-health-partnership/	12 African countries	Variety of public health issues (chiefly in communicable diseases)
USA	Yale University - Africa Initiative https://world.yale.edu/africa	Links with 43 African countries but research and educational programs in 8 countries	Clinical medicine, palliative care, education and training, amongst others
USA	Johns Hopkins Center for Global Health https://hopkinsglobalhealth.org/faculty-research/project-map/	15 African countries	Both communicable and non-communicable diseases including HIV, TB and malaria
France	Institut Pasteur https://www.pasteur.fr/en/institut-pasteur/institut-pasteur-throughout-world/institut-pasteur-international-network	Institutes in 7 African Countries	Communicable diseases: biomedical research, public health activities, education, innovation and technology transfer
Switzerland	Swiss Institute for Tropical and Public Health https://www.swisstph.ch/fr/research-we-do/	Collaborations throughout Africa with focus on Cameroon, Ghana, Kenya and Uganda	Infectious and non-communicable diseases, society and health; environment; health systems and innovation

United Kingdom	Wellcome Trust https://wellcome.org/what-we-do/our-work/programmes-and-initiatives-africa-and-asia	Projects throughout Africa, but institutes in Kenya, Malawi and South Africa	TB, HIV, malaria, respiratory diseases, leadership, training amongst others
United Kingdom	Medical Research Council https://mrc.ukri.org/about/institutes-units-centres/list-of-institutes-units-centres/?filtersSubmitted=true&textSearch=Search+centres...&centreLocation=The+Gambia&centreLocation=Uganda	Projects throughout Africa with dedicated research units in Gambia and Uganda	All aspects of communicable and non-communicable diseases including vaccinology
European Union	European Union https://ec.europa.eu/info/research-and-innovation/strategy/international-cooperation/africa_en	Supports potential research projects throughout Africa through specific funding calls	All aspects of medical research, innovation and education including new calls for COVID-19 work
Germany	Federal Ministry of Education and Research (BMBF) https://www.bmbf.de/en/africa-strategy-of-the-federal-ministry-of-education-and-research-2280.html	Collaborations in 14 African countries	Both communicable and non-communicable diseases
GAVI (Global Alliance for Vaccines and Immunization) (international organisation based in Geneva, Switzerland)	https://www.gavi.org	Projects in 43 African countries Associated with WHO, UNICEF, Bill and Melinda Gates Foundation and World Bank	Established work with HIV and 12 vaccine programs but work on COVID-19 underway now.

USA	Bill and Melinda Gates Foundation https://www.gatesfoundation.org/Where-We-Work/Africa-Office/Focus-Countries	45 countries in Africa eligible for help but focus on 10 countries: Ethiopia, Nigeria, South Africa, Burkina Faso, Democratic Republic of Congo, Ghana, Kenya, Senegal, Tanzania, and Zambia	Multiple areas including TB, HIV, malaria, neglected tropical diseases, maternal and child health. Current attention on COVID-19
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Note to Table 1: Oxford and Cambridge Universities and the London School of Hygiene and Tropical Medicine, UK support a variety of international partnerships usually through indirect resourcing e.g. via Wellcome and other outside sources. They are therefore not included as direct resource providers in this table.

Table 2. Exemplars of South - South network collaboration in Africa

Study	Synopsis	Countries involved
THESUS-HF (14) - Sub-Saharan African Survey of Heart Failure: A prospective, multicenter, observational survey of patients with acute heart failure (AHF)	Of 1006 enrolled African patients, AHF was predominantly non-ischemic in cause: most commonly hypertension.	12 Centres in 9 countries: Mozambique, South Africa, Nigeria, Sudan, Kenya, Uganda, Cameroon, Sénégal, Ethiopia
CREOLE (15) - Comparison of Dual Therapies for Lowering Blood Pressure in Black Africans: single-blind, three-group trial	Of 728 black patients enrolled with uncontrolled hypertension: Amlodipine plus either hydrochlorothiazide or perindopril was more effective than perindopril plus hydrochlorothiazide at lowering blood pressure at 6 months.	University Hospital Centres in 6 countries: Uganda, Cameroon, Mozambique, Kenya, South Africa, Nigeria