

Building the Foundations for Improved Global Healthcare

Faculty of Biology, Medicine & Health

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GREATER MANCHESTER, GLOBAL MANCHESTER

As the University of Manchester prepares to enter its third century in 2024, our motto of 'Knowledge, Wisdom and Humanity' is still the driving force across our collective institutional efforts towards improving the lives of people across the world.

Consequently we are proud to be named top in both the UK and Europe, and second in the world for meaningful contributions towards the United Nations' Sustainable Development Goals (UN SDGs) in the 2023 Times Higher Education Impact Rankings. Indeed, we are the only University in the world to feature in the top ten of this ranking since its inception.

As a Faculty of Biology, Medicine and Health, it is our belief that good health is a fundamental global right for all people. Our efforts in helping to achieve health equity for all are seen both in our teaching, where we are educating and developing the next generation of healthcare workers, and in our research, where we are delivering breakthroughs in understanding and management of diseases. In looking to improve health outcomes, we know that health cannot be looked at in isolation, separate from factors such as climate, housing, access to clean water, air and nutrition, to name just a few.

The size, scale and breadth of our research and teaching across The University of Manchester means that we partner with colleagues in areas such as geography, urban planning, climate and pollution in seeking to address the wider factors that impact on global health.

Looking primarily through a health lens, this publication will highlight how our research collaborations are making a real difference to people and communities across the world.



GLOBAL CITY

Manchester is a proud global city. Our region is home to more than 200 different spoken languages, we have the UK's highest number of overseas students and we have almost 230,000 international professionals in the North West region.

However, the health and social care delivered to our diverse communities is not as global, as much of the world's research to discover diagnostic and treatment pathways for non-communicable diseases is based on European populations.

Our communities are feeling the very real need for this to change to ensure that breakthroughs and life changing treatments work effectively across all ethnic groups.

We must understand diseases such as cancer or heart disease that are prominent in different ethnic groups and the differences across different populations.

This will provide a much-improved global evidence base for the treatment of non-communicable diseases and provide effective personalised treatments for our different communities.

Our partnership with the Kenyan Government to research the causes of cancers in East Africa is one example, this publication contains many more.

HEALTHCARE WORKFORCE

The World Health Organisation (WHO) predicts that in 2030, there will be a deficit of 10 million healthcare workers globally, 42% of which will be in Africa and a further 32% in South-East Asia.

Access to good health is a global right, as stated in UN Sustainability Goal 3. However in 2017, only around one third to half of the global population was covered by essential health services if this is not reversed, more of our global population won't be covered by essential health services by 2030.

This projected healthcare workforce shortfall will make achieving healthcare equity even more difficult, especially in low-and middle-income countries (LMICs) where the need will be most felt.

Along with research, our staff and students are involved in global teaching partnerships and student exchange programs that will deliver a robust and resilient healthcare workforce that has the necessary cultural competence to address the inequalities that currently exist within healthcare.

By working with partners to establish a handful of centres of excellence for healthcare education and training around the globe, we are producing the resilient and flexible multi-professional healthcare workforce needed to combat the rising tide of non-communicable diseases.

We have already established one hub at Mansoura University in Egypt, with another starting in Alexandria University and will soon start a third at Kisii University in Western Kenya. These centres will use modern educational and pedagogical approaches to train the next generation of nurses, doctors, dentists and pharmacists, who will have the skills to provide patient centred healthcare for non-communicable diseases in the community, helping to maintain family structures and economic activity.

POWER OF PARTNERSHIPS

By forming research and teaching partnerships with like-minded global universities, Governments and research institutions, we hope to understand the causes of non-communicable diseases in different ethnic groups much better and develop the personalised therapies needed to treat these patient groups.

We are poised to drive transformation across the globe in the detection, treatments and increased access to healthcare provision.

We know we cannot do this alone. Our ambitions can only be achieved with a new approach to partnerships, both locally, nationally and internationally, and I hope Global Futures provides some insight into how we are focussed, through these partnerships, on tackling some of the leading global health challenges to improve health outcomes for everyone, now and in the future

Professor Graham Lord, Vice-President of The University of Manchester and Dean of the Faculty of Biology, Medicine and Health.



The success of devolving the budget in Manchester is driving changes across the NHS with the formation of the new Integrated Care Systems.

Very recently, our researchers have developed a method to identify new-born babies at risk of deafness if treated with the antibiotic, gentamicin. Although often used in new-borns to treat life threatening infections, gentamicin can cause deafness in some babies due to a particular genetic change.

HELPING WOMEN TO SURVIVE BREAST CANCER

One in eight women globally will develop breast cancer in their lifetime and the rate of breast cancer in women has doubled over the past 50 years. Our research led to revolutionary changes in the treatment of breast cancer that has given women a better chance of survival.

Breast cancer survival is improved by early detection and the use of systemic therapy given after surgery. Endocrine therapy (treatment that blocks the body's





A GLOBAL HERITAGE

Manchester was home to the first NHS hospital in 1948, starting the process that saw universal health coverage become the reality that the UK has enjoyed for the last 75 years. Manchester has also led on developing many of the new treatments and care strategies that have been incorporated into the NHS since 1948. Manchester has also played a key role in shaping the NHS from its inception to the present day and continues to do so.



Like many things, the diseases seen in a country change over time. What was common once is rare at another time. We also learn to recognise new illnesses. Consequently, health practice evolves as well; what was right in 1948 may not be appropriate today. The scientific world responds to these changes and helps redefine our healthcare system over time.

Manchester researchers have led on developing many new treatments and care strategies that are crucial to shaping treatment and care in the NHS and helping more people survive disease across the globe.

Our work developing tamoxifen has been a game changer for breast cancer treatment, as our teams brought the benefits directly into the clinic by getting the guidelines changed and the drug approved for use. Our teams have gone on to demonstrate the use of tamoxifen as a preventative agent for breast cancer and pioneer the use of other endocrine therapies.

The devolution of the health and social care budget has allowed us to shape provision within Greater Manchester, increasing healthy life span across the region and particularly within low socio-economic groups. natural hormones) can prevent relapse and improve survival and can also extend the duration of survival after systemic relapse. Breakthroughs in this area are therefore both life-changing and life-saving.

In the 1970s we developed a breakthrough therapy using tamoxifen, an anti-oestrogen drug that blocked oestrogen receptors in tumours, which meant that the cancer grew more slowly or stopped growing altogether.

Manchester research from the 1990s led to clinical trials showing that fulvestrant, another anti-oestrogen drug, was effective in women with advanced breast cancer who had become immune to tamoxifen.

Our team went on to show that anastrozole, another hormone therapy, outperformed tamoxifen in preventing the relapse of breast cancer. Anastrozole proved to be a breakthrough drug that is now the major endocrine therapy for breast cancer.

Our research into new approaches to endocrine therapy has resulted in anastrozole being adopted as the world's major endocrine therapy that has revolutionised breast cancer treatment worldwide and has changed and helped to set international treatment standards.

> Our research led to revolutionary changes in the treatment of breast cancer that has given women a better chance of survival.

DEVOLUTION

As disease profiles change, so too does our understanding of how to detect, prevent and treat disease. Innovations in disease management require the ability to respond quickly, with adaptability in delivery.

Under an historic devolution deal with the Government, the region has been able to make its own spending decisions since April 2016 with Greater Manchester laying claim to being the first city region in the UK to have control over its £6 billion health and social care budget.

This whole system devolution of acute and primary care, community and mental health services, social care, public health, and health education and research and development means the city region has autonomy to develop a more streamlined innovation adoption

pathway with the aim of delivering new health and social care innovations at pace and scale.

Representing a unique opportunity for the region to pioneer new partnerships and improve patient outcomes in the diseases that affect the population, devolution is driving research from the bench to the bedside and pulling solutions to diseases seen in the region from our researchers.

These enabling factors for successful innovation are critical to success; what sets Manchester apart from other cities is its devolved healthcare system. It is unique in being able to try new ways of working and to focus resource where it is needed most to help achieve improvements.





DEVELOPING A WORLD-FIRST BEDSIDE GENETIC TEST TO PREVENT BABIES GOING DEAF

Manchester scientists have developed a pioneering, rapid bedside genetic test that could save the hearing of hundreds of babies each year.

In just 25 minutes, a bedside machine identifies whether a critically ill baby admitted to intensive care has a genetic variant that could result in permanent hearing loss if they are treated with a common emergency antibiotic.

The new swab test technique replaces a test that traditionally took several days and could save the hearing of 180 babies in England alone every year.

People admitted to intensive care are usually given a common antibiotic, gentamicin, within 60 minutes. While gentamicin is used to safely treat about 100,000 babies a year, one in 500 babies carry the genetic variant that can make it cause permanent hearing loss.

Developed in Manchester, the new test means that babies found to have the genetic variant can be given an alternative antibiotic within the 'golden hour' when severely unwell babies should be treated with antibiotics.

The deployment of rapid genetic testing into the hands of healthcare professionals to guide treatment choices is driving a revolution in patient care. Their affordable nature also means that these tests can be used in resource limited low- and middle-income countries (LMICs), impacting healthcare globally.

ADDRESSING TOMORROW'S CHALLENGES

AT A GLANCE

- Non-communicable diseases (NCDs) include chronic respiratory and cardiovascular diseases, diabetes, poor mental health and cancer.
- In 2020 the global health workforce was estimated to be 65 million, reflecting growth of 29% since 2016.
- Despite this growth, there is predicted to be a healthcare workforce gap of 10 million by 2030, 40% of which will be in Africa and 32% in South East Asia.

"The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition."

Adopted almost 70 years ago in the *Constitution of the World Health Organization (WHO)*, realising this fundamental right for all remains a challenge for health systems globally, particularly as new health challenges that threaten this right emerge all the time across the globe.

RISE IN DISEASE

NCDs - such as cardiovascular diseases, diabetes, poor mental health, cancer and chronic respiratory diseases - have a higher morbidity and mortality rate globally than do all other causes combined.

Until recently, NCDs have primarily been seen in high income countries, but their incidence has been increasing in low and middle-income countries (LMICs). In all continents, except Africa, the number of deaths from NCDs has now exceeded the total number of deaths from communicable, maternal, perinatal and nutritional conditions.

The WHO estimates that by 2030, NCDs will account for 80% of the global disease burden. Seven out of every ten deaths in LMICs will be caused by NCDs.

Moreover, the global NCD burden will increase by 17% in the next decade, and in Africa, it will increase by 27%. Nearly half of all deaths in Asia are attributable to NCDs, accounting for 47% of the global disease burden.

NCD research is primarily done in people of European descent in Europe and North America. Ethnically diverse populations experience NCDs differently and require different treatments. Research on the



The World Health Organization (WHO) estimates that by 2030, NCDs will account for 80% of the global disease burden.



different genomic and environmental factors that impact NCD progression need to be expanded to other populations and different environments.

"NCDs are becoming an issue of equity. They disproportionately affect low-and lower-middleincome countries, and in all countries the poorest and most vulnerable are the most at risk and the least likely to have access to treatment."

Dr Tedros Adhanom Ghebreyesus, Director-General, World Health Organization

WORKFORCE DEFICIT

Realising the right to the highest attainable standard of health is dependent on the availability, accessibility, acceptability and quality of a healthcare workforce. The WHO estimates a projected shortfall of 10 million health workers by 2030. Africa and the Eastern Mediterranean and Middle East will shoulder an increasing burden of the workforce shortages.

Contributing factors to the workforce shortage include under-investment in education and training of health workers, the mismatch between education and employment strategies and differing population needs which are compounded by difficulties in deploying health workers to rural, remote and underserved areas.

An increasing international migration of health workers can exacerbate health workforce shortfalls, particularly in LMICs.

Morbidity and mortality of NCDs is higher for people living in LMICs. In countries where environmental and climate factors are at their worst, healthcare costs are spiralling, leading to a profound impact of the NCD epidemic in some of the most economically challenged parts of the world.

MANCHESTER: A GLOBAL CITY

MANCHESTER'S CONTRIBUTION TO GLOBAL HEALTH

The global disease burden of infectious and non communicable diseases varies in incidence and type between low and middle-income countries (LMICs) and high-income countries (HICs). This geographical variation is affected by many things including nutrition, environment, cultural behaviours and genetics.

MOBILE WORLD

Our increasingly mobile world sees our local communities becoming more diverse, and if we are to discover and develop more effective treatments, as well as prevention and detection strategies for all our population, a global research base, based on a wider understanding of risk factors, social factors and genetic variations is needed.

Ian Bruce, Vice Dean for Health and Care Partnerships and Director of the National Health Institute for Health and Care Research (NIHR) Manchester Biomedical Research Centre (BRC), is also a practicing rheumatologist and he tell us how Manchester based research in a wide range of non-communicable diseases, including his own work into lupus, is directly benefiting patients, locally and globally.

CHANGES IN DISEASE

"We traditionally have had the view that infectious diseases were the dominant health care problem that needs addressing across LMICs . However, noncommunicable diseases such as cancer and cardiovascular disease are emerging as major health challenges in those regions, along with autoimmune diseases such as lupus.

Systemic lupus erythematosus (SLE) or Lupus is an autoimmune disease that occurs when a person's immune system attacks its own tissues and organs. Inflammation caused by lupus can affect many different body systems including your joints, skin, kidneys, blood cells, brain, heart and lungs. Certain ethnic groups are more vulnerable than others to developing lupus and symptoms of lupus can vary widely, from mild to severe. There is no cure for lupus, but treatment can help control symptoms.

Consistent with many other studies, our research in Manchester, has shown that lupus is more common in people of African origin as well as in people from Indo-Asian and South-East Asian origin. In these populations more severe disease, including kidney involvement, is also more common. Therefore, from a global perspective, the majority of lupus patients in the world are living in low and middle-income countries.

In the UK, we are fortunate to have access to new, highly effective treatments for lupus patients, which impacts positively on their outcomes. However, many of these new treatments are expensive and so in LMICs, where the need for them is greatest, their high cost severely restricts access and use.

We have this paradox therefore, where the largest numbers of lupus patients cannot access the most effective therapies. As a result, these patients can only access cheaper, more affordable drugs, one of which is steroids (glucocorticoids).

Globally, glucocorticoids are extremely cheap and, in many countries, they can be bought over the counter. Our research, however, has shown that many of the long-term complications of lupus such as high blood pressure, osteoporosis, diabetes, and infection risk are all increased by higher doses of steroids. We know they are harmful drugs in the long-term.

Our recent published work on lupus focussed on the risk of severe infection in UK patients with lupus and we found that of all lupus treatments, steroids are the drug which increases infection risk the most. In contrast, the use of other drugs, such as immunosuppressive drugs and newer therapies for treatment avoided the use of steroids. Patients prescribed these drugs therefore experienced better disease control and fewer long-term complications. Now we want to see to what extent this is also true in other parts of the world. A collaboration with The University of Nairobi, Kenya and with colleagues in Sri Lanka to look at the risk of infection of their lupus patients is aiming to better understand this problem at a global level and propose effective measures to prevent this important complication of lupus.

Our ultimate aim is to develop an evidence base to help local physicians influence policy in their own countries so that they can widen access to newer lupus treatments which are more effective, control the disease better and reduce the use of steroid therapy amongst their patient populations.

A problem like this will need to involve patients, carers, physicians, healthcare planners, payers and the pharmaceutical industry to ensure that we can truly narrow the gap in overall health outcomes for all lupus patients."

REAL WORLD SOLUTIONS

"All of the major problems that we are addressing in Manchester through the BRC are globally relevant. Take hearing health for example which is one of our research themes; currently over 1.5 billion people globally live with hearing loss, but the WHO predicts that this number could rise to over 2.5 billion by 2050. Therefore, improved understanding of hearing loss and how our solutions to hearing loss can be made applicable across cultures and in LMICs, will be hugely important.

Our researchers have a global eye because they understand that the things they are learning here will have widespread applicability and that is a crucial driver for our research teams based in Manchester."



SHARING LESSONS GLOBALLY

AT A GLANCE

- Oesophageal cancer is the sixth most common cause of cancer-related death worldwide.
- One of the two major subtypes of oesophageal cancer is oesophageal squamous cell carcinoma (OSCC).
- OSCC accounts for 90% of all cases of oesophageal cancer globally.
- It is highly prevalent in East Africa.
- Risk factors could include tobacco, consumption of alcohol and hot beverages, and indoor air pollution.

Kenya has one of the highest incidence rates of oesophageal cancer in the world; it does not discriminate by gender and mortality rates are almost equal to incidence. It is a cancer that can progress undetected until late stage, when treatment options are very limited. Dr Suzanne Johnson is a Lecturer and Programme Director for Transformative Oncology, School of Medical Sciences at The University of Manchester. One of her current research collaborations is with the Kenyatta University Teaching, Referral and Research Hospital (KUTRRH), which is focused on improving oesophageal cancer survival in Kenya.

Here she tells us why parallels between Manchester and Kenya might lead to learnings that will improve outcomes for patients in Kenya, the UK, and countries worldwide.

KENYAN SPECIFIC CANCER

"Our current project seeks to better understand the biological and genetic background of squamous cell carcinoma of the oesophagus (OSCC), a cancer type that differs to the adenocarcinoma we see more frequently in the UK. This difference has prompted an interest in the potential role of lifestyle choices, environmental and genetic factors, which may lead to the development of this cancer, and are specific to Kenya. These learnings can help to raise awareness, promote preventative measures and develop earlier detection methods, with the primary aim to reduce morbidity and mortality of future cases.

MANCHESTER: A GLOBAL CITY

Just like Greater Manchester (GM), Kenya as a country does not have a homogenous population. Huge diversity in ethnicity, language and culture are apparent. This similarity allows us to draw parallels with research approaches that have been successful here in Manchester and look to apply the same principles there.

We are working with our Kenyan colleagues to build a trusted network of researchers, community health workers, clinicians, patients, and carers who will enable us to gather data about the early signs and symptoms, lifestyle choices and practices, help seeking behaviours and access to care. These insights are essential to inform future interventions and build improvement.

Kenya's regions and counties also vary dramatically in geographical and environmental features, which adds other rich and interesting dimensions to our research."

GLOBAL HEALTH RESEARCH

"There are many compounding factors to performing relevant and aspirational health research, whether that's in the UK or globally. Often clinical improvement cannot be measured for 10 years or more. Securing adequate funding to ensure the sustainability of any

 Community

 engagement is

 a key feature of

 this and a number

 of projects.



project that seeks to learn and then implement changes in behaviours, in the hope it will lead to improvements in clinical outcome, requires vision and long-term commitment. There are also the constraints of academic rigour, historical bias or deep-rooted discrimination that need to be navigated.

It is challenging, and one size does not fit all but by working together with the population we seek to serve, researchers can overcome many barriers and deliver fruitful and more importantly meaningful advances in their field."

COMMUNICATION

"Research which involves collecting information, life experiences and personal insights to disease across a population requires sensitivity. It can be very complex, as it aims to account for human diversity and its success is determined by the quality and authenticity of data that is gathered as part of the project.

Community engagement is a key feature of this and a number of projects across GM and beyond. The dialogue between individuals is crucial to gather what are often anecdotal insights into personal experiences of cancer and which can be so valuable when designing research."



"Gaining the trust of the communities we wish to engage is pivotal and engagement relies on clear and honest communication. People's perception of research varies and so framing the research sensitively can bring greater willingness to participate. Pledging to support the development of those we engage with, through education or awareness, can be a positive influence and lead to co-development of resources or approaches which in turn offer ownership, belonging and sustainability."

GLOBALISING OUR APPROACHES

"The University of Manchester was the first UK University to place Social Responsibility as a core goal, alongside research and discovery and teaching and learning. Global influence is a key theme and aligns directly with the United Nations Sustainable Development Goals. Using our expertise and knowledge of cancer discovery and clinical research, in collaboration with a low middle-income country such as Kenya, offers opportunities to share advances in understanding, which can directly support the improvement of outcomes for patients with cancer.

For example, in addition to bringing expertise in community engagement, this project brings expertise in cancer genomics that actively seeks to balance the deficit of understanding of the African genome. If we identify any underlying genetic signatures that are linked to an increased likelihood of developing OSCC, this can assist in future screening, treatment and education programmes, both in Kenya and elsewhere globally.

Clinically, in Greater Manchester, the Christie Hospital is the central hub for cancer care. Through the development of connections with a network of outlying care facilities, embedded within various communities, all patients with cancer acros<mark>s GM have</mark> access to world class care. This Hub and Spoke model forms the basis of our approach in Kenya, with KUTRRH in Nairobi as the Hub and 5 diverse counties (Meru, Nyeri, Kiambu, Kisii and Nakuru) as Spokes.

As part of the project, we are supporting the development of infrastructure, which will enable effective channels for communication, to ensure that each case is given the best possible treatment plan."

RECIPROCAL LEARNING

"There is a real opportunity with this project to broaden our understanding of the impact of movement of populations.

Working with the Kenyan diaspora in the UK enables us to monitor incidence of squamous cell carcinoma of the oesophagus in those who have migrated. That way we can investigate whether environmental, geographical and dietary changes have influenced the disease. In conjunction with new insights into the underlying genetic profiles, we can better advise on treatments as we move closer to precision oncology.

We may also identify specific signatures that suggest environmental triggers, which can be further explored through new screening programmes to facilitate early detection in Kenya. We may find from our study in Kenya that because a person lives in a more urban or rural environment, or whether they have more or less arsenic in their drinking water, or change their practice of drinking hot tea, or any number of other cultural and environmental changes that happen because of the fact that they have moved locality in Kenya could inform their cancer risk, both increasing and decreasing it.

Whatever we find will ultimately benefit not only Kenyans living in Kenya but Kenyans globally."

Gaining the trust of the communities we wish to engage is pivotal and engagement relies on clear and honest communication.



TACKLING INEQUALITIES IN MENTAL HEALTH

People of African and Caribbean backgrounds, including those who identify as 'Black British' and 'mixed heritage', are significantly more likely to be diagnosed with schizophrenia and related psychoses than other ethnic groups in the UK, but the least likely to access psychological care.

Dawn Edge is Professor of Mental Health and Inclusivity in the Faculty of Biology, Medicine and Health whose work focuses on tackling inequalities in mental health, especially of Black, Asian and other minoritised communities both in the UK and globally.

Her Manchester based research has led to the development of a low cost, digital alternative to conventional face-to-face therapy for people with mental health disorders, which is currently being evaluated in a national study in the NHS. Dawn envisions that technology could be harnessed to help 'level up' inequalities in mental health provision between the Global North and South by increasing access to evidence-based care alongside building workforce capability and capacity to deliver culturally informed psychological therapies.

PSYCHOSIS IN MINORITY COMMUNITIES

"What I found really intriguing was that, after decades of research into the inequalities that Black service users and their families experience in accessing mental health services and experiencing poorer care and outcomes, there were no evidence-based interventions to address the needs of these communities," Dawn says.

To address these disparities, Dawn began organising community mental health conferences in collaboration with NHS mental health trusts, policy makers, voluntary sector and community partners, including faith-based organisations. From these conferences and focus groups with local African and Caribbean communities, she found that service users, their families and the wider community had three main research priorities: i) more information about mental health and illness, ii) less reliance on medication and iii) better access to talking therapies.

The National Institute for Health and Care Excellence (NICE) recommends Family Intervention as a 'talking treatment' for schizophrenia, other psychoses, and related difficulties. However, as Dawn explains, other factors contribute to people from minority backgrounds being less likely to receive talking treatments in general, and family therapy in particular.

"NICE guidance is that Family intervention should be offered to service users 'in regular contact with their families', but what if your family is in another country or even for people with families, there may be geographical, economic or a myriad of other factors that limit access to family therapy."

DEVELOPING A FAMILY INTERVENTION

Dawn led a team of researchers at the University of Manchester, which includes service users and members of African and Caribbean communities. Together they undertook research, funded by the National Institute of Health & Care Research (NIHR), to see whether it was possible to develop **C**ulturally-**a**dapted **F**amily Intervention (CaFI). Their starting point was an evidence-based family therapy for schizophrenia and psychosis that was developed in Manchester.

CaFI was subsequent digitised, creating CaFI:Digital - a low-cost, online therapy, that can be delivered by professionals trained to work with families in culturally sensitive way and where Dawn sees CaFI:Digital helping to increase access to psychological therapy in some of the world's least well-resourced countries.

MEETING GLOBAL NEED

Between 76% and 85% of people with severe mental health conditions in Global South countries receive no treatment at all. National health budgets in the poorest countries often allocate less than 1% to mental health. It is against this backdrop where Dawn sees CaFI playing a potentially important role.

"A colleague, Professor Nusrat Hussain, is doing a lot of work in Pakistan, India and increasingly in the Middle East; working with people who are not psychologists but community workers to train and develop them as practitioners and deploy them to deliver what we might call, 'low intensity interventions' in the UK."

Although conditions like psychosis are classified as 'Serious Mental Illnesses' (SMI), other 'Common Mental Health Disorders' like depression and anxiety actually present a greater global disease burden due to higher prevalence. However, low-and middle-income countries (LMICs) just do not have the resources to deliver treatments to address the level of need.

"However, using CaFI as a model, we could ensure that therapies are culturally and context appropriate versus exporting interventions developed and trialled in the Global North. Additionally, therapists in more resource rich countries, like the UK, could deliver therapy with people in LMICs. We could also develop training and supervision models with local people, building workforce capacity explicitly focussed on sustainably addressing global mental health inequalities– for example, recruiting and training Community Mental Health Workers locally."

Between 76% and 85% of people with severe mental health conditions in Global South countries receive no treatment at all.

BUILDING CAPACITY

Dawn and her team are now set to test the feasibility of using digital therapy as a way of helping address the lack of capacity in LMICs, starting in Jamaica.

"We could have therapists in the UK and in North America, for example, delivering therapy anywhere in the world because they no longer have to be in the same room as therapy recipients.

Delivering family therapy remotely via CaFI:Digital could also improve access for families in rural communities in LMICs where resources are often concentrated in urban centres, making psychological care inaccessible for those with limited capacity to travel.

By bringing CaFI:Digital into Jamaica initially, working with people like Nusrat to start building up a workforce of community-based practitioners we are able to bridge the gap in accessing specialist mental health care. Interestingly, the UK has begun to adopt similar approaches to building capacity in the psychological therapy workforce to meet increasing need.

Globally, there is such a lack of psychological therapists, particularly Clinical Psychologists. In the UK, there is a whole strategy now for diversifying and increasing the psychological professions to meet increasing need – particularly in conditions like anxiety and depression. In this context, the CaFI model, which was developed in the UK, has potentially global application."

COMBINING OUR STRENGTHS



AT A GLANCE

- We align our discovery science, translational research, clinical and applied health research capabilities to ensure new treatments and care protocols reach patients as soon as possible.
- We are addressing major challenges in discovery science and health by bringing together staff with expertise in biomedicine, healthcare, engineering, physical sciences, mathematics, materials and computing.
- We are influencing policies to ensure the effect of housing, climate, pollution and urban planning on human health is considered.

Human health cannot be addressed in isolation, there are many non-medical factors that profoundly influence health outcomes from housing and urban planning to water, nutrition, agriculture, pollution and climate, not to mention economic policies, social policies and political systems. These can all impact on a person's health.

SUSTAINABILITY

SUSTAINABLE TECHNOLOGY

INFRASTRUCTURE

CLIMATE

CHANGE

DISPLACEMENT

COMMUNITY

HOUSING

URBAN

CHANGE

SOCIAL JUSTICE

POLITICS

ETHNICITY

MIGRATION

DIVERSITY

EQUITY

POVERTY

POPULATION

AGRICULTURE

ENERGY

Our medical and health research cannot exist in isolation and to achieve impact on patients, our researchers are working with expert colleagues from across The University of Manchester in the Global Development Institute, Manchester Urban Institute, Royce Institute and Manchester Environmental Research Institute from the Faculties of Humanities and Science and Engineering.

The following features are examples of where and how our internal partnerships are harnessing the best in subject expertise from across the University to make a difference.



DISEASE DETECTION

The cassava crop plant is one of the most important crop plants in Sub-Saharan Africa. It provides the third highest yield of carbohydrates per cultivated area and can survive in poor soils and low rainfall. The crop is affected by two common viral diseases- the cassava mosica and brown streak disease. These are transmitted plant to plant and infected root are only discovered at harvest, meaning that farmers don't know the crop has been infected until almost a year after planting.

This threatens food supply and causes severe economic loss. A team of electronic engineers from The University of Manchester, working alongside plant science and crop virology researchers at North Carolina State University in the US, and in partnership with the International Institute for Tropical Agriculture in Tanzania have developed a portable, low cost field sensor that uses AI to detect viral diseases in cassava crops. The sensors can detect disease in the plant within the first two weeks of infection meaning that agricultural workers can eradicate disease outbreaks before they spread.

ACCESSING CLEAN WATER

Malawi is a country considered as highly vulnerable to climate change having suffered several severe droughts in recent years.

In Lilongwe, the capital city, these droughts cause water shortages that can last from a few hours to several days. However, shortages have very different effects across neighbourhoods in cities due to variable access to water and sanitation.

In the informal settlements, most households collect water from kiosks and use self constructed sewage solutions. When water stops in these areas, residents use unsafe water resources and subsequently face serious health and hygiene challenges.

In the richer areas, residents have access to water taps, flush toilets and access to storage tanks to cope with service disruptions. However, water shortages affect these areas in different ways and can produce sewage blockages that pollute the environment and threaten the health of residents.

A \$100 million sanitation project is planned for the region but work needs to be done to sure that this investment takes into account all local needs.

Research at Manchester is being done alongside local universities and organisations such as the Urban Research and Advocacy Centre to support knowledge creation and encourage appropriate solutions.

MAPPING LIMB LOSS IN UGANDA

Undertaking robust studies to determine the health challenges faced by people living in postconflict environments in the Global South remains difficult. Understanding the extent of any given problem, its severity and its distribution within a given country or even within a given community is essential to finding effective solutions.

However, with many of the affected populations living in sparsely populated areas that have limited road and transport networks, identifying truly random samples of people to be included in these surveys isn't straightforward.

The challenge is exacerbated where these regions are 'data poor', lacking census, population and even map data. Such difficulties have previously been overcome by limiting studies to subpopulations living in accessible areas or even people from subgroups that present to health care or other similar institutions. This process of 'convenience sampling' introduces bias that can make the estimates obtained unreliable.

LIMB LOSS

Mahesh Nirmalan, a Professor of Medical Education and Vice Dean for Social Responsibility in the Faculty of Biology, Medicine and Health at The University of Manchester, wanted to understand the extent of post conflict disabilities, including limb loss, within Northern Uganda to begin to see where the University could help in providing rehabilitation services for people affected by a 25-year war between Ugandan Government forces and the Lord's Resistant Army.

Given the lack of available map data that existed for the region however, Mahesh realised he would need expert support and consequently approached a colleague Dr Jonathan Huck, a Senior Lecturer in Geographical Information in the Department of Geography at The University of Manchester, to see if he would be able to help.

Despite the extensive media coverage at the time about mass killings, displacements of an entire population and physical mutilation of innocent subjects, very little data was available for the government officials to plan and implement a suitable rehabilitation service for the people.

The only facility where prosthetic limb services were available at the Gulu Teaching and Referral Hospital was facing closure, as the international non-governmental organization (INGO) providing this facility began to scale down its role. Jonathan introduced Mahesh to a novel and innovative approach involving Geographical Information Systems (GIS). The system uses algorithms to identify populated areas using satellite data from which a truly random sample of people can be selected.

OUTREACH CLINIC

Using this method, Jonathan and Mahesh worked in partnership with the Gulu Medical Faculty and the Gulu Teaching and Referral Hospital to map the extent of post-conflict disabilities in Northern Uganda. They also engaged thousands of students and alumni from the University and volunteers through public engagement events, such as the Bluedot Festival, to create freely available maps of Northern Uganda.

Together, their work provided the rationale to train a team of prosthetic technicians and establish the first outreach prosthetic limb service in Uganda. Furthermore, to help reduce the stigma felt by people with post-conflict disabilities within the region, they developed a series of street plays and other cultural events with colleagues from the University's School of Arts, Languages and Cultures in the Faculty of Humanities.

COVID IN KENYA

Following the success of using GIS-aided studies in Uganda, the team went on to use this technique in three large informal settlements in Kenya to understand people's attitudes to Government imposed public health interventions such as face masks, hand washing and isolation during the COVID 19 pandemic. Informal settlements are characterised by high population density, low urban services, tenure insecurity, poor sanitation, poor ventilation and poor access to even the most basic forms of health services.

In 2016, the United Nations estimated that close to 55% of the Kenyan population was living under such conditions. Again, the team faced the challenge of identifying a truly random selection of people for the interviews.

The team in Manchester therefore transferred their experience of GIS-aided studies in Uganda to recruit random samples of residents living within the Kibera





settlement in Nairobi, the Rhoda settlement in Nakuru County and Daraja and Nubian settlements in Kisii County to understand the competition set up between public health interventions to control a pandemic and the economic challenges faced by people living in these settlements.

The team are now using GIS technologies to aid their work studying the health-impact of increasing salinity in ground water due to rising sea levels in some of the low lying islands in the Indian Ocean, such as Sri Lanka.

UNDERSTANDING HEALTH OUTCOMES THROUGH AIR POLLUTION

AT A GLANCE

- Poor air quality in urban areas, especially in rapidly growing cities in the Global South, is the result of industrial and societal practices such as coal combustion, agricultural burning, diesel vehicles and open waste burning.
- Rapid urbanisation leads to large numbers of people living in or very close to hotspots for air pollution.
- Poor air quality can exacerbate inequalities since low-income urban communities have the highest levels of exposure.

There is now global recognition of the role air pollution plays in non-communicable diseases including stroke, heart disease, and chronic obstructive pulmonary disease.

It has also been shown to impair cognitive function and childhood development. The Global Burden of Disease project estimated in 2017 that 3.4 million premature deaths globally could be attributed to outdoor air pollution and in 2019, 2.31 million global deaths could be attributed to household, or indoor air pollution. Researchers at The University of Manchester are developing models and tools that are being used to document and predict how environmental changes are impacting on human health.

Workplaces, homes, economic circumstances and lifestyle environments impact on health outcomes starting with a child's chances of a healthy future being dictated by the environment into which they are born. Professor Hugh Coe is working with colleagues to develop modelling tools that will be used by medical and healthcare professionals to anticipate how the environment influences health outcomes to improve quality of life in the UK and globally.

DEVELOPING MODELS FOR TRACKING POLLUTION

A team working in the Department of Earth and Environmental Sciences have developed an Exposure model which looks at air quality within different regions of a city and how people move through that city to see what they are exposed to during their day.

The work, led by Dr Matthew Thomas, allows the team to break down the findings by age and the place they are living, for example those living in urban areas compared to those in the suburbs, as the exposure for the different groups is likely to be very different.



The measurement and observational air pollution data, which the model delivers, are then linked with health statistics to help identify whether local air pollution can explain prevalence of particular diseases to the same region.

MARRYING EXPERTISE

The correlations between air pollution and poor health are well known but the mechanisms driving this relationship are less understood. Research teams in The School of Health Sciences in the Faculty of Biology, Medicine and Health are working with environmental modelers in the Faculty of Science and Engineering to better understand how environmental drivers impact pollution-specific health outcomes across the globe.

Prof Coe said; "Manchester is unique in that it can bring together expertise in different fields with unique facilities to conduct initial experiments to identify pollutants within an environment and then transfer this fundamental knowledge into a set of controlled health experiments that look at whether these pollutants link to diseases such as cancer, heart disease or lung disease."

CLIMATE CHANGE

Along with air pollution as a determinant of health outcomes, Professor Coe says that climate change, such as increases in humidity or temperature, could equally be mapped to health outcomes, saying;

"Globally we are seeing massive urbanisation which comes with a whole raft of health pressures that weren't there previously.

We need to develop our knowledge of the physical and chemical environment, in a way that health





researchers can comprehend; to allow them to understand the biological and physiological response to those changes.

Only then can we address the question: 'we want to make the environment healthier, so what do we really need to do beyond just reducing pollution?' There are plenty of sources of pollution and understanding which of these are most important and how they drive disease is essential for us to move beyond our current simple and broad brush approach to addressing air pollution problems.

We have not come close to scratching the interface between the environment and health and what that really means".

GLOBAL APPROACH

Joint working - combining expertise, capability and local knowledge - is vital to underpinning the development of regional solutions to the challenging air pollution problem.

The University of Manchester is currently working alongside Chinese scientists in Beijing, collaborating with Indian researchers in Delhi and participating in a variety of studies across South East Asia and Africa to address urban air quality across the globe.



Hugh Coe is Professor of Atmospheric Composition at The University of Manchester and Director of the Manchester Environmental Research Institute.

OUR GLOBAL FACULTY

OUR STAFF REPRESENT 2 OUT OF EVERY 3 COUNTRIES GLOBALLY.

NORTH AMERICA

Our strategic partnership with the University of Toronto and the University of Melbourne has led to the creation of the International Centre for Translational Digital Health where our research programme includes furthering the use of artificial intelligence in health data science, improving remote monitoring and virtual care, and advancing health data policy implementation.

OUR RESEARCH AND TEACHING PARTNERSHIPS ARE IN 1 OUT OF EVERY 5 COUNTRIES GLOBALLY.

AFRICA

In addition to our strategic partnership in Kenya, our research includes establishing and training a national pathology service in Zambia, understanding how yellow fever mosquitoes spread disease in Tanzania and improving the prevention and management of stillbirths and neonatal death in Zimbabwe.

SOUTH ASIA

Our research includes supporting health worker capacity and capability in Bangladesh, S investigating the genomics of rare developmental disorders in India, and investigating the impact of rising sea levels and the consequent increase in salinity of ground water on cardiovascular health of people living in low lying islands in the Indian ocean in Sri Lanka.

AUSTRALASIA

Our strategic partnerships with the Universities of Melbourne and Toronto has led to the creation of MMT-SEARCH (the Manchester Melbourne & Toronto - Synergy cEntre for cAncer ResearCH) which is understanding the evolution and trajectory of cancers of unmet need, using advanced materials and biomarkers in cancer early detection, and exploring the potential for Al and machine learning as applied to cancer.

OUR

4 OUT OF

COUNTRIES

GLOBALLY.

EVERY 5



UNDERSTANDING HEART DISEASE IN AFRICAN POPULATIONS

UNMET DIAGNOSTIC NEED IN AFRICA

Congenital Heart Disease (CHD) is a leading cause of childhood mortality and makes up one-third of all congenital birth defects globally.

Reduced diagnostic capacity and limited access to healthcare can substantially impact the reported birth prevalence of CHD. These factors can also delay diagnosis and treatment, meaning patients are often not seen until CHD is at an advanced stage when treatment is harder and outcomes are less favourable.

The prognosis for a child born with CHD in a LMIC is worse than in a high-income country. In 2019, our systematic review concluded that low prevalence rates of CHD in Africa did not provide a true picture of disease prevalence but, rather, were evidence of a severe unmet diagnostic need on the continent.

GENOMIC UNDERSTANDING

CHD research has traditionally focussed on European populations. It is therefore essential to document whether CHD occurs at the same rate in African populations and whether the range of CHD conditions encountered is similar. Furthermore, there is a need to evaluate genomic variations in the African population to discover CHD genes of importance to patients and families of African descent.

The University of Manchester and the University of Cape Town are collaborating in a project called PROTEA (PartneRships in cOngenital hearT disEase in Africa) which is attempting to address the knowledge gaps about CHD in African populations whilst also building research capacity and expertise in Cape Town and surrounding areas.

DEVELOPING DIAGNOSTIC TECHNIQUES FOR USE IN LOW RESOURCE SETTINGS

We worked with colleagues from Red Cross War Memorial Children's Hospital, Cape Town and used computational fluid dynamics (CFD) to develop a patient specific CFD pipeline which can be used in LMICs. CFD provides important diagnostic data by providing detailed insight into the forces acting on vessel walls due to blood flow. It can be used to assess potential procedures and the associated risk of complications. In high income countries CFD is already used routinely but often relies on high resolution magnetic resonance imaging (MRI).

Access to MRI is often limited or not possible in LMICs. Therefore we used other existing technologies (CT scans and Doppler echocardiography) which are more clinically available in these areas, along with open-source software to develop a clinically feasible and repeatable CFD pipeline for use within resource-constrained environments. Our pipeline is able to make use of cloud computing where computational resources are otherwise unavailable. If adopted, this pipeline will enable LMICs to benefit from the patient-specific diagnostic information and insights which CFD provides.

REDUCING THE KNOWLEDGE GAP

Through PROTEA, we have established a CHD Registry and Biorepository at Red Cross War Memorial Children's Hospital, Cape Town. By working with CHD volunteer families, we are investigating the genetic and molecular determinants of CHD in the region and are creating new knowledge about the genetics of CHD.



TRAINING TO BUILD CAPACITY

This work is also enabling the training of students and young scientists in South Africa in state-of-theart genomic medicine and bioinformatics, delivering high-value skills to our African research partners and building capacity for CHD research in the area by establishing expertise and a sustainable CHD research infrastructure at the University of Cape Town. The laboratory work is also all being done within South Africa to enhance local infrastructure.

IMPROVING ELECTRONIC RECORDS

Many African health centres have limited means to capture and store patient records electronically. We built the PROTEA database which, is both an electronic health record system and a clinical research electronic database meaning it has value as both a clinical and research tool. The database is now in use at Red Cross War Memorial Children's Hospital in Cape Town, and the Nelson Mandela Children's Hospital in Johannesburg, two of the major South African centres for the treatment of congenital heart disease.

Using the database improves the quality, detail and accessibility of clinical record-keeping which aids patient care planning. For example, patients who need to be fast tracked for procedures can easily be identified and contacted through information held in the database. The information is held securely and it can be easily used to give greater insight into mortalities and morbidities and related opportunities for learning.

ROLLING OUT TO OTHER AFRICAN COUNTRIES

The research database became operational in Namibia in early 2021 and is being used to facilitate research and clinical care at Windhoek Central Hospital. Plans are now in place to roll this out to two further African countries.



The research is being led by Bernard Keavney, Professor of Cardiovascular Medicine at The University of Manchester.

EXPLORING THE HEALTH OF GLOBAL GIG WORKERS

Gig working has exploded across the world in the last few years, fuelled by the effects of the COVID-19 pandemic and the growth of apps enabling people to access a variety of services online. However, such rapid growth has meant that the health and safety implications for gig workers themselves have not yet been fully explored. Research in this area has been taking place at The University of Manchester.

Gig workers are people who work in a freelance capacity as and when demand for their services requires it, such as couriers and drivers.

They do not hold traditional contracts with the companies they perform work for, as they are paid for each task they complete rather than for the amount of time worked, often working long or unconventional hours. There is often no line management and work is usually allocated via an app, the most well-known examples including Uber and Deliveroo.

MENTAL HEALTH AND WELLBEING

In the Faculty of Biology, Medicine and Health at Manchester, occupational health researchers Martie Van Tongeren and Hua Wei have been examining the impact of gig working on health and wellbeing in both the UK and China, a previously neglected area in terms of research.

The idea for their research, which involves both qualitative and quantitative methods, came on a trip to China, where there are thought to be around 84 million gig workers. It is also estimated that there were around 7.25 million gig workers in the UK as of the end of 2022, accounting for almost a quarter of the total UK workforce.

"Our qualitative work in China identified a number of areas that the couriers themselves linked to their health and wellbeing - work demands and the way that work is distributed," Martie explains.

Work-related stress can be significant for gig workers who are under pressure to complete tasks as quickly as possible. Combined with the impact of a work environment heavily oriented around customer feedback and the isolation of lone working, this pressure could lead to mental health problems and burnout - and potentially a desire to change jobs.

This can be further compounded by worries over pay and the rising cost of living, particularly if workers rely on gig working for a large proportion of their overall income.

"When the proportion of income coming from app-based work increases, then they feel more stress," Hua says.

The key thing to identify is whether the app-based nature of this work makes stress and burnout more likely.

"Obviously both app-based work and office-based work can provide stressful situations, but what we want to look at and research further is whether we can separate it out - can we identify whether there is something unique about the technology that increases the risk of burnout and stress? And we want to do that in the UK, China and other countries, because gig working is really a global phenomenon," Martie says.



WORKING GLOBALLY

The fact that the research is being undertaken in both the UK and China means that Martie and Hua are able to compare gig working and the effects it has on workers in both countries. Although the two cultures are very different, there may be things that the UK can learn from how gig working has impacted on health and wellbeing in China.

"Technology innovation is going a lot quicker in China in a way that it isn't in the UK," Hua says. "We can probably learn some lessons and prevent the health and safety issues that are happening there, here in the UK and globally."

The China-based research has involved collaboration with institutions such as Peking, Hong Kong and Beijing Normal universities, the National Center for Chronic and Noncommunicable Disease Control and Prevention, and China National Center for Occupational Safety and Health.

As well as this, Martie and Hua have been working with colleagues from across The University of Manchester, including data scientists and health and occupational psychologists.

"That is a real strength of Manchester, the fact that it is a large university that can bring together all these different disciplines that are really essential to target a complex issue like this," Martie says.

Hua adds: "It is a very supportive environment in terms of collaborative international projects."

DEVELOPING AN INTERVENTION

While Martie and Hua are still undertaking their research and are looking for opportunities to expand the scale of their work, they have one particular end point in mind for their activities: developing interventions to help gig workers combat the negative impact of their jobs on their health.

Ironically, such interventions could come in the form of an app or other technology.

"Interestingly, you are looking at the artificial intelligence (AI) and algorithms as a problem, but in a sense they may also inevitably lead to the solution for increasing occupational health support," Martie explains.

"It is an interesting part of the work: asking how we can limit the impact, and whether that same technology can be used to improve health and wellbeing."



Professor Martie Van Tongeren is a Professor of Occupational and Environmental Health.



Dr Hua Wei is a Research Associate in the School of Health Sciences at The University of Manchester.

INTERNATIONAL COLLABORATIONS

BUILDING A SUSTAINABLE HEALTHCARE WORKFORCE

AT A GLANCE

- The World Health Organisation estimates by 2030 there will be a deficit of 10 million healthcare workers across the globe.
- Low and lower-middle income countries face the worst shortage, especially in Africa and South East Asia.
- All countries face difficulties retaining their health workforce long term.

TEACHING EXCELLENCE

- We have national and international leaders in health professional education, prescribing safety, patient and public involvement in medical education, ethics and law applied to medicine, assessment in health professional education, and health psychology applied to health professional education and training.
- We have leading clinicians and clinical academics in a wide variety of specialties.
- We are active in the teaching and leadership of health professional education, as well as in educational research, publishing in broad areas including international health partnerships, clinical reasoning, differential attainment, medical careers and educational technology.

The University of Manchester is contributing to global efforts to increase the quality and quantity of health workers internationally, moving our partners and ourselves closer to the goals of universal health coverage for all.

SUPPORTING HEALTH WORKER DEVELOPMENT

With partner countries, we have a suite of activities to support the development of tomorrow's health workers to increase quality and quantity of these essential workers in the long term.

EGYPTIAN MEDICAL EDUCATION

To address the deficit in health workers in Africa and South East Asia, it is essential to build capability in these countries to train their own robust and flexible multi-professional work force.

A collaboration between Mansoura University, Egypt and The University of Manchester that began in 2006 is addressing this issue.

In partnering with Mansoura, the University of Manchester has helped to develop an international medical programme that has expanded from an intake of 97 to over 400 annually and has graduated over 2,500 students to date. The size of the programme has also allowed Mansoura to take students from nearby countries in crisis for little or no fee, ensuring that these countries have the healthcare work force they need to recover.

The first partnership of this kind in Egypt and the Middle East, the Mansoura-Manchester Medical Programme has adapted teaching and learning methods used in the UK for the Egyptian system, enhancing Mansoura's medical training programme and equipping students with the skills to be able practice as a doctor internationally. Internationalising the curriculum has also made the programme more attractive to overseas students who have taken advantage of a programme that enables them to either return to their home country to practice medicine or work elsewhere in the world.

Mansoura also has a reputation in Medical Education within the region, with many of their staff moving to other universities within Egypt and the Middle East to lead health professional education development. Since, Mansoura and UoM have developed a Mansoura-Manchester Dentistry Programme that graduated its first cohort of students in 2021.



CLINICAL PHARMACY IN CHINA

Clinical pharmacy is a relatively new profession in China but recent reform and development of China's medical and health services, has seen clinical pharmacists become an increasingly important part of modern medical teams.

Pharmacy professionals are taking on many more clinical responsibilities in healthcare settings. However, very few Chinese universities run Clinical Pharmacy programmes and the shortage of clinical pharmacists persists.

The World Health Organisation estimates by 2030 there will be a deficit of 10 million healthcare workers across the globe.

A teaching collaboration between The University of Manchester and China Pharmaceutical University (CPU) is enabling Chinese students to develop the skills they need to work in clinical pharmacy. Launched in 2021, the BSc Clinical Pharmacy course is a dual award programme for Chinese students and runs over five years.

Learners are taught at CPU in Years 1, 2 and 5 and attend classes in Manchester during Years 3 and 4. Staff at both institutions are working together to design the curriculum and deliver the content, with CPU teaching the foundations of pharmacy and Manchester offering advanced clinical pharmacy topics and skills.

MEDICAL EDUCATION IN SAUDI ARABIA

Modern medical careers require a large range of professional competencies that go beyond the traditional knowledge base of undergraduate medical degrees. There is a growing expectation globally that doctors will graduate with excellent skills in areas such as clinical communication and safe prescribing, and a wide knowledge base in topics such as behavioural and social sciences and ethics and law. These requirements can require substantial changes to medical curricula and assessments.

A teaching partnership between University of Manchester and Taibah University, Saudi Arabia enabled academic staff in Taibah to develop their knowledge and skills in these wider aspects of medical education.

Over six years, exchanges between the two universities enabled both a sharing of curriculum components and extensive staff development in areas necessary to deliver a variety of new components, including practical assessments, clinical communication teaching and an expanded biopsychosocial approach to prevention, diagnosis and management. The new curriculum successfully integrated these revisions whilst retaining the local social and cultural context for medical practice.

SUSTAINABLE CARE FOR DEPRESSION AND ANXIETY IN INDONESIA

Depression and anxiety are common mental health problems, affecting large numbers of people globally. In Indonesia, depression and anxiety affect 14 million people and has one of the highest rates of depression in South East Asia. Depression and anxiety are treatable but there is a shortage of trained professionals. Many people in Indonesia, and across the world, are not getting the help they need.

TALKING TREATMENTS

Talking treatments can help people with depression and anxiety to recover. They can be delivered by people without a mental health qualification and are recommended by the World Health Organisation for regions where mental health services are limited. Training lay workers to deliver talking treatments is cheaper and more feasible than training a smaller number of highly skilled professionals.



A team from The School of Nursing, Midwifery & Social Work led by Penny Bee, Professor of Applied Mental Health Research, are working directly with patients and professionals in Indonesia to understand their experiences of, and preferences for, receiving and delivering treatments, the team will use this information to culturally adapt talking treatments and produce locally relevant delivery plans.

A collaborative study in partnership with the Universitas Indonesia and the Ministry of Health, Indonesia, the team will talk to patients and professionals about their experiences of our intervention and explore the impact this has had on individuals, communities, and health service use.

The research will evaluate the cost of delivering the intervention and identify the geographical regions and patient groups that should be prioritised for future treatment roll out. They will also compare findings from different regions across Indonesia to help inform understanding of how best to support treatment availability and increase uptake in the longer term.

The new learnings from the study will help to improve the delivery of talking treatments across the globe, starting with a low-intensity psychological intervention that will be implemented across Java Island in 2024.

> Depression and anxiety are common mental health problems, affecting large numbers of people globally.

INFLUENCE AND IMPACT

CHANGING POLICY

We listen to the Ministries of Health in the countries we are partnering with to ensure that the research questions we ask are relevant to them and will make a difference to their populations, by informing healthcare policy changes in disease detection and treatment methodologies.



AT A GLANCE

- Developing a first national mental health policy for Pakistan.
- Designing an assessment tool to support refugees who are struggling with their mental health.
- Creating a global approach to the treatment of fungal infections.
- Transforming childhood leukaemia outcomes in India.
- Increasing awareness of infectious disease control in Madagascar.

WRITING PAKISTAN'S FIRST MENTAL HEALTH POLICY

University of Manchester researchers have drafted the first mental health policy for Pakistan which is being initially implemented in Sindh Province for its population of approximately 50 million people. Globally someone dies by suicide every 40 seconds and 80% of disease burden is felt in low- and middleincome countries.

Pakistan has one of the highest rates of depression including postnatal depression, and limited access to treatment.

Climate change is also having a major impact on Pakistan. Around 33 million people, including approximately 16 million children, were affected by the heavy monsoon rains in Pakistan in 2022 which has added to an existing mental health crisis.

DECRIMINALISATION BILL

Recognising the scale of the problem and in a bid to support mental health rehabilitation, a bill was passed in the Pakistan Senate in 2022 to decriminalise acts of self-harm and suicide, and eradicate stigma around mental illness. After the bill was passed, the President of Pakistan, Dr Arif Alvi approved the Criminal Laws Amendment Bill 2022 that abolished the suicide punishment law in the Pakistan Penal Code, officially decriminalising attempted suicide in Pakistan. Globally someone dies by suicide every 40 seconds and 80% of disease burden is felt in lower-middleincome countries.

SUICIDE PREVENTION

In a move to address the mental health challenge facing the country, a team from the University of Manchester's Global Mental Health Cultural Psychiatry Research Group, led by Nusrat Hussain, Professor of Psychiatry, were invited to meet with the National Assembly lead for UN Sustainable Development Goals along with the representatives from the Pakistan Institute of Living and Learning (PILL) to discuss a suicide prevention strategy for Pakistan.

Referencing the research group's South Asian Harm Reduction Movement (SAHAR-M) project, the meeting focussed on on understanding the causes of self-harm and suicidal behaviour in Pakistan and developing targeted programmes.

As a result, the research team from Manchester were asked to support the Pakistan Institute of Living and Learning (PILL) in developing and implementing the first mental health policy in Pakistan.



DEVOLVING POLICY

Health is a devolved service across Pakistan, controlled at the Provincial level, with decisions such as implementing a mental health policy decided by the Provincial Parliament.

In 2022, a delegation from University of Manchester and PILL attended meetings to look at policy formation across Pakistan. There the Sindh Minister for Health and Population Welfare not only decided to take the mental health policy forward, but also took the initiative to establish the 'Improving Access to Psychological Therapies (IAPT-PK)' programme to be delivered by PILL in collaboration with The University of Manchester, starting initially in the two districts of Sindh, Sukkur and Qambar Shahdadkot.

The Sindh Mental Health Policy and Implementation Plan also contains essential strategies to improve access to mental health care in Pakistan. It will incorporate telehealth to scale up mental health intervention, which will improve access to appropriate psychological support, especially in remote areas. It will play a vital role in levelling up access to mental health care across the country.

MENTAL HEALTH CARE

The World Health Organisation Mental Health Report of 2022 highlights the slow progress in reducing the treatment gap for people with mental illness worldwide since the earlier report of 2001.

"For most of the world, the approach to mental health care remains very much business as usual. And the result is that all over the world too many people living with mental health conditions are not getting the care they need and deserve".

To address this lack of progress, researchers at The University of Manchester, led by Vimal Sharma, Professor of Global Mental Health Research, have developed the Global Mental Health Assessment Tool (GMHAT).

GHMAT is a computerised clinical assessment tool, available in multiple languages, that helps healthcare professionals identify mental health problems in a variety of settings. It asks questions on a range of things such as participants worries, stressors, phobias and obsessions. It then produces a final assessment which outlines any mental health problems, scores against a range of mental health concerns, and an assessment of the severity of symptoms.

One setting where GMHAT has been used successfully is the assessment of Syrian refugees who have been accepted for resettlement in the UK. The majority of local authority caseworkers and healthcare practitioners felt that GMHAT is a useful tool for informing their actions and role in supporting resettled refugees. Many commented on the value of receiving information in advance about a refugee's mental health, given the limited information typically available and the time it can take to overcome barriers, such as trust and language on first arrival.

As a result, the Home Office along with the International Office of Migration (IOM) and Public Health England have integrated the assessment of mental health using GMHAT as a part of their overall pre-entrance health assessments. The tool is also having global impact, an example being its use by health care professionals who are working at the Indian Border Security Force. They are using GMHAT within their annual health check programmes to reduce mental health conditions and suicides within the Force.

TACKLING FUNGAL DISEASE

Over 1,000,000,000 people worldwide are affected by serious fungal disease, resulting in over 1,500,000 deaths annually. University of Manchester research has led an evidence-based global advocacy programme to address the lack of diagnostics and antifungal treatments, as well as inadequate clinical skills.

Led by Professor David Denning, Professor of Infectious Diseases and Global Health, the Global Action Fund for Fungal Infections (GAFFI) was set up in 2013 to mitigate the global impact of fungal diseases. As a result of their work, five antifungal drugs and eight diagnostics are now flagged by the WHO as 'Essential' and GAFFI has produced estimates of fungal diseases for 65 countries. Additionally, Guatemala and Nigeria have developed national clinical training programmes for HIV patients with life-threatening fungal infections which has resulted in improved clinical skills and saved the lives of these patients.



TRANSFORMING AUTISM TREATMENT

University of Manchester researchers led by Jonathan Green, Professor of Child and Adolescent Psychiatry, have developed a novel early childhood intervention for autism that sees health professionals working through parents rather than exclusively with the child. It is the first treatment to have achieved sustained improvement in autism symptom severity before and after diagnosis, whilst also improving parental well-being. Over 600 professionals in more than 21 countries have been trained to date and more than 80% with actual or planned implementation with multiple families. It has influenced policy guidance internationally and has been adapted and evidenced for low and medium income country settings. International survey evidence shows high acceptability, implementation and effectiveness.



STANDARDISING CANCER TREATMENT ACROSS INDIA

Researchers at The University of Manchester have formed a partnership with the Tata Medical Center (TMC) in Kolkata to help improve outcomes for children with acute lymphoblastic leukaemia (ALL) and their families. In children and teenagers, ALL is the most common type of leukaemia, accounting for 75% of all leukaemia diagnosed in these age groups. Children younger than 5 have the highest risk of ALL.

The partnership aims to increase survivorship through increased regional and national access to cancer care across the country. The first step was the creation of a dedicated paediatric cancer unit and a cancer research centre – the Tata Translational Cancer Research Centre (TTCRC). The centre opened in 2018 and is led by Vaskar Saha, Professor of Paediatric Oncology, and includes a cancer biorepository, a clinical trials unit and state-ofthe-art laboratories.

Since 2018 the TTCRC has connected with other centres across India to exchange knowledge and training, including the standardisation of protocols and sharing best practise in cancer prevention, detection and treatment.

This alignment of research and treatment – with clinicians and scientists working closely together to identify solutions for patients – is modelled on, a similar approach at Manchester.

The research has helped to:

- Establish a national hub of cancer centres and connect five major paediatric centres across India.
- Create a modernised cancer healthcare system.
- Standardise treatment for ALL and care, which has helped to treat more than 5,000 children.

IMPROVING INFECTION AWARENESS, PREVENTION AND TREATMENT

Many infectious diseases, such as parasitic worm infections, are preventable if there is awareness as to how they transmit. A lack of awareness and misunderstanding leads to stigma and avoidance of preventative measures. A team of University of Manchester researchers led by Sheena Cruikshank, Professor in Biomedical Sciences and Public Engagement, are studying parasites and have worked with diverse communities in the UK and Madagascar to share research findings and develop resources and toolkits to raise awareness, understanding and dialogue about infection. This has changed behaviour and attitudes, leading to greater confidence in treatments and adherence to preventative measures. This work led to a policy-change to start deworming treatment in Marolambo, Madagascar, enhancing uptake of treatment and reducing worm infection.



SUPPORTING THOSE IN NEED

AT A GLANCE

- In 2022, the UN estimated 103 million people were forcibly displaced globally.
- Causes include conflict, violence, human rights violations, persecution, disasters and the adverse effects of climate change.
- Maintaining and growing healthcare services are critical if nations are to recover.

Research and teaching staff in the Faculty of Biology, Medicine and Health are helping to maintain healthcare services in countries in crisis by:

- supporting universities in these countries to maintain their healthcare programmes.
- providing scholarships to students to train at the University of Manchester.
- enabling qualified professionals who have fled their home countries to maintain their skills within the NHS.

EDUCATION THROUGH WAR

The University of Manchester has twinned with the Ivan Horbachevsky Ternopil National Medical University (TNMU) in Western Ukraine to help maintain their healthcare programmes.

Previously, TNMU provided high quality professional medical and healthcare training to 7,000 students studying medicine, dentistry, pharmacy, nursing, paramedic science and public health. However, the war has placed pressure on academic staff numbers, as some academics and students from TNMU have joined the Ukrainian defence forces, whilst others are now teaching trauma management to civilians. To help stabilise the pipeline of desperately needed newly qualified doctors, dentists, pharmacists and nurses, Manchester will provide academic support and training to academic staff and will also be sharing teaching and learning materials. The partnership will enable the TNMU to maintain their medical and healthcare programme despite the war and build expertise through education.



THE RIGHT TO EDUCATION

The training and education of the next generation of healthcare professionals should not be affected by war. The University of Manchester is committed to supporting students through the Article 26 scholarship – named after Article 26 of the Universal Declaration of Human rights, 'Everyone has the right to Education'.

These scholarships are offered to students seeking asylum, those who are granted temporary leave to remain, or forced migrants as these students are often not eligible for UK government funded financial support so may struggle to cover the cost of education themselves.

The scholarship covers the full cost of an undergraduate course and a significant contribution towards living cost expenses. In addition to this, it provides a free place in our Halls of Residence for those who wish to stay in University accommodation.

Through this scheme, we have seen 16 scholarships awarded in 2022/23. Eight were awarded for FBMH related subjects and included biosciences, medical microbiology, clinical biochemistry, medical and molecular virology, biomedical science and clinical psychology. The students came to The University of Manchester from Myanmar, Syria and Ukraine.

EQUITY AND MERIT

Our Equity and Merit Scholarships assist talented but economically disadvantaged young professionals from some of the world's poorest countries in Africa to advance themselves and their wider society, whilst making a significant contribution towards addressing the UN's Sustainable Development Goals.

361 scholarships have been awarded since 2007 with alumni focussing on projects ranging from helping to improve palliative care through formulating public health policy in Rwanda to a programme focussing on ending malaria in East Africa.

SUPPORTING REFUGEES BACK INTO WORK

Medical and allied health professionals across The University of Manchester have been supporting refugee and asylum seeker doctors, nurses and allied health professionals into NHS employment for over 18 years to help maintain their skills.

Over 612 refugee and asylum seeker healthcare professionals have been supported though REACHE (Refugee and Asylum Seekers Centre for Healthcare Professionals Education) to register their qualifications in the UK and therefore have the chance to continue their professional practice employment within the NHS. REACHE has also created the first European network of organisations supporting refugee and asylum seeker doctors and healthcare workers in conjunction with Utrecht University in the Netherlands and other partners in Italy, Germany and Sweden.

MANCHESTER - THE FIRST INTERNATIONAL RESPONSE

UK-Med, the first UK based charity to be certified by the World Health Organization as an independent Emergency Medical Team, has its roots in Manchester. It was founded in 1995 by Tony Redmond, who was working as an accident and emergency consultant in Manchester at the time. UK-Med helps to co-ordinate responses to major humanitarian disasters worldwide, including the provision of vital medicines, co-ordinating clinical services and training of local healthcare staff.

The seeds for the charity were laid in 1988, when Tony, a registered specialist in emergency medicine, travelled to Armenia with a team of eight Manchester clinicians in the aftermath of a huge earthquake that had ripped through the north of the country, killing 60,000 people and destroying nearly half a million buildings. Since then UK-Med has been at the forefront of the UK's response to many crises, including the siege of Sarajevo in Bosnia and Herzegovina, the Ebola outbreak in Sierra Leone, the diphtheria outbreak in Bangladesh and Yemen, and more recently the war in Ukraine and the earthquake in Turkey and Syria, where they have set up clinics to treat the injured and displaced people.

UK-Med are often among the first responders when a disaster or outbreak hits and take with them the best of the NHS and UK healthcare across the world.

SPOTLIGHT ON KENYA

We are proud of our partnerships in Kenya which show how our Faculties are working together to address the challenges identified by the World Health Organisation, addressing the workforce deficit and increasing understanding of NCDs in non European populations.

With Kenyan colleagues, we are seeking to co-produce solutions that meet some of the biggest global healthcare challenges.

TRANSFORMING CANCER HEALTHCARE

The University of Manchester has partnered with the Ministry of Health, Kenya to help uplift the standard of healthcare, initially focusing on

improving cancer outcomes through early detection, rapid diagnosis and the delivery of high quality care.

The Kenya UK Healthcare Alliance (KUKHA) is focused on creating a resilient healthcare system in Kenya that can cope with the changing disease burden in the country from infectious to non-communicable diseases, including cancer, mental health and cardiovascular diseases.

with Universal Health Coverage.

"This oesophageal cancer study will go a long way in establishing ways that will tilt the balance to oesophageal cancer being detected at the potentially curative stages 1 and 2 rather than the late stages 3 and 4. This will be a game changer in diagnosis and management of the disease".

Professor F. George Njoroge, Chief Scientific Officer at Kenyatta University Teaching, Referral and Research Hospital (KUTRRH).

OESOPHAGEAL CANCER

A groundbreaking initiative by Manchester and Kenyan researchers is bringing world leading oesophageal cancer early detection and research to Kenya.

CANCER AT A GLANCE

- There has been a 29% increase in new cancer cases annually from 37,000 to 47,887 from 2012 to 2018.
- Annual mortality has increased from 28,500 to 32,987.
- 7/10 cancers were diagnosed late, resulting in some cancers (such as oesophageal cancer) having mortality rates of more than 99%.

A unique partnership between The University of Manchester, The Christie NHS Foundation Trust, and Kenyatta University Teaching, Referral and Research Hospital (KUTRRH) will raise awareness of squamous cell carcinoma of the oesophagus (OSCC) in Kenya and increase engagement in public screening opportunities using mobile detection units that travel across the country.

The funding will help establish a central cancer specialist 'hub' at KUTRRH in the capital Nairobi, which will support local cancer care delivery 'spokes' in five regional counties: Meru, Kiambu, Kisii, Nakuru, and Nyeri.

The International Agency for Research in Cancer found that oesophageal cancer is the third most common cancer in Kenya and the most lethal. 99% of patients die from their disease within 5 years, with the poor prognosis being directly related to patients with OSCCbeing diagnosed too late when they have advanced, incurable disease. This initiative will establish early detection as a part of the Kenyan healthcare system by training healthcare workers to recognise early symptoms of OSCC. It will co-train Kenyan clinicians and healthcare workers in Manchester and provide continuous, bespoke training in state of the art cancer diagnosis and molecular pathology. The initial trainees, who travel to Manchester, will become the future trainers, cancer researchers and carers.

Using next generation genetic and cell biology approaches, tissue samples taken for patient diagnosis will undergo sophisticated molecular pathology studies to document the abnormal cancer genes and proteins that drive the initial growth, unique biology and aggression of Kenyan OSCC cancers.

The genetic results will be obtained from all 5 Kenyan counties and matched with clinical data and county level information to try to understand the differences which cause the variable rates of OSCC seen across Kenya. Importantly, these results will also help to identify Kenyans at greatest risk of OSCC.



Associated with the increased incidence, there is an increase in the morbidity burden associated with cancer. Consequently, developing a comprehensive cancer care service is an essential part of Kenya delivering on its Vision 2030, which aims to transform Kenya into an industrialized middle-income country

THE RISK OF INFECTIOUS DISEASES IN KENYA

Zoonotic diseases (those that spread from animals to humans) are responsible for pandemics and present significant global challenges to human and animal health.

These diseases can cause economic hardship for local communities and potentially conservation crises. Although most emerging disease transmission is from wildlife to livestock, domestic animals also pose risks to wildlife.

The Laikipia Plateau in Kenya is home to a mix of nature conservancies, community pastoral group ranches and commercial livestock properties. Its livestock numbers, particularly goats, sheep and donkeys, are increasing and mixing with wildlife, which could lead to changes in disease prevalence.

Our research focuses on how these interactions between wildlife, livestock and humans affect the risk of disease in Laikipia. So far, our researchers have identified high infection levels in livestock and wildlife associated with drought and sharing limited water sources. The research is used to inform communities about transmission risk and water management.

INFLUENCE AND IMPACT

REDUCING INEQUALITIES IN CANCER TUMOUR GENETIC SCREENING

This project collected and analysed cancer tumours from Nigerian, Kenyan and South African populations, revealing substantial differences in genetics between different ethnic groups that were previously unknown. This work is progressing personalised medicine tailored to people with different ethnicities and will help improve their health outcomes following a cancer diagnosis.

KAƘAMEGA KISUMU

VISII

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NYERI

PREVENTING STILLBIRTHS

The National Institute for Health Research (NIHR) Global Health Research Group on Stillbirth Prevention and Management in Africa, based at the University, worked with the Lugina Africa Midwives Research Network (LAMRN) to improve outcomes for parents and children across Kenya, Malawi, Uganda, Tanzania, Zambia and Zimbabwe. The partnership brought together LAMRN's extensive maternity care experience in low-income countries with leading stillbirth prevention research from across the UK, where the stillbirth rate is less than five per thousand live births.

IMPROVING CERVICAL CANCER TREATMENT

Cervical cancer is caused by infection with high-risk forms of the human papillomavirus (HPV). It has a high mortality in LMICs where HPV vaccines are expensive, there are no screening programs and limited surgical facilities.

Researchers at The University of Manchester discovered a drug that could provide a simple, non-surgical treatment alternative for women with early-stage cervical cancer in developing countries.

The team revealed the potential of lopinavir – a commonlyused HIV drug – to treat cervical cancer. Tests carried out on cell cultures indicated that repurposing the drug as a topical, self-applied treatment for early-stage HPV-related cervical disease could prove successful.

This showed efficacy against HPV infection and all grades of dysplasia. All women followed up were disease-free one year later. Adoption of clinical practices from this trial, and recommendations from another UoM study on survival of Kenyan women with advanced cervical cancer, has improved disease management in Nairobi by providing specialist training for healthcare staff, free screening and treatment for more than 3,000 women and reduced waiting times.

LIMITING CORONAVIRUS SPREAD

Our researchers helped to limit the spread of coronavirus – including assessing the effectiveness of bespoke locally sourced face masks in reducing COVID-19 transmission within informal settlements. The research looked into how non-medical interventions can effectively limit the spread of COVID-19 in places where conventional approaches to mitigating diseases are particularly challenging.

MOMBASA



CO- PRODUCING SOLUTIONS FOR AFRICAN CITIES

Many residents in African cities face challenges relating to health and wellbeing, along with marginalisation or exclusion in accessing healthcare, especially those living in poverty.

In Mukuru, Nairobi, a coalition of local residents has long worked with external researchers and urban experts to engage local authorities - pushing forward essential upgrades for services and infrastructure. Poor access to clean water, sanitation and affordable quality health services, as well as malnutrition, have made many people living in African cities - particularly in informal settlements - vulnerable to communicable diseases such as malaria and tuberculosis.

Largely coordinated by Muungano wa Wanavijiji, a social movement of Kenya's low-income urban communities, the coalition successfully established a Special Planning Area. They prepared an Integrated Development Plan for Mukuru as part of this, designed to improve the lives of the 100,000 households. This precedent-setting partnership for upgrading informal settlements at scale has established plans for the provision of water and sanitation, roads and drainage, and electrification.

Led by The University of Manchester's African Cities Research Consortium (ACRC), ACRC comprises research institutions, policy think tanks, civil society organisations and community-based researchers with a long history of helping to understand, facilitate and create positive change for African urban residents. They prepared an Integrated Development Plan for Mukuru to improve the lives of the 100,000 households.

A WORKFORCE EXCHANGE PROGRAMME

To provide a broader understanding of the needs and imperatives of the different health systems in Kenya and the UK, a number of Fellowships have been awarded to support Kenyan healthcare professionals complete a short period of in service training in Manchester covering a range of specialisms from surgery to pathology. The Fellows will gain experience and insight of the system in Manchester to then take back to Kenya and implement relevant learnings into the Kenyan healthcare system to improve patient outcomes. There will also be a number of travel awards funded by Health Education England to allow UK healthcare professionals to complete a period of training in Kenya and bring insights back and which will help inform practice in the UK.



LOOKING FORWARD TO OUR THIRD CENTURY

As we prepare to close the chapter on our second century, two things strike us. Firstly, the warnings of Dr Tedros Adhanom Ghebreyesus, the Director General of the World Health Organisation (WHO), that 'Non-communicable diseases are becoming an issue of equity. They disproportionately affect LMICs, and in all countries the poorest and most vulnerable.' Secondly, the WHO predictions of a deficit of 10 million healthcare workers globally by 2030, 42% of which will be in Africa and a further 32% in South East Asia.

Tackling these challenges will require a holistic approach from the University. It will see colleagues from across our three Faculties working together to improve health globally, using expertise in housing, urban planning, health policy, health economics, climate change, pollution, water, agriculture and nutrition, noncommunicable diseases, workforce training, behaviour change and implementation science to tackle individual problems. This 'One Manchester' approach will also draw on expertise from our local NHS Trusts.

GLOBAL PARTNERSHIPS

We are forging research partnerships with like-minded global universities and hospitals that are working with their Ministries of Health to understand the causes of non-communicable diseases in different ethnic groups, develop the personalised therapies needed for these patient groups, and change health policies.

Our work in Kenya looking at the early detection and causes of oesophageal cancer and in Indonesia at the use of cognitive behavioural therapy or talking therapies to improve mental health are two great examples of this type of partnership that are yielding outcomes that are changing lives. We are now looking to build on these to identify a handful of long-term close partnerships. Comparing the outcomes of these partnerships could be very powerful and would represent a truly global approach to understanding non-communicable diseases. We are also working with partners to establish a handful of centres of excellence in healthcare education and training around the globe that will produce the resilient and flexible multi-professional workforce needed to combat the rising tide of noncommunicable diseases. Importantly, these centres will be led by our partners to ensure that training capacity is built in LMICs where it is needed most.

We have already established one hub with Mansoura University in Egypt, we have started a second with Alexandria University and we will soon start a third with Kisii University in western Kenya. We are looking to establish a few more centres over the coming years. These centres will train the next generation of nurses, doctors, dentists and pharmacists, using modern educational and pedagogical approaches, to have the skills to provide patient-centred healthcare for non-communicable diseases in the community. This will also help to reduce health tourism, maintaining family structures and economic activity within a patient's own community.

We will learn much from these partnerships. Whether it is understanding the fundamental differences in the basic biology of non-communicable diseases in different populations, learning how to better treat the diaspora populations in our own global city of Manchester, finding practical solutions to climate change, pollution and urban planning to reduce their impact on human health, or understanding how to make a truly global healthcare curriculum.

Our third century is nearly here and it looks bright and truly global.



Professor Keith Brennan Vice Dean for Internationalisation, Faculty of Biology, Medicine & Health.





FIND OUT MORE

For more information about our global work, please visit: www.bmh.manchester.ac.uk/connect/global-health/

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