Institution: Liverpool School of Tropical Medicine (LSTM)

Unit of Assessment: UOA2

1. Unit context and structure, research and impact strategy

Work in this UOA2 submission focuses on applied health research and its delivery for the prevention and control of disease. Pivotal to LSTM's success are long-lasting equitable partnerships in Low-Middle Income Countries (LMIC) and commitment to capacity strengthening (see section 2). As a result, UOA2 work is multidisciplinary and collaborative (including with LSTM researchers returned to UOA1). UOA2 staff work both in Liverpool and in LMIC partner organizations (particularly the *Malawi-Liverpool-Wellcome Programme* (MLW), the KEMRI *Centre for Global Health Research and the Centre for Sexual Health and HIV/AIDS Research Zimbabwe)*. The strong functional links between staff in Liverpool, staff in LMIC endemic-countries, research users and beneficiaries allow smooth translation of research findings into practical application.

This REF submission is the first for LSTM as an independent HEI (awarded 2014). A joint UOA2 submission with the University of Warwick (UoW) was made to REF2014, based on a partnership designed to strengthen both parties. There were two main elements of this relationship: (a) Appointments in selected disciplinary areas; (b) Expansion of the applied health research portfolio in both LSTM and UoW through collaborative grant applications with partners in the 'global south'. The collaboration has been a success for both partners in terms of collaborative grant applications (totalling more than £3.5M relevant to UOA2).

Most of the staff submitted to UOA2 are within the Department of International Public Health (IPH). The 27.71 FTE submitted to UOA2 is a 6-fold increase upon the joint submission to REF2014.

Key initiatives and awards

During the submission period IPH staff won grants and contracts totalling **£100M**. We present examples of these below.

Research for building pro-poor health systems during the recovery from conflict (ReBUILD), was funded by Department for International Development (DFID) (£7.5M; 2011-2019). This international health systems research partnership addressed fragile and conflict-affected settings and helped the world's most vulnerable people access effective health care and reduce the burden of health costs.

Reaching out and Linking in: Health systems and close to community services (REACHOUT). REACHOUT was an European Union (EU) FP7 (£4.6M; 2013-2018) international research project helping to understand and develop the role of close-to-community providers of health care in preventing, diagnosing, and treating major illnesses and health conditions in rural and urban areas in Africa and Asia. The project created multi-nodal information networks in support of community health workers and policy makers and helped to improve health care services.

The International Multidisciplinary Programme to address Lung Health in Africa (IMPALA) is a National Institute for Health Research (NIHR) Unit (£7M; 2016-2021) that promotes transdisciplinary approaches and research capacity building for Lung Health in a large collaboration in sub-Saharan Africa. IMPALA focuses on tuberculosis, determinants of lung health and approaches to diagnosis of respiratory diseases in LMICs and is developing investigation and treatment pathways which have direct policy uptake. Key to success is the training of African scientists through supervision of post-doctoral and PhD researchers, and supporting research institutions in the Global South to deliver high quality, relevant research.

The Research Evidence and Development Initiative (READ-It). READ-It (£7M; 2018-2024) is the latest phase of DFID-funding (which has run since 1992 at LSTM) to develop the 'evidence ecosystem' for diseases of poverty. This long-term investment has helped demonstrate how evidence synthesis provides reliable, unconflicted, scientifically defensible evidence in key technical policy areas, and can have real impact on content of care, more efficient health care, and poverty reduction. The new READ-It programme: (a) produces systematic reviews with anticipated high impact; (b) develops methods projects led by collaborators in LMICs; (c) addresses the Sustainable Development Goals agenda, where transdisciplinary working is important; and (d) promotes research leadership in LMICs.

The Accountability for Informal Urban Equity Hub (ARISE). This is a UKRI-Global Challenges Research Fund (GCRF) project (£12M; 2019-2024) aiming to catalyse change in accountability and improvements to the health and wellbeing of marginalised people living in informal urban settlements. ARISE is collecting data, building capacity and supporting people to exercise their right to health in Bangladesh, India, Kenya and Sierra Leone. ARISE works closely with – and is guided by – communities themselves: vulnerable people living in informal settlements who are often 'off the map'.

Adapted Micro planning: Eliminating Transmissible HIV In Sex Transactions (AMETHIST) is funded by a Wellcome Trust Collaborative award in Science (£4M; 2019-2023) and is exploring whether an intensified, risk-differentiated sex work programme, tailored for the African context, can raise uptake and adherence to prevention and treatment among female sex workers to levels that could lead to the virtual elimination of HIV transmission attributable to sex work. A large-scale cluster randomised trial of the AMETHIST Intervention is underway in Zimbabwe with research in Malawi and South Africa exploring transferability and generalisability of the intervention to other settings.

Reducing the Burden of Severe Stigmatising Skin Diseases through equitable person-centred approaches to health systems strengthening (**REDRESS**): is funded by NIHR *Research in Global Health Transformation* (£3M; 2019-2023) and uses a person-centred approach to evaluate, develop and adapt health systems interventions for the management of skin diseases in Liberia to generate learning for other settings in sub-Saharan Africa.

The LIGHT consortium is funded by UK Aid (£8M; 2020-2026). LIGHT is a cross-disciplinary global health research programme that aims to transform gendered pathways to health for those with tuberculosis in urban, HIV-prevalent settings and to stop the spread of TB. The research programme will do this by enabling and supporting global and national policy environments and health systems to improve sustainable, equitable access to quality TB services and medical products, to reduce TB mortality and morbidity among men, women and children.

Menstrual Health Consortium. LSTM leads a consortium (with the Kenya Medical Research Institute (KEMRI), US-Centres for Disease Control (CDC), and Safe Water and AIDS (SWAP)) funded by a *Joint Global Health Trials* (JGHT) grant (£4.6M; 2014-2022) to examine Menstrual health (MH) needs and study the use of menstrual cups in 30 rural Kenyan primary schools. MH challenges girls in LMIC due to inadequate puberty education, poor sanitation and restricted supplies. A lack of sanitary products force girls to use unhygienic materials causing shame and discomfort. Such factors could predispose girls to increased risk of HIV/STI, early marriage, high fertility, and thus contribute to health inequities. LSTM presented to Government of Kenya stakeholders' roundtable in April 2016 and contributed to national policy, strategy and training guidelines for MH.

Internationally leading findings

DISEASE-SPECIFIC AREAS have been addressed by the following staff. Working on tuberculosis Squire has led the health economic evaluation of a short-duration TB regimen, demonstrated it to be non-inferior to a longer period of treatment (Nunn et al 2019 ***NEJM)***, with substantial health system and patient cost savings (Rosu et al 2020 ***Bulletin WHO***) all of which has prompted the WHO to update its guidelines (see ICS LSTM203). Meanwhile Cuevas has

shown that a community-based package significantly increased case finding and improved treatment outcome in TB (Datiko et al 2017, ***BMJ Global Health***). Kelly-Hope has demonstrated that the lifetime benefits of hydrocoele surgery far exceed its costs, preventing lost earnings among affected men (Sawers et al 2019, ***PLOS Neglected Trop Dis***) (see ICS LSTM202). Working on sexual health, Phillips-Howard (working between Kenya and the UK) has shown that menstrual cups are a safe option for menstruation management (Van Eijk et al 2019, ***Lancet Public Health***). Morroni (based in Botswana) studied a high-risk population with HIV and showed that allocating resources to colposcopy in resource-limited settings may be more effective than other screening strategies (Luckett et al 2019, ***Obst & Gynaecology***). In **COMMUNITY HEALTH**, Cowan (based in Zimbabwe) developed a dedicated programme for female sex workers which led to high levels of HIV diagnosis and treatment (Cowan et al 2018, ***Lancet HIV***). Desmond (based in Malawi) has shown that HIV self-testing achieved high coverage and was accurate and acceptable (Choko et al 2015, **PLOS Medicine**). Mavhu (based in Zimbabwe) has shown that peer-supported service delivery can substantially improve HIV virological suppression in adolescents (Mavhu et al 2020, ***Lancet Global Health***). Sibanda (based in Zimbabwe) showed that demand for HIV self-testing was highly price sensitive and that pharmacy-based distribution was preferable to clinic-based distribution (Chang et al 2019, ***JAMA Netw Open***). Taegtmeyer, working in Malawi and Zimbabwe, showed that HIV-self-testing services for young people should respect them as autonomous individuals (Indravudh et al 2017, ***AIDS***). Raven Theobald and Tolhurst work on **GENDER EQUITY**: Raven found that health systems reinforce traditional gender inequities and disempowered women health workers (Hay et al 2019, ***Lancet***). Theobald showed that services for female genital schistosomiasis need better integration with sexual and reproductive primary health (Kukula et al 2019, **PLOS Neglected Trop Dis**). Tolhurst has recommended improvement to ‘close to community’ programmes (Steege et al 2018, ***Soc Sci Med***). In the area of **HEALTH ECONOMICS**, Niessen has shown that 1 week of amphoteracin-B and flucytosine (previously shown to have lower mortality than a two-week regimen) was cost-effective for treatment of cryptococcal meningitis in Africa (Chen et al 2019, ***Clin Inf Dis***) whilst Shiri has shown the cost-effectiveness of adding flucytosine to fluconazole (Shiri et al 2019, ***Clinical Infectious Diseases***). Martineau and Valadez work on aspects of **HEALTH POLICY**. Martineau has shown workforce performance would be improved by devolution of power and resources onto district health managers (Alonso-Garbayo, et al 2017 ***Health Policy & Practice***). Meanwhile, Valadez has studied *Health Systems Resilience* in fragile, conflict-affected settings and has made recommendations for in-depth analyses (Odhiambo et al 2019*,* ***Health Policy & Practice***). Garner works on **EVIDENCE SYNTHESIS** and publishes Systematic Reviews with relevance to health guidelines and policy (Jiang et al 2017, ***Cochrane Database Systematic Rev***).

Promoting interdisciplinarity

Cross-disciplinary research features across all of UOA2; **IMPALA**, **LIGHT, REDRESS** and **ASCEND** Consortia (see above) are examples of research consortia which include cross-disciplinary approaches from concept development through to design, delivery and completion. Each uses multi-method research with combinations of approaches and disciplines including qualitative social science, participatory action research, health systems research, health economics and operational modelling, policy analysis, and political economy analysis.

The **Centre for Neglected Tropical Diseases (CNTD)** has been a major force for interdisciplinary research. Formed in 2009 CNTD was funded to work towards the goal of eliminating lymphatic filariasis (LF) as a public health problem by 2020 through disease mapping followed by mass drug administration (MDA). Funding was renewed in 2013 and again in 2017 and CNTD is now working in 12 countries in sub-Saharan Africa and Asia to: (a) support national NTD programmes by strengthening their capacity for implementation; (b) improve laboratory facilities and diagnostic services, permitting monitoring and evaluation; (c) introduce morbidity management & disability prevention (MMDP). Commencing in 2015, MMDP became an integrated component of the overall LF Elimination programme. (See ICS LSTM202).

The Centre for Evidence Synthesis (see ‘READ-It, above) collaborates with staff in all disciplines preparing systematic reviews across LSTM.

The **Workforce & Health Systems Strengthening Unit** and **Centre for Health Systems Strengthening (CHESS**) aim to strengthen health systems and promote the development of the health workforce in the Global South for equitable access to quality health care. These are multi-disciplinary groups of researchers, educators**,** policy makers, practitioners and communities working together to improve health and well-being amongst the poorest and marginalized communities.

Sustainability of this UOA2 submission
The leadership of LSTM is all research active. Lalloo (UOA1) replaced Hemingway as Director of LSTM in 2019; Squire (UOA2) replaced Lalloo as Dean of Clinical Science & International Public Health in 2019. The Heads of the four academic departments are all submitted to UoA1. Since REF2014 LSTM has created Deputies to Heads of Department thereby strengthening succession planning. Senior academics and administrators form a single leadership team, share a joint mission, and work closely together to ensure the highest quality of research, its impact and benefit to the public health of LMICs.

The size of LSTM's UOA2 Academy is growing: the 27.7 FTE (28 people) in the present UOA2 submission represent a 6-fold increase since REF2014 and includes 7 FTE appointed to LSTM in the current REF period and 4 FTE promoted internally to core-funded posts via the Career Track (see section 2). All the externally appointed staff in this Census Period have attribution for competitive research grants and 5/7 are PIs on grants totalling £9M. Research income has remained strong since January 2014 being an average of £440,780 per FTE per annum over the census Period (this is set out in more detail below).

Within the UOA2 submission, a critical mass of health economists is emerging, catalysed by the appointment of Niessen as Prof of Health Economics in 2013. A total of 7 health economists have been appointed across the key initiatives listed above and health economics underpins ICS LSTM203

LSTM has a strategic goal of increasing engagement with Global Southern partners through both Capacity Development (see below), new appointments (both joint and honorary) and secondments between LSTM and partner organizations in LMICs. These are key to long term sustainability of LSTM's UOA2 work and are exemplified by joint appointments for Sibanda and Mavhu from Centre for Sexual Health and HIV AIDS Research (CeSHHAR) (see below) and a joint appointment for Chakaya (Respiratory Society of Kenya; RESOC) within IMPALA (see above).

Future goals for research and impact
LSTM has no stand-alone 'system' to enable Research Impact: *all* our research, whether single-discipline or interdisciplinary, aims to achieve impact for the world's poorest people through translation and implementation. Knowledge Exchange activity is embedded within all Departments with 27 staff engaging in consultancies worth £29.8M over the census period and, as signatories of the Knowledge Exchange Concordat, we are equipping our staff and students with the necessary skills and knowledge to thrive in an open research environment.

A major strategic goal for LSTM is an increase in the prominence of Global Southern partners in the initiation and delivery of research and ever-increasing alignment with national and regional policy goals. Our large research consortia all include FTE's dedicated to Research Uptake and Policy Engagement both at LSTM and within our partner organizations. The African Institute for Development Policy (AFIDEP) is a key strategic partner on several consortia and AFIDEP's Madise has been appointed to the LSTM Board of Trustees.

Using resources that include the *Global Health Clinical Trials Unit* (below) LSTM UOA2 staff will advance new knowledge in the scale up of both TB and HIV testing to progress ending both the TB and HIV pandemics in difficult to reach populations including vulnerable adolescents. In this work, intersectional and gender analyses will be essential in understanding barriers to access to

health and to inform interventions to overcome these. For example, men's excess burden of TB disease, disproportionate contribution to transmission, and disparities in access to care for TB and HIV can be explained by a complex framework of personal, interpersonal, structural and environmental factors which will be addressed in the LIGHT Consortium. In 'health systems strengthening' research, the focus will be on using innovative and people centred methods and approaches to build more inclusive, responsive health systems at all levels, with a particular focus on fragile health systems and informal urban settlements. In chronic diseases, UOA2 staff will evaluate the transformation of health services to provide integrated services, both at the health facility and the community level, with a particular focus on preventing the very high and increasing mortality associated with diabetes and hypertension. UOA2 staff will advance new knowledge in how non-communicable chronic conditions should be diagnosed, monitored and prevented in the African setting.

Dame Tina Lavender (with senior lecturers Bedwell and Mills) joined LSTM after the 2020 Census Date (and so not submitted here). These appointments will enable LSTM to build on its strengths in *Childbirth, Women's and Newborn Health*

2. People

Staffing strategy and staff development

Aims and guiding principles.
LSTM aims to achieve depth of research excellence within its range of interests and is committed to hiring and promoting only the very best academic staff, irrespective of gender, ethnicity, or nationality (subject to UK Visas & Immigration controls); our Athena-SWAN status is set out below. The Management Committee of LSTM has responsibility for policy, but the recruitment process and responsibility for staff development are devolved to Departments which identify priority areas for appointments. Joint appointments between departments are encouraged.

LSTM conducted a formal review of its research culture between 2019 and 2020, particularly **researcher careers** and **researcher assessment** which overlap both one-another and changes to **research integrity**. Working Groups (inclusive of post-docs, technicians, programme managers and academics) conducted 'gap analyses' and made recommendations to Management Committee. A continuous cycle of review (including open consultation with staff) has been instituted and the Board of Trustees will be briefed regularly on progress. Following these recommendations, LSTM has signed up to: (**A**) The revised ***Vitae Concordat on Researcher Careers***. Changes are being implemented that include: (i) Involvement of researchers in development and review of policy; (ii) A systematic approach to workloads; (iii) A revised programme of training for line managers (including mental health awareness); (iv) An institution-wide review of job security; and (v) Formalisation of career advice (including opportunities to move into sectors other than Higher Education). (**B**) The ***San Francisco Declaration on Researcher Assessment*** (**DORA**). Changes are being implemented that include: (i) A rolling programme of presentations on research performance expectations (the details of which were published in intranet pages in 2016); (ii) Clarification of those 'wider contributions' approved by LSTM; (iii) Greater transparency in the assessment of candidates for appointment and promotion; (iv) The investigation of DORA-related complaints; and (v) A rolling programme of monitoring compliance with DORA principles. (**C**) The revised ***Universities UK Concordat on Research Integrity***. Changes are being implemented that hinge on: (i) rolling training programmes in laboratory work (including work on animals, Garner co-authored the revised version of the ARRIVE guidelines for reporting animal research), work on human subjects and systematic reviews; and (ii) development of a proactive system to ensure that the highest standards of research integrity are maintained.

Recruitment
Posts funded from LSTM core budgets. 7 external academic appointments (7 FTE) have been made to 'research-&-teaching' contracts in UOA2 (25% of the FTE submitted here) in the

Census Period (ranging from Lecturer to Reader). A further 4 internal academics (4 FTE) moved into substantive positions as part of our Career Track process, which underwrites salary support for promising researchers and provides mentorship to help them transition to permanent contracts.

Posts fully supported from external funding sources. 2.6/27.7 FTE (9%) of this UOA2 submission have 'R only' contracts - all 'permanent subject to funding' - fully supported by external funding. Since 2019, a concerted effort has been made to reduce the use of fixed term contracts for such 'R only' staff by engagement with line managers (to identify upcoming vacancies) and with staff (to explore their career plans). Staff eligible for redeployment are then prioritised for consideration for roles ahead of other applicants. As a result, across the whole of LSTM in the present Census Period, 33 of 139 staff on R-only contracts have changed from 'fixed term' to 'permanent subject to funding' (24%).

Support and training
Internally funded schemes The *Director's Catalyst Fund*, launched in 2016, provides grants of around £50K to support external grant applications: 21 awards have been made to date, 3 of which have led to externally won fellowships.

Support for overseas based staff. Long-term placements in LMIC are essential to our mission. 6 UOA2 staff (21%) are based overseas in Zimbabwe, Malawi, Kenya and Botswana. We support these staff by maintaining environments where high quality research may be conducted in Public Health, Implementation and Social Science (e.g. our MLW and CeSHHAR Programmes; see below), personal financial support (to offset higher tax rates, security fees, housing costs, health insurance and holiday flights) and measures to maintain integration with UK-based colleagues. LSTM's 'overseas' Programmes are committed to training: for example, MLW organises on-site training (a £2M budget within the current core grant).

Medical staff. 4 UOA2 staff hold honorary consultant contracts with NHS Trusts or *Public Health England Northwest* and provide clinical services in Merseyside. In addition, some UOA2 staff have health service roles overseas as part of their placements with partner organisations. All these staff have carried extra service duties during the 2020-21 COVID-19 pandemic. In partnership with the University of Liverpool (UoL), LSTM has held a '*Wellcome Trust Clinical PhD Programme'* since 2007. This funds four 4-year Fellowships per annum with a total grant award of £5M to LSTM over the census period (and an identical sum to UoL). 26 young doctors have started these highly competitive Fellowships in the present Census Period of whom 13 are (or have been) registered for PhD at LSTM. There is an impressive record of retention in academia: 5/13 Fellowships have completed and remain employees of HEIs, 5/13 are ongoing and 3/13 have completed and returned to NHS employment. The work of one such Wellcome Fellow (Cohen) has contributed to ICS LSTM201 – advancing the clinical and public health management of MDR-TB.

Training for researchers. The staff development programme includes technical, transferable skills, teaching and management courses. Research staff can take courses from our MSc programmes to update their knowledge. LSTM is a signatory to the *Technician Commitment*, *Knowledge Exchange Concordat* and the *Vitae Concordat on Researcher Careers* (see above).

Opportunities for teaching qualifications. Since 2014, 28 staff have completed the *Professional Certificate in Supporting Learning* (accredited by the 'Staff & Educational Development Association'). Since 2019, 19 staff have completed the *Leading in Global Health Teaching* scheme (accredited by 'Advance-HE'); this qualification gives the opportunity to read for different categories of Fellowship of the Higher Education Academy.

Appraisal. All research and academic staff are formally appraised annually by senior members of their Departments. Academics who hold Honorary Consultant Contracts in the NHS also undergo an annual joint NHS/LSTM appraisal. An LSTM Workload Dashboard is currently being trialled that will provide up-to-date data on activity to allow transparent and

fair discussions.

Research students

Overview

Two points should be stressed at the outset: (a) LSTM won degree awarding powers in August 2017 and began to register PhDs soon after. Numbers of PhD students are projected to rise as numbers of Masters students double between now and 2024. (b) In line with its Mission, 38% of current LSTM-registered postgraduate students are based overseas (and thus excluded from the REF).

Research students are fully integrated into research groups. An annual postgraduate symposium provides an opportunity for all students to present their work. Students undertake an appraisal of their professional and personal training needs upon registration and annually thereafter using the ‘Development Needs Analysis’ (DNA) tool and engage with training opportunities via the PGR Skills Development Programme, MSc modules, and external courses to bridge their knowledge gaps. The DNA and Skills Development Programme are both built around the four primary domains of the VITAE Researcher Development Framework, and training sessions are tailored to be suitable for participants to join on-site as well as off-site. LSTM consistently achieves approval scores from student participants of above 80% in the Postgraduate Research Experience Survey (PRES) in relation to Professional Development and Research Skills.

Each student has access to at least two academic supervisors and also benefits from the support of a ‘Progress Assessment Panel’ (PAP). The PAP comprises two members of academic staff who monitor the student’s progress and make recommendations on the research project, supervision and pastoral issues. Annually, students produce a portfolio of work to evidence their progression and present this to the PAP. The PAP produces a report for the Director of Postgraduate Research containing recommendations relating to continued registration.

The MLW programme holds a training budget from the Wellcome Trust (currently coordinated by Jambo) which supports pre-MSc ‘interns’ (totalling 34 between 2018 and 2020), MSc students (30 in the same period) and PhD students (44 in the same period, none of whom may be submitted to the REF).

Numbers and funding sources

Growth in UK Postgraduate training has been a strategic priority for LSTM since the award of HEI status in 2014 and is a growing component of our research and scholarly activity. Of 109 UK-based doctorate students who registered since August 2013, 23 had an UOA2 staff member as primary supervisor and 7/23 of these students were non-EU. Gender was declared by all students: 16/23 female and 7/23 male. Ethnicity was declared by all students: 10/23 were BAME and 13/23 were white. During the period August 2013 to July 2019 the completion rate (full and part-time) was 100%.

Equality and diversity

LSTM is committed to inclusivity for the diverse population for whom and by whom our activities are delivered. LSTM invested dedicated *Equality and Diversity* (E&D) resources in 2016, including a full-time post for development of the Equality, Diversity & Inclusion (ED&I) strategy. ED&I strategy and progress is governed by our *Equality, Diversity & Inclusion Committee* (EDIC), which is co-chaired by the LSTM Director and Global Director of HR. EDIC consists of Equality Champions from faculties and professional support functions, representation from staff networks and student community. EDIC reports to Management Committee and Board of Trustees.

The E,D&I strategy addresses *Equality Impact Assessment* processes, governance structures and data capturing. Recruitment bias has been reduced by anonymous shortlisting and gender

decoding software, review of career progression mechanisms and a new *Dignity at Work* policy. All staff are required to complete mandatory E,D&I e-learning at induction and at regular intervals.

LSTM has an online reporting platform, *Freedom to Speak Up*, where people can raise issues relating to safeguarding, staff and student conduct (including allegations relating to research integrity and DORA) and wellbeing. Following staff feedback, further information relating to racism and racial harassment has been added to the system to raise awareness and encourage reporting of these issues.

2019-20 has seen the creation of two staff-led networks; the LGBTQ+ Network (open to both staff and students) and our BAME Staff Network. Events of May 2020 highlighted ongoing inequality across the globe: LSTM was challenged by staff on adequacy of its focus on internal race equality and a Taskforce is now addressing key areas in consultation with the BAME Staff Network. Outputs from the Taskforce will feed into the new 2021-2024 E,D&I Strategy and will work to ensure that LSTM becomes an actively anti-racist Institution.

LSTM holds two faculty-level Bronze Athena SWAN awards and institutional-level Bronze. Advance HE (the awarding body) has offered all institutions a 12-month extension to current awards because of COVID-19, and LSTM will submit an institutional-level bid for Silver in April 2022, having undertaken a thorough self-assessment.

LSTM has created an intranet wellbeing hub (including links to external organisations) to provide support and raise awareness (e.g. mental health awareness and stress awareness days). A global employee assistance programme has been started, which allows access to counselling support.

Criteria and processes for promotion to academic roles have recently been updated: Teaching-Only and Research Only routes to progression have been formed and work has started on a career development framework for Programme Management roles. The Technician Commitment action plan is being implemented and promotion opportunities in professional services will shortly be updated.

COVID-19 has posed unprecedented challenges. 50 people were placed on furlough: fewer than 5 of these have left LSTM. More than 30 staff were seconded to support the NHS or Public Health England. A ‘pulse survey’ was done in May 2020 to determine impact of COVID-19: over 60% of responders rated their wellbeing as ‘good’ or ‘very good’ and 80% felt supported by their managers.

Capacity Strengthening (and research into this)

The Centre for Capacity Research (CCR). Led by Bates, CCR includes 10 members of staff from different research groups and is a global leader in the science of research capacity strengthening (RCS), defined as strengthening/scaling the ability of individuals, institutions and systems to generate the knowledge needed to address a population’s health and development needs. CCR collaborates with leading funding/implementing partners (including DFID, the Royal Society, the Wellcome Trust, the UK Collaborative on Development Sciences, WHO and UKRI (GCRF)) who use CCR’s evidence to underpin major UK RCS investments. CCR has developed consistent methods and applied them across multiple programmes. Analyses of investment in 25 universities/research institutions from 15 African countries has been completed since 2014 and 13 common gaps in research systems have been identified. These findings have been used by research funders to fix deficits within a programme’s lifetime (thereby making the programme more effective). Because the findings are drawn from a large dataset and have identified common problems that are amenable to investment, CCR’s research has contributed to a significant re-focussing of funders’ priorities on sustainably improving institutions’ research systems. CCR currently holds £3.3M in externally funded projects that train local staff to take on the surveys themselves for example: (a) The *Developing Excellence in Leadership, Training and*

Science (DELTAS) Africa which is supporting the Africa-led development of world-class researchers and scientific leaders in Africa; and (b) *The Royal Society-DFID Africa Capacity Building Initiative (ACBI)* which aims to strengthen multi-disciplinary partnerships for research in soil science, renewable energy, and water & sanitation.

The Pan African Thoracic Society 'Methods in Epidemiologic, Clinical and Operations Research' (PATS-MECOR) course was initiated by Gordon (LSTM) in 2007. Doctors and Clinical Officers (including those working in the MLW Programme) have the option to progress through three levels of research training. The programme has run four times since 2014 (in Kenya, Malawi, South Africa and Tanzania) with 166 registrants from 17 African countries. Three PATS MECOR graduates secured PhD studentships within the IMPALA programme (see above). In 2019, eleven members of the 25-strong faculty were previous PATS MECOR graduates.

Other academic activities. PhD studentships open to candidates in the Global South are integral to the conduct and delivery of research within the key initiatives outlined above. Candidates are selected and supported through transparent, competitive processes in collaboration with LSTM's MRC Doctoral Training Programme. For example, 4 UOA2 PhD's will be completed through the IMPALA programme in Kenya (Policy x1 and Health Systems x1), Malawi (Health Economics x1) and Uganda (Social Science x1) and COUNTDOWN has supported 3 PhD and 4 Masters students with skills in international public health, qualitative research methodology, research data collection and literature synthesis. In line with LSTM's mission to strengthen capacity of researchers in LMICs we have supported multiple overseas staff to gain independent fellowships in partnership with LSTM. 13 Wellcome Trust Public Health and Tropical Medicine Training and Intermediate Fellowships were sponsored by LSTM academics in the Census Period and 22 Master's Fellowships in Public Health and Tropical Medicine. Further, LSTM has supported staff (submitted to both UOA2 and UOA1) who secured Fellowships in the competitive MRC-DFID *African Research Leader Scheme*. **Example**: Sibanda (UOA2) holds an *African Research Leader Fellowship* (£748,635, 2019-2022) in CeSHHAR (Zimbabwe) to investigate interventions to increase uptake of HIV self-testing and linkage to post-test services among higher education students in Zimbabwe. During the fellowship Sibanda will have access to mentoring, training and support to enhance her leadership skills.

Support services. LSTM believes that academic support is insufficient, on its own, for the capacity development of talented researchers: attention is also needed to governance aspects of the local environment. With this in mind the Head of Research Management Services (RMS) was a member of the technical committee to establish the Good Financial Grant Practice (GFGP) Accreditation Scheme and is now a continuing member of the GFGP Scheme Governance Committee, hosted by the African Academy of Sciences. RMS has provided key capacity strengthening visits to overseas partners in Kenya, Nigeria, Malawi, Sudan, Cameroon, Tanzania and Uganda, some of these specifically funded by NIHR Financial Assurance Funding as part of the NIHR 'Groups' and 'Units' funding. RMS has also played an influencing role in the development of the *African Standards Organisation* 'GFGP'. CeSHHAR has recently become the first organisation in the world to be awarded gold level GFGP accreditation, and LSTM is currently undergoing platinum level GFGP accreditation so that we can be the leading exemplar across the global grant community.

3. Income, infrastructure and facilities

Income

UOA2 shows evidence of vitality and sustainability in the FTE submitted and in research income which both show marked upward trends (Figure 1). It must be remembered that income in the year 2019-20 has been affected by COVID-19:

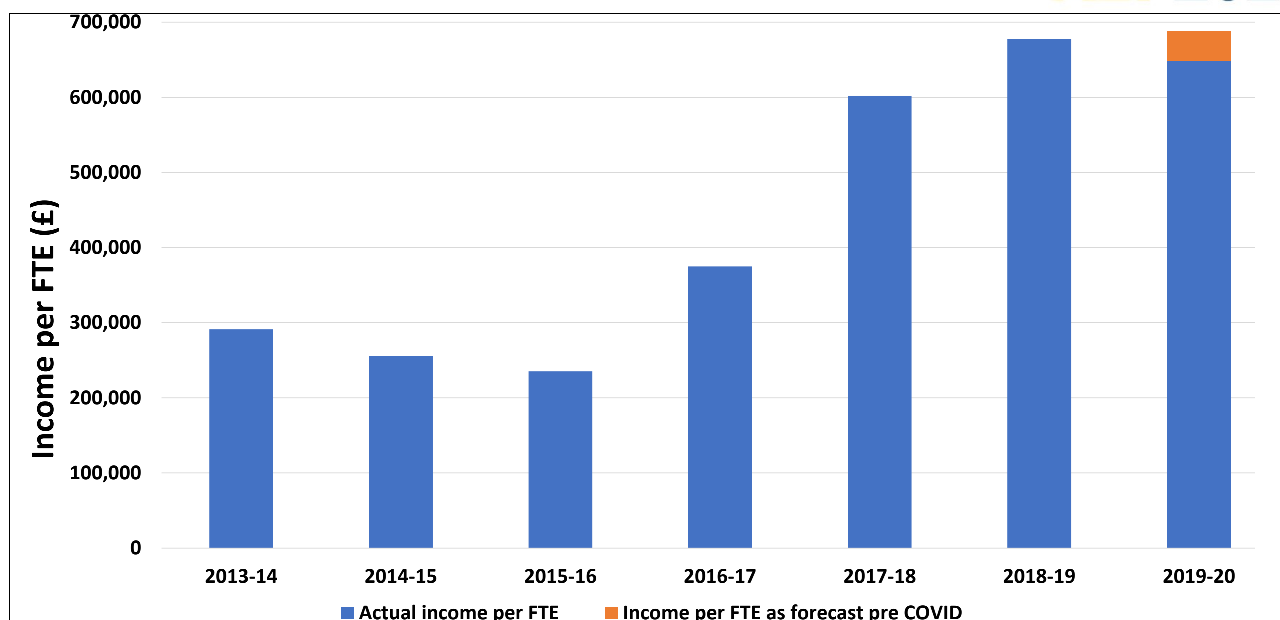

Figure 1: UOA2 research income per FTE per annum (inclusive of partner income).

The average research income per FTE per annum over the whole Census Period has remained strong at £440,780. UOA2 seeks to build a diverse portfolio of funding, much of it shared with the Global South and contributing to research capacity development there.

Table 1: Major sources of grant income over the census period.

	UKRI	UK charity	UK gov	EU gov	Non-EU charity	Non-UK other	NIHR
Total income (millions)	£9.7	£6.3	£18.1	£13.1	£6.6	£14.9	£7.9

Unsurprisingly, given its previously low relevance to LMICs, NIHR has not previously been a major source of funding for LSTM but the *Global Health Research Units and Groups Scheme* started in 2017 and awards totalling £17.7M have been won.

Buildings

The LSTM campus (Figure 2) is adjacent to both UoL and the Liverpool University Hospitals NHS Foundation Trust (LUHFT). In addition, LSTM has committed resource to facilities in the MLW Programme.

The Liverpool campus at REF2014. The *Centre for Tropical Infectious Diseases* (CTID; 8,707m^2; A in Figure 2), which is contiguous with the original Maegraith, Gilles and Kingsley buildings (7,300m^2 in total), was opened in 2009.

New building since REF2014. The *Wolfson Building* (opened 2015; £8.8M; 2,800m^2; E) is 50m from CTID and is designed to support later stages of translation and interdisciplinary activities.

Land bank in Liverpool. LSTM has secured a 3497m^2 land bank that is contiguous with our other buildings and bridges to LUHFT to accommodate future expansion plans. Current planning builds upon our recent *Strength in Places Fund* award (see below) for which we envision a Translational Infection-Research Facility in collaboration with Liverpool City Region (see below) and an expansion of our student numbers accommodated in a specially designed refurbishment of the *Pembroke Place* building (K).

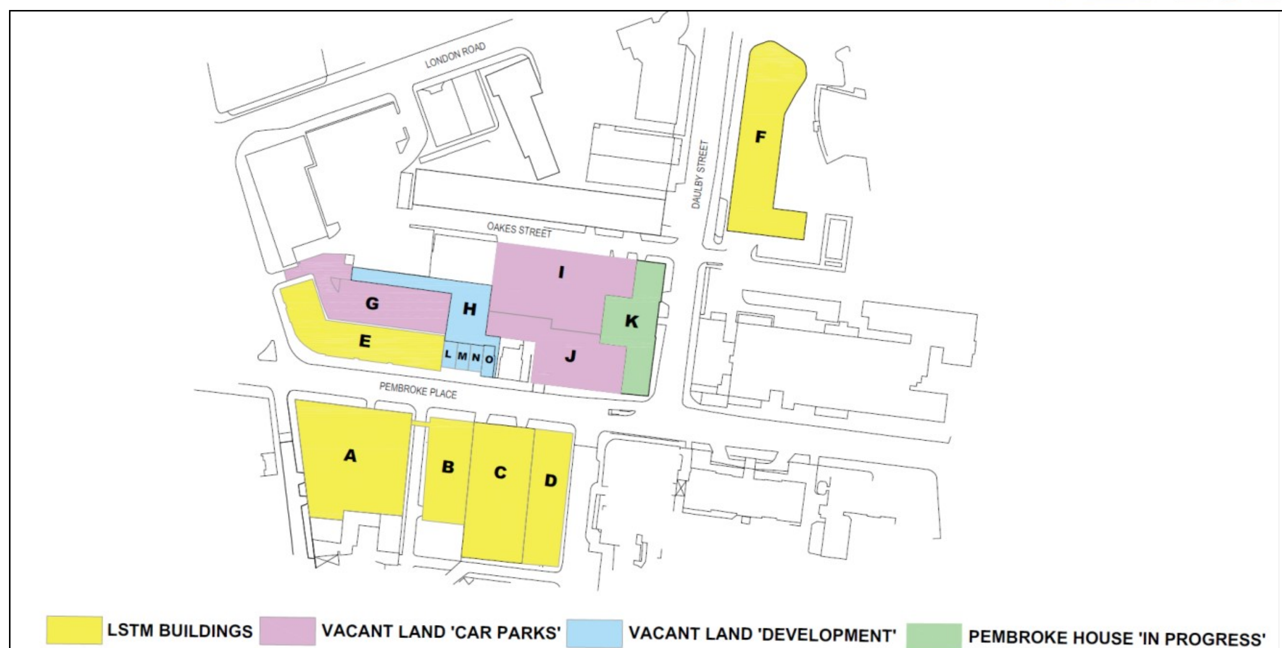

Figure 2 The LSTM Campus.

Buildings in the Malawi-Liverpool-Wellcome Programme (MLW). LSTM investments in buildings at MLW are described in section 4 below.

Governance and administration.

LSTM Board of Trustees interacts with academics and receives reports from the Management Committee (MC, chaired by the Director). MC steers, determines strategy and controls the budget (including elements of strategic investment including the Wellcome Trust Institutional Support Fund (currently £1M). Research Committee, like other committees, reports to MC, advises on research strategy and makes strategic investments in people (including bridging funding, the director's catalyst fund and Jean Clayton awards). The Director is represented on the *Health & Life Science Board* of Liverpool City Region and the *Liverpool Health Partners Board* (see below).

Scientific support.

The Global Health Clinical Trials Unit (GHTU) includes twelve staff members with expertise for planning, supporting and managing Phase 2 and 3 randomised and observational studies in low-income settings. Most of these studies are conducted by LSTM and its partners, but we also work on external trials that fit within LSTM's vision and strategy. Current trials relevant to UOA2 address TB in both southern Ethiopia and Nigeria ('TB-Reach' Cuevas), contraceptive efficacy during HIV treatment in Botswana (Morroni), the use of menstrual cups in western Kenya (Phillips-Howard) and antiretroviral therapy in late pregnancy ('DolPHIN 2', Taegtmeyer).

Research governance

Our Research Governance Manager (RGM) is responsible for ensuring that research is undertaken to the highest standards in accordance with UK law and the LSTM's *Guidelines on Good Research Practice*. The *Guidelines* follow national guidance from Universities UK and the UK Research Integrity Office and are supported by detailed policies for ethics review, health and safety, grant management, research management, confidentiality of data and records, intellectual property, working with the private sector, and investigating allegations of misconduct. These policies have recently been reviewed to ensure conformity with the UUK Concordat for Research Integrity.

Conduct of research on human participants in LMICs requires additional specialist infrastructure. Our Research Ethics Committee (REC, supported by the RGM) reviews all protocols for work on human participants in LMICs including (but not restricted to) randomised trials (including those on investigational medical products) and observational studies (including those using social science methods). The expertise of LSTM REC is recognised by the frequent requests to review protocols from other UK Institutions (e.g. Marie Stopes UK, Consultancy Companies, other HEIs and MRC) for studies to be conducted in LMICs. The LSTM REC also reviews protocols for work being conducted in the UK by LSTM researchers that does not fall within the remit of the HRA/MHRA. Finally, the *Research Governance Oversight Committee* is responsible for oversight of work on human subjects, has a detailed audit schedule and conducts ad-hoc audits as required.

4. Collaboration and contribution to the research base, economy and society

Worldwide collaborations

LSTM UOA2 teams often have their roots in the health systems of LMICs – South-North interactions determine the questions posed, the research methods used and the mixed-affiliation of team members. The resulting in-country ownership of research findings increases the likelihood that research translates into improved healthcare delivery. LSTM UOA2 staff have led 13 collaborative awards (of more than 4 partners and value over £2.5M) in the Census Period and examples are described below.

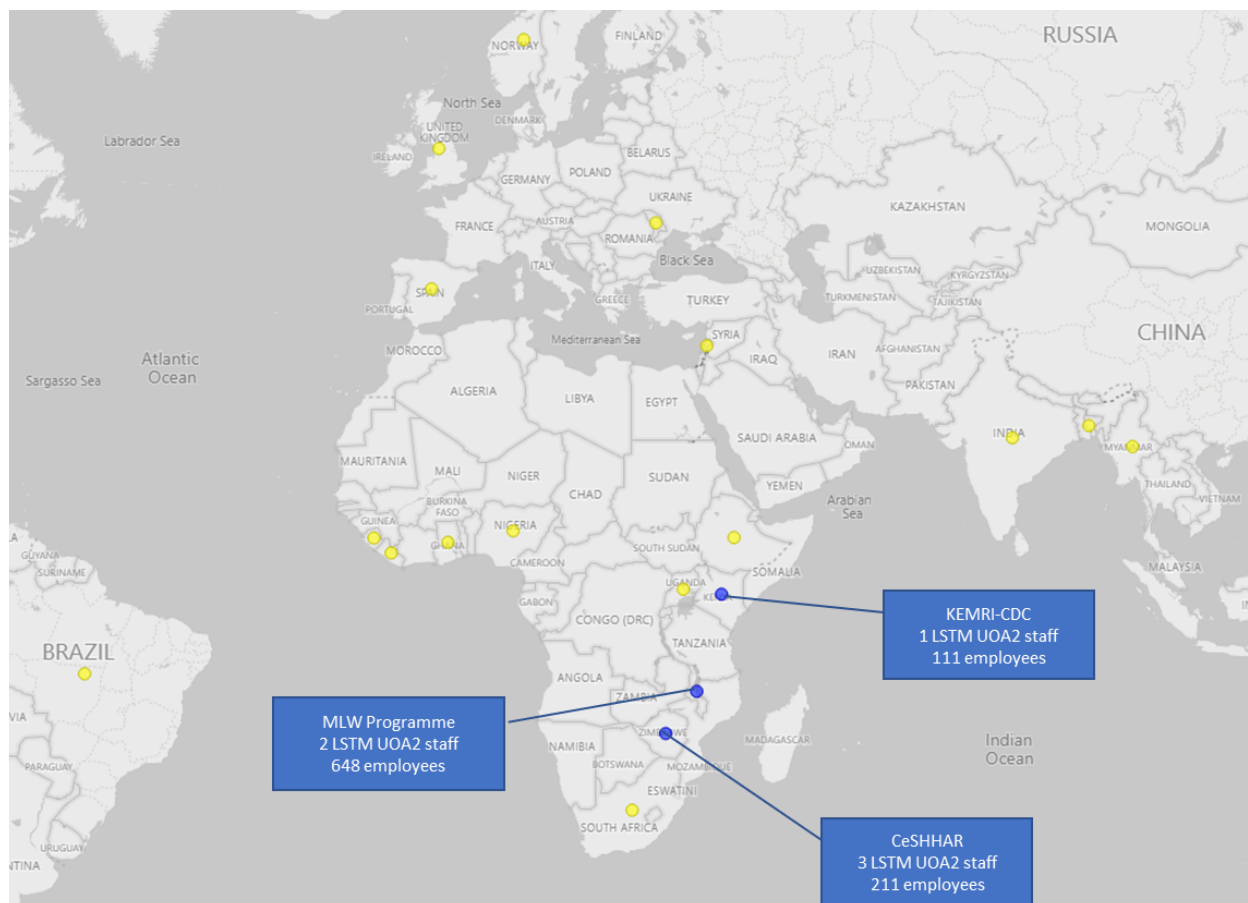

Figure 3. Long term collaborations with resident UOA2 LSTM staff – blue symbols. International collaborators in LSTM UOA2 awards >£1M – yellow symbols.

The Centre for Sexual Health and HIV/AIDS Research (CeSHHAR) Zimbabwe. CeSHHAR (which now has 211 staff) was established by Cowan (of LSTM) in 2012 with a mission to conduct research, deliver programmes, and strengthen capacity to inform health policy and programming in Zimbabwe and beyond. Cowan and other LSTM staff in CeSHHAR (Mavhu and

Sibanda) are members of the Department of International Public Health. CeSHHAR conducts implementation research related to HIV and sexual and reproductive health including evaluation of several national programmes. Funding sources are wide-ranging (Wellcome Trust, The Gates Foundation, NIH, The Children's Investment Fund Foundation (CIFF), UNITAID, USAID and The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)). CeSHHAR also runs Zimbabwe's national program for sex workers on behalf of Ministry of Health which has, for 10 years, acted as a research implementation platform for a broad range of research relate to sex work in Southern Africa.

The Malawi-Liverpool-Wellcome Programme (MLW). LSTM holds the Wellcome Trust core grant for MLW (£25M) which currently employs 648 staff. MLW was established by Molyneux (of LSTM) in 1990 with a mission to conduct excellent research and train the next generation of researchers (particularly Malawians). Now directed by Gordon (of LSTM; UOA1) MLW is a constituent of the University of Malawi College of Medicine and a partner of both LSTM and UoL. Ten LSTM staff in MLW have affiliations to 3 of the 4 LSTM departments; most are submitted to UOA1 but Desmond and MacPherson, E (behaviour & health) is submitted to UOA2. LSTM awards in MLW total £58M since January 2014. MLW is based in the Queen Elizabeth Central Hospital (QECH) Blantyre. In the present Census Period, LSTM has invested the following sums in MLW buildings. The *Learning & Teaching Centre* (2013; £2M) – as well as space for meetings this houses offices (thus freeing space in the *Malcolm Molyneux Research Laboratories* (1999; refurbished 2014 £600K). The *Adult Accident & Emergency Building* of QECH (2013; £1.3M) – standards of care have risen and high-quality clinical research can now be done. The *Clinical Research And Training Open Resource (CREATOR)* Building (4,324m^2; under construction and due to open 2023; £8.9M in partnership with UoL) - the first, specialist postgraduate medical training centre in Malawi, CREATOR will provide the most sophisticated (and open-resource) research environment in the country.

The LSTM collaboration with KEMRI/CDC in western Kenya. The *Kenya Medical Research Institute* (KEMRI) and US *Centers for Disease Control and Prevention* (CDC) has its campus at Kisian, close to Kisumu City. The campus is a registered NIH clinical research trial site and has world class certified laboratory facilities. The health and demographic surveillance system covers a population of approximately 250,000, providing a platform for population-based studies. ter Kuile (UOA1) leads the LSTM team while Phillips-Howard (submitted to UOA2) leads LSTM work on sexual and reproductive health. LSTM UOA2 research in KEMRI has been supported by funding from the UKRI Joint Global Health Trials Initiative, the Gates Foundation, European and Developing Countries Clinical Trials Partnership (EDCTP) and CIFF; current LSTM grants total £29M.

Childbirth, Women's and Newborn Health. Health workers trained in Emergency Obstetric Care (EmOC) can reduce the risk of maternal and newborn deaths in low- and middle-income countries. LSTM designed and implemented EmOC interventions in the *'Making it Happen' (MiH)* programme (between 2009 and 2016) in 3 Asian and 6 sub-Saharan Africa countries. LSTM's MiH programme reduced maternal mortality and stillbirths by improving access to EmOC-trained staff in a cost-effective manner; it is now being scaled up in all participating countries. The recent appointment of Lavender, Bedwell and Mills (after the 2020 Census Date, and so not submitted to REF2021) will enable LSTM to expand our activities in this area.

The Evidence-informed decision-making network (EvIDeNT). EvIDeNT is co-funded by the longstanding partnership of LSTM-MLW with the College of Medicine (Health Economics & Policy Unit, Lilongwe) and has been expanded to a wider, inclusive national network to support effective uptake of research evidence into health policy and practice in Malawi. The current partners are the Ministry of Health (MoH) Department of Planning & Policy (which leads EviDeNT) with the MoH Department of Research, and the African Institute for Development Policy.

The STAR (Self-Testing HIV in AfRica) Initiative is funded by UNITAID (between 2015 and 2020) and aims to shape and stimulate the global market for HIV self-testing through formative

work to determine acceptability, accuracy, safety, usability and costs of self-testing as well as the prevailing regulatory environment; early scale-up (large scale randomised trials across Southern Africa, discrete choice experiments and cost effectiveness studies) and implementation research to optimise delivery at scale. LSTM and partners generated high quality evidence that catalysed a supportive regulatory, policy and funding environment globally leading to rapid scale-up of self-testing in LMICs, resulting in demonstrable increases in testing coverage particularly among vulnerable, underserved and key populations.

Other notable contributions

Public engagement (PE) activities:
LSTM is committed to support PE both locally and overseas and supports staff and postgraduate students to undergo training in PE. Locally, the COVID-19 pandemic has led to new on-line relationships such as engagement with primary schools within the Everton FC *Schools Supporters' Club* Programme. In addition, LSTM staff have been frequent presenters on the local radio 'Science Show', providing reassurance and information throughout the pandemic. Each LSTM international 'unit' runs PE with their own communities. For example, work in 2019 in Malawi included a PE focus around anti-microbial drug resistance involving the Health Ministry; this work won an award from the Wellcome Trust (£248,385) in October 2020.

Leadership in UK and international advisory scientific bodies:

- Taegtmeyer – co-chair of the PHE multidisciplinary COVID patient flow working group
- Squire – chair of the WHO-TDR Scientific Working Group for Intervention & Implementation Research
- Cowan – co-chair of the USA NIH adolescent working group; Chair of the Essential Drug List (STIs) in Zimbabwe
- Garner- Member of the WHO Expert Advisory Panel on Drug Evaluation

Membership of international advisory scientific bodies:

- Moroni - WHO, Treatment and Care, Department of HIV/AIDS, WHO Committee on Hormonal Contraception and HIV
- Cowan – WHO/UNAIDs expert panel on PrEP for women, WHO expert panel for guidance development process for adolescents with HIV and AIDS
- Sibanda – WHO Self Testing technical working group
- Bates - WHO Clinical Use of Blood steering group
- Valadez – USAID Bureau for Global Health, World Bank Global Health Practice.
- Taegtmeyer - WHO HIV counselling and testing guidelines sub-committee
- Squire - WHO Strategic and Technical Advisory Group on TB (STAG-TB)
- Squire – WHO Task Force on TB patient cost measurement
- Valadez - USAID Bureau for Global Health; UNICEF Regional and Country Offices
- Wingfield – WHO Task Force on TB patient cost measurement
- Tolhurst - Equity Reference Group on Immunisation; UNICEF & Gates Foundation.

Membership of national funding committees:

- Bates, MRC PHIND, WHO TDR Impact, WHO TDR Capacity Strengthening
- Obasi, MRC PHIND,
- Squire – deputy chair NIHR Global Health Research Units Funding panel
- Raven – Research Council of Norway
- Valadez - Wellcome Trust Science, Innovation and Translation Programme Advisory Group
- Cowan - MRC Panel 'improving adolescent health in LMIC settings'

Organization of major international academic conferences:

- Squire – the Union World Conference on Lung Health, Liverpool 2016.
- Theobald - Co-chair of the Executive Committee for Health Systems Research 2018