Cambridge Global Challenges

Strategic Research Initiative

Old Divinity School, St John's College

2018 Annual Conference

About Us

Cambridge Global Challenges (**CGC**) is the Strategic Research Initiative (SRI) of the University of Cambridge that enhances the contribution of the University's research towards addressing global challenges and achieving the Sustainable Development Goals (SDGs) by 2030.

CGC was co-founded by University of Cambridge researchers and by the Centre for Global Equality (**CGE**). This partnership facilitates access to relevant civil society practitioners in the developing world, and mechanisms for the R&D and diffusion processes often required to ensure that research achieves the intended impact, but that are beyond the academic remit.

About the Conference

The Cambridge Global Challenges Annual Conference 2018 will bring together the University of Cambridge's global challenges community contributing to the United Nations' Sustainable Development Goals (**SDGs)** and highlight ongoing and emerging:

- **research themes** across the University
- **collaboration opportunities** with researchers and implementation partners in Official Development Assistance (ODA)- target countries
- **funding opportunities** that support research contributing to the SDGs in developing world contexts

The 2018 conference focuses on **three central aspects** of research addressing global challenges and achieving the **SDGs** by 2030**:**

- **interdisciplinary research** for**,**
- **co-creation** with and
- **implementation** in

Official Development Assistance (ODA)'s countries.

Conference Program – Morning I

09.00 – Registration

09.30 – Opening Remarks

- **David Good**, Director of Research of the Cambridge Global Challenges (CGC) Strategic Research Initiative (SRI)
- **Gunilla Carrlson**, UNAIDS Deputy Executive Director, Management and Governance, and Assistant Secretary-General of the United Nations

10.00 – Session 1: Interdisciplinary research for challenges faced by ODA-target countries

Collaboration between Science, Technology, Engineering and Mathematics (STEM) and from Arts, Humanities and Social Sciences (AHSS) disciplines in research that contributes to the SDGs in ODA-target countries.

Chair: Carol Brayne

- 10.00: Managing tropical agricultural ecosystems for resistance and recovery of ecosystem processes – **Edgar Turner**
- 10.10: Africa's Voices Foundation: Representing citizens at scale – **Luke Church** and Sharath Srinivasan
- 10.20: Global Energy Nexus in Urban Settlements (GENUS) – **Minna Sunikka-Blank, Ruth Massey,** Charlotte Lemanski, Ruchi Choudhary and Jaideep Prabhu
- 10.30: Transforming India's Green Revolution by Research (TIGR^{2}ESS) – **Howard Griffiths**
- 10:40: **Erwin Reisner**
- 10:45: The IHAT-GUT trial in The Gambia: beyond clinical discovery – **Dora Pereira**
- 10:50: The Centre for the Study of Global Human Movement – **Tugba Basara**, Madeleine Arnot and Loraine Gelsthorpe

10:55: Questions and discussion

11.15 – Coffee Break

Conference Program – Morning II

11.45 – Session 2: Flash talks
Chair: Alan Blackwell

- A systems approach to Traumatic Brain Injury (TBI) in Myanmar – **Tom Bashford**
- Scheherazade Speaks Science: communication for higher female visibility in STEMM – **Ghina Halabi**
- Understanding the linkages between mother's empowerment through a grassroots microfinance programme and daughters' education in rural India – **Rebecca Gordon**
- Modeling the impact of cyclones in the South Pacific – **Krittika DSilva**
- FibroScHot: A multidisciplinary programme investigating causes and control of schistosomiasis in Uganda – **Shona Wilson**
- Designing our Tomorrow - Thinking Tools for a Complex World – **Melanie Smith**
- Re-thinking biosensors for low-resources settings – **Cassi Henderson**
- Exploring natural capital within and outside academic research – **Yuan Pan**
- Assessing the impact of a sugar-sweetened beverage tax: lessons learnt from the small island developing state of Barbados – **Miriam Alvarado**
- GCConnect: connecting developmental problems with solutions – goo.gl/SLonf7 – **Christopher Proctor,** Johnny Habchi and Pietro Sormanni
- Southern urbanism(s) and the Goal 11: building inclusive cities and communities – **Giulia Torino** and Shreyashi Dasgupta
- DEPLOY - 'Diagnostics to Empower Pathogen-detection in a LOw-income CountrY' – **Luke Meredith**
- Bridging the gap: crossing the academic boundary to build global partnerships – **Catherine Hasted**
- Opportunities to make a difference in the Off-grid solar market in Tanzania – **Arfa Karani**
- One Health and accelerating Vaccines for Ebola and Lassa (OVEL) – **Simon Frost, Rebecca Kinsley** and Jonathan Heeney
- The determinants of diet and physical activity in Africa and the Caribbean: a scoping review – **Eleanor Turner-Moss**

12.45 – Lunch and Poster Session

Conference Program – Afternoon I

14.00 – Session 3: Co-creation for challenges faced by ODA-target countries

Research jointly conducted by Cambridge researchers and researchers and implementers in ODA-target countries contributing to the SDGs in these countries.

- 14.00: Cambridge Alliance to Protect Bangladesh from Long-term Environmental Hazards (CAPABLE) – **Emanuele Di Angelantonio,** Rajiv Chowdhury and John Danesh
- 14.10: Heritage Matters: Culture and Development in the Pacific Museums – **TBC** and Nicholas Thomas
- 14:20: – The Co-creation of Methods to Assess the Impact of Community Food Production on the Risk of Non-communic-able Diseases, Social and Economic Wellbeing and the Environment – **Nigel Unwin** on behalf of the Community Food and Health (CFaH) Project
- 14:30: Open-source hardware for Official Development Assistance countries – **Alex Patto** and Jeremy Baumberg
- 14:35: LCVD: Low-cost Cell-extract Viral Diagnostics – **TBC** and James Ajioka
- 14:40: Experiences in scientific collaboration and education in developing countries: malaria diagnostics and basic science – **Pietro Cicuta**
- 14:45: Targeting virus transmission in a vital crop for African food security – **John Carr**
- 14:50: Equity and the sustainable development agenda: evidence from the African Education Research Database – **Rafael Mitchell, Samuel Asare** and Pauline Rose
- 14:55: Clean fuel switch: piloting biogas for multiple SDG benefits – **Jake Reynolds**.

15:00: Questions and discussion

15.15 – Coffee Break and Poster Session

Conference Program – Afternoon II

15.45 – Session 4: Implementation of research for the SDGs in ODA-target countries
Chair: Lara Allen, Director of Impact and Implementation of the Cambridge Global Challenges (CGC) Strategic Research Initiative (SRI)

- 15:55: Utilisation of field deployable genomics as part of epidemic response – **Ian Goodfellow**
- 16:05: Operational excellence for disaster management – **Tariq Masood**
- 16:15: BUGALERT: Pest and Disease Monitoring in Greenhouses in Kenya – **Eiko Yoneki**
- 16:20: (Re-)decentralisation of communications systems for fun and societal profit – **Jon Crowcroft**
- 16:25: Building sustainable projects towards sustainable health solutions for Uganda – **Rosalind Parkes-Ratanshi** and Carol Brayne
- 16:30: Towards an Integrated Global Transport and Health Assessment Tool (TIGTHAT) – **Rahul Goel** and James Woodcock

16:35: Questions and discussion

16.45 – Closing Remarks

- **Alan Blackwell,** Director of Research of the Cambridge Global Challenges (CGC) Strategic Research Initiative (SRI)
- **Stephen Toope**, University of Cambridge Vice-Chancellor

For future training, collaboration and funding opportunities, as well as news and events related to emerging research themes please visit the Cambridge Global Challenges website.

https://www.gci.cam.ac.uk

Session 1 – Interdisciplinary research for challenges faced by ODA-target countries

Edgar Turner

Managing tropical agricultural ecosystems for resistance and recovery of ecosystem processes

Palm oil is now the number one source of vegetable oil worldwide, with production currently focussed in Southeast Asia, where it is crucial for the economy of the countries involved. However, palm oil cultivation has been linked to severe deforestation and biodiversity loss in the region and there is a growing demand for the development of more-sustainable management practices. Management for higher biodiversity within the oil palm ecosystem itself, may also be advantageous for production and for buffering the crop from environmental changes, as this can provide a wider range of species supporting important ecosystem processes, such as pest control.

Using data from a long-term, large-scale experimental project (the Biodiversity and Ecosystem Function in Tropical Agriculture Project), based in Riau, Indonesia, we will assess the potential of different understory management strategies within oil palm to increase the abundance and diversity of key groups of animals. We will also assess the impacts of a recent El Niño Southern Oscillation (ENSO) related drought, which affected oil palm cultivation in the region. Our findings show that a wide range of species benefit from management practices that encourage a higher level of complexity within oil palm, but that many of these are also negatively affected by drought. We will discuss our results from the point of view of increasing the biodiversity and resilience of highly productive tropical ecosystems.

Luke Church, Sharath Srinivasan

Africa's Voices Foundation: Representing citizens at scale

In any emergency health or humanitarian intervention in the context of a developing country there is interpretive work to be done translating the complex realities of rapidly changing circumstances on the ground into evidence that can be acted upon. Extractive social science places the burden of this translation on the participant by shaping what they can express via the research instrument. This often seeks reductive generalisability from the 'what' of human knowledge and behaviour rather than the 'why'. Assumptions are then made concerning the stability and predictability of knowledge obtained. This approach has been found wanting in examples such as the use of Knowledge, Attitude and Practice (KAP) surveys in public health crises, or poorly sampled perception surveys in fragile and conflict affected settings.

AVF takes a different approach: engaging the citizens in a meaningful, free text conversation that they value, and placing the burden of interpretation on our researchers. We use technology to make it possible to apply this approach at scale and with speed by augmenting our researchers capability to interpret these conversations.

Making this all work is a deep interdisciplinary problem. We relying on domain expertise, social science theory and methods, interactive radio production, machine learning, human computer interaction and systems research.

In this talk we will outline an example case study and highlight design lessons that we suggest might apply elsewhere.

Minna Sunikka-Blank, Ruth Massey, Charlotte Lemanski, Ruchi Choudhary and Jaideep Prabhu

Global Energy Nexus in Urban Settlements (GENUS)

GENUS is an active research network that spans four departments in Cambridge (Geography, Engineering, Architecture and the Judge Business School) and three Schools. The group has two core aims: 1) Conducting research on sustainable and innovative forms of energy for urban dwellers, and 2) Implementing an interdisciplinary approach to research that both values and critiques disciplinary difference.

Our work responds to widespread knowledge that the world faces an energy crisis. This is particularly acute in both the existing and emerging urban areas of Africa and Asia. Recognising that existing academic and policy debates on urban energy largely focus on city-scale responses to climate change, this research group targets the consumer side of reliable and clean energy provision, in particular the energy demands of low income urban households. Methodologically the research group adopts an integrated socio-technical approach that recognises the technology of energy as embedded in social relations, and implements this approach by combining expertise from the physical and social sciences.

GENUS research network is currently working on two on-going research projects funded by the British Academy: 1) Gender and household energy: female participation in designing domestic energy in India's slum rehabilitation housing (2018-19), and 2) Energy innovation for low-cost housing in India and South Africa: strategies for inter-disciplinary and cross-institutional dialogue (2017-19). Our local collaborators include NGOs (e.g. Doctors For You), policy makers (Mumbai Metropolitan Region Development Authority) as well as academics (Indian Institute of Technology Bombay, Indian Institute for Human Settlements, University of Cape Town). GENUS is a CRASSH (Centre for Research in the Arts, Social Sciences and Humanities) funded Research Network and hosts interdisciplinary reading groups and open access research seminars at CRASSH.

Howard Griffiths

Transforming India's Green Revolution by Research (TIGR^{2}ESS)

TIGR^{2}ESS will define the requirements for a second Green Revolution in India, set the necessary policy agenda, and engage an extensive network of academic stakeholders, NGOs and industrial partnerships to deliver the requirements for it to become a reality.

At its core is a research programme focused on how to attain sustainable crop production and resource use in different regions of India, with a particular emphasis on water use. The challenge will be contextualised within the widespread changes taking

place in Indian society today, aiming towards a realistic outcome that is both technically and socially acceptable.

TIGR^{2}ESS involves three key components:

1) Themed, interlinked research projects to address fundamental questions relating to crop productivity and water use in India, and identify appropriate crops and farming practices for different climatic regions. Research will also define the policy requirements for a second Green Revolution;

2) Capacity-building exchanges, enabling leading researchers from India and the UK to work together in framing collaborative research, and junior researchers to access training and skills development opportunities in areas across the research programme;

3) Training workshops, on-farm demonstrations, and education programmes for communities in rural India, to promote engagement and stimulate entrepreneurship, and empower the next generation of female farmers.

The IHAT-GUT trial in The Gambia: beyond clinical discovery
Dora Pereira

Iron deficiency anaemia (IDA) is the largest nutritional deficiency disorder worldwide and one of the 5 leading causes of global disease burden. In spite of many successes, IDA remains the leading cause for years lived with disability (YLDs) in low-middle income countries, and it is clear that more needs to be done to eliminate this form of malnutrition in resource-poor settings.

One challenge has been the fact that it is not trivial to replenish body iron levels in populations with high infection or inflammation burden. Iron nutrition is closely interlinked with innate immunity and hypoferraemia is a primitive defensive mechanism in humans which evolved to minimise iron availability to pathogens. This means that iron bioavailability is low in those with infection or inflammation.

The second challenge is that iron deficiency and anaemia are protective against malaria and other co-infections and unsupervised iron supplementation programmes can remove this protection. Equally, unabsorbed 'free' iron in the colon is a major modulator of the gut microbiome and of enteric infection risk. In the IHAT-Gut trial we explore the compromise between iron bioavailability to the human host and iron bio-accessibility to pathogens.

My talk will briefly highlight the many challenges we face day-to-day in this rural setting and why I believe it is our responsibility to look beyond scientific discovery and to add social value to clinical research to build a legacy for development and sustainability.

I will introduce a qualitative study ancillary to the clinical trial named 'a day in the life of the IHAT-GUT trial', where qualitative methods were employed to determine the perceived barriers and facilitators of such trial in rural West Africa.

The IHAT-Gut trial is a collaboration between the University of Cambridge and the MRC Unit The Gambia at LSHTM, and is funded by the Bill and Melinda Gates Foundation Grand Challenges New Interventions in Global Health.

Tugba Basara, Madeleine Arnot, Loraine Gelsthorpe

The Centre for the Study of Global Human Movement

The creation of *the Centre for the Study of Global Human Movement* is a response to the importance of movement as one of the greatest achievements and challenges of the 21st century. Hereby, human movement is not limited to the circulation of people, but extends to the sedimentation and circulation of knowledge, moralities and artifacts. To this end, the Centre promotes collaboration among the arts, humanities, social sciences, natural sciences and technologies. Movement and migration are an integral part of the Sustainable Development Goals, central to target 10.7 (facilitate orderly, safe and responsible migration and mobility of people), but also significant for a number of SDGs related to mobility, migration and integration, such as SDG 3 on health, SDG 4 on education and SDG 8 on decent work. This presentation will focus on current interdisciplinary research at the Centre, underline key initiatives related to the SDGs and ODA countries, and conclude with the challenges faced in furthering research, interdisciplinarity and partnerships (https://www.humanmovement.cam.ac.uk/).

Session 2 – Flash talks

Tom Bashford

A systems approach to Traumatic Brain Injury (TBI) in Myanmar

"Traumatic Brain Injury (TBI) affects over 50 million people per year, with the greatest burden of this disease affecting low and middle income countries (LMICs). It is a heterogeneous pathology which is difficult to manage and can have devastating effects for both the sufferer and their social support network. Improving TBI care in LMICs is challenging: it sits within a complex, integrated, health system consisting of people, equipment, processes, institutions, and culture. Consequently, change in any given area may have unpredictable and far-reaching effects.

Myanmar is an LMIC which exemplifies the global challenge of TBI. It has seen an exponential rise in the use of motorcars in the past five years, with a concomitant rise in the prevalence of TBI. However, TBI care remains underfunded and fragmented, with poor clinical outcomes. To help address this, Myanmar has a become member of the newly established NIHR Global Health Research Group on Neurotrauma, an international group of clinical academics coordinated through the University of Cambridge who are working to improve the understanding and provision of TBI care in resource poor environments.

Improving TBI care requires a systems approach, necessitating a deep understanding of the people involved in care: their experiences, their interactions, and their insight. Improving care as part of an institutional health partnership requires that this understanding be equally shared by partners from both the low and high income (HIC) institutions. Our research in Myanmar uses Soft Systems Methodology as an embedded participatory approach, rooted in Systems Engineering, to explore the different views of the stakeholders involved and use them to create systems models which can in turn be used to co-design, risk-assess, and co-create improvement initiatives. Qualitative interviews, carried out by local clinical researchers, provide the

primary data along with sketches, images, and formal diagramming tools. The shared learning between the HIC and LMIC research partners is developed as systems models are proposed and refined, with ultimate discussion as to potential areas for improvement based on this shared understanding. Published pilot data has demonstrated the potential for this methodology, and the research is currently ongoing.

Ghina Halabi

Scheherazade Speaks Science: communication for higher female visibility in STEMM

In the tales of One Thousand and One Nights, Scheherazade the storyteller saves herself and other women from execution by telling king Shahrayar engaging stories. In the 21st century, by telling the public about her science, she will save herself and other women from inequality, bias and under-representation.

Scheherazade Speaks Science is a science communication platform that uses storytelling to make science engaging, accessible and inclusive. It provides voice, community and agency to diverse female scientists by soliciting and narrating their science thus facilitating their recognition and visibility through which gender equality (SDG5) can be achieved.

The published science necessarily has a social dimension and engaging narrative so that the public can relate to it. On a longer time-scale, the platform will offer mentorship and capacity-building workshops to provide girls with diverse female role models they can identify with.

Rebecca Gordon

Understanding the linkages between mother's empowerment through a grassroots microfinance programme and daughters' education in rural India

My research focuses on the work of a grassroots microfinance organisation, Rojiroti, in rural Bihar, India. The debate between researchers and practitioners about both the purpose of microfinance and its supposed impacts continue (Duflo & Karlan, 2009; Easterly, 2010), including both a critique of its 'neoliberal' agenda and a feminist criticism of approaches that rely on women and girls to solve world poverty (Chant, 2016). However, Rojiroti is a grassroots organisation which has observed the microfinance movement and adapted practices to their own context. The organisation is unique in the way in which they operate, due to supporting women members to facilitate groups themselves and a focus on providing loans in a supportive environment that works for its members; previous research has found that the organisation has had a positive impact on indicators of empowerment for its women members, such as a reduction in domestic violence, in line with the aims of SDG 5 (Gordon, 2016; Yaron et al, 2018).

This current study uses mixed methods research and aims to link previous findings to SDG 4, the provision of quality education, to explore whether this organisation has had an impact on girls' education, and if so, how. It additionally focuses on what unique aspects of Rojiroti have enabled positive impacts on its members, where other research on microfinance has proved predominantly inconclusive.

Preliminary findings have found that there has been a positive impact on educational spending for the children of women members. Focus group discussions and one-on-one interviews have also highlighted a change in aspirations for girls' education due to group meetings and skill development through group membership, and recognition of women group leaders as being role models for education. This is accompanied by the feasibility to support education financially due to flexibility in loans available and emergency loan provision to protect against income shocks.

Krittika DSilva

Modeling the impact of cyclones in the South Pacific

I am a PhD student in the Department of Computer Science and also work for the United Nations Global Pulse team in Jakarta, Indonesia which focuses on using big data to inform policy and make decisions. I work on modeling patterns of behavior after natural disasters to quantify the impact of the disaster, measure resilience of different communities, and gain insights for future relief efforts. This work relates to SDG 13, Sustainable Cities and Communities.

My research focuses on using Call Data Records (CDR) to model the impact of cyclones in the South Pacific, specifically Cyclone Gita which hit Samoa and Tonga in 2018 and Cyclone Donna which hit Vanuatu in 2017. With the global proliferation of mobile phones and the datasets that have been in turn generated, these fine-grained representations of national movement can enabled a deep understanding of the impact of natural disasters. As the CDR data logs calls and texts between different anonymous users, this data can be used to build a social network. We work with CDR data from users before, during, and after each cyclone and examine and analyze the changes in the mobility and sociability of individuals. We see significant changes in the social connection of users immediately after the cyclone; users tend to connect with a smaller subset of their network but are however much more closely connected to individuals in this smaller network. We also show that measuring the amount of time it takes the social network of an area to return its characteristics prior to the disaster can act as a measure of the resilience of the area. The insights from our analysis and models can help future disaster relief efforts in these countries.

Shona Wilson

FibroScHot: A multidisciplinary programme investigating causes and control of schistosomiasis in Uganda

Intestinal schistosomiasis is a devastating parasitic infection, highly prevalent within sub-Saharan Africa, particularly in poor, rural areas. Caused by the trematode Schistosoma mansoni it is characterised in its severest form by fibrosis of the liver and accompanying portal hypertension. Since 2000 and the Millennium Development Goals, mass drug administration programmes have been developed and initiated, and huge steps forward in the control of this neglected tropical disease have been made. However, its control, along with that of other neglected tropical diseases has been specifically passed forward into Sustainable Development Goal 3, target 3, "By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases

and combat hepatitis, water-borne diseases and other communicable diseases"; highlighting that this infection has proven to be a particularly intractable problem that cannot be solved via preventative chemotherapy alone. Crystallising this issue are the screening results for periportal fibrosis amongst adults and children resident in Ugandan fishing villages on the shores of Lake Albert. In one district, Hoima, ultrasound detectable fibrosis due to schistosomiasis was observable in over 80% of individuals screened, even though control programme administrators report an annual high treatment coverage.

FibroScHot is a multidisciplinary consortium, funded by the European and Developing Countries Clinical Trial Partnership (EDCTP), led by the Department of Pathology Schistosomiasis Research Group, with three partner institutions within Uganda: Makerere University, Uganda Virus Research Institute and Vector Borne Disease, Ministry of Health; along with the Cambridge Clinical Trials Unit, University of Copenhagen, RVC and the Sanger Institute. The consortium is to conduct a trial, in which treatment for schistosomiasis will be increased in frequency from annual to bi-annual or quarterly treatment. Exploratory analysis will include medical anthropological investigations, host immunology, and parasite population genetics and genomics. The trial protocol and the reasoning behind the exploratory analyses will be discussed.

Melanie Smith

Designing our Tomorrow - Thinking Tools for a Complex World

Designing Our Tomorrow (DOT) is a long-term, collaboration between the Faculty of Education and the Department of Engineering that has played a key role in the reform of education policy GCSE/A-level qualifications in England for 11 to 18 year-olds for teaching design and technology (D&T). This has included the development of curriculum resources or 'thinking tools' and has been adopted by a number of schools nationally and increasingly, internationally (Nicholl, et al., 2013). Our vision is to 'equip every child with the thinking tools to solve problems in a complex world'. This is done through the use of authentic challenges that provide the context for learning. The ability to solve problems effectively will help contribute to overcoming the issues highlighted across all the SDG's, empowering the learner and teacher in the process. An example of DOT in action can be seen in the following video (under 3 minutes), made by students in Canada. This documents their experience of utilizing appropriate 'thinking tools' to solve a problem related to inclusive design. See: https://vimeo.com/269048007

The key is the authenticity of the challenge. One of the resource sets addresses infant asthma treatment which has led to a 12 year-old's design going forward for testing within the NHS (SDG #3). See: https://www.healthylondon.org/breathing-new-life-asthma-treatment/

We are increasingly focusing on work with marginalised students and populations (that include indigenous/aboriginal – SDG's #4, 5, 9, 10 & 12), both nationally and internationally. The DOT approach is considered to be a Type III intervention according to the Enrichment Triad Model (http://journals.sagepub.com/doi/pdf/10.1177/026142941002600303) that looks to tackle underachievement amongst students. Nicholl, B., Flutter, J., Hosking, I. &

Clarkson, P. (2013). Joining up the DOTs: authentic teaching and learning in Design and Technology. Cambridge Journal of Education, 43(4), 435-450.

Cassi Henderson

Re-thinking biosensors for low-resources settings

A major barrier towards achieving affordability of diagnostic systems for low-resource settings is the lack of purchasing price parity between the countries where tests are manufactured and those where the tests are needed. Synthetic biology can be used to circumvent the classical manufacturing chain by enabling a complete production pathway amenable to in-country manufacture for the most expensive portion of the test – the functional protein.

Fusion proteins have been designed for this purpose with 3 core elements: 1) the central assay protein (e.g. enzyme, binding protein or peptide); 2) a visualising protein (e.g. fluorescent protein) to facilitate visual monitoring of the production and isolation without requiring a laboratory infrastructure; 3) an affinity peptide which is fundamental to effective interfacing between the biological component and the transduction system in the diagnostic and plays a key role in simplifying isolation and purification. In this work, silica extracted from sand acts as the support, as it is a cheap and abundant material.

The fusion proteins on silica extracted from sand can then be used directly in the diagnostic assay. While immobilisation adds stability for long-term storage, it restricts the movement of enzyme around the sample, changing the dynamics of the reaction. A novel hourglass-like design is presented which takes advantage of particle sedimentation to improve particle-sample interactions and adds a built-in timing element for ease of use. The new device has successfully enabled the detection of both small molecule and nucleic acid analytes. With the continued challenge of infectious diseases and the rising rates of non-communicable diseases in the Global South, a system that is applicable across a range of analytes will be critical to changing the paradigm of diagnostic testing in low-resource settings.

Yuan Pan

Exploring natural capital within and outside academic research

Natural capital is the world's stock of natural resources and protecting natural capital is a common challenge that needs to be urgently addressed globally. Research and interest into natural capital is increasing within and outside academia.

We used bibliometrics to quantitatively explore the key authors, collaboration and keyword networks within natural capital research. In addition, we used Twitter to obtain and analyse tweets about natural capital.

Within academia, there are three distinct collaboration clusters and a lack of collaboration with soil scientists. Outside academia, a range of words is used in tweets about natural capital and the overall sentiment score of tweets is positive. Both within and outside academia, "ecosystem services" and "biodiversity" are important key words associated with natural capital. Nevertheless, the words "natural" and "nature" are only associated with natural capital on Twitter.

Our results indicate that there is a potential disconnect between natural capital researchers. In addition, the use of language surrounding natural capital varies within and outside academic research.

Miriam Alvarado

Assessing the impact of a sugar-sweetened beverage tax: lessons learnt from the small island developing state of Barbados

Background

Sustainable Development Goal (SDG) 3.4 focuses on reducing pre-mature mortality from non-communicable diseases such as diabetes. To achieve this, taxes on sugar-sweetened beverages (SSBs) have been increasingly introduced in ODA countries. However, much is still unknown about how SSB taxes operate as a result of different tax designs. In 2015, Barbados implemented a 10% ad valorem (value-based) tax on SSBs. It has been hypothesized that this tax structure may inadvertently encourage consumers to switch to cheaper sugary drinks, although other ODA countries have followed this structure (i.e. Philippines, Chile). We aimed to assess whether and to what extent there has been a change in sales of SSBs following implementation of the SSB tax.

Methods

We used electronic point of sale data from a major grocery store chain and applied an interrupted time series (ITS) design to assess grocery store SSB and non-SSB sales from January 2013 to October 2016. We conducted sensitivity analyses using a cross-country control (Trinidad & Tobago) and a within-country control (vinegar). We included a post-hoc stratification by price tertile to assess the extent to which consumers may switch to cheaper sugary drinks.

Results

We found that average weekly sales of SSBs decreased by 4.2% (95%CI 3.6 to 4.9%) compared to expected sales without a tax, primarily driven by a decrease in carbonated SSBs sales of 3.6% (95%CI 2.9 to 4.4%). Sales of non-SSBs increased by 5.2% (95%CI 4.5 to 5.9%), with bottled water sales increasing by an average of 7.5% (95%CI 6.5 to 8.3%). The sensitivity analyses were consistent with the uncontrolled results. After stratifying by price, we found evidence of substitution to cheaper SSBs.

Conclusions

This study suggests that the Barbados SSB tax was associated with decreased sales of SSBs in a major grocery store chain after controlling for underlying trends. We found evidence to suggest that consumers may have changed their behaviour in response to the tax by purchasing cheaper sugary drinks, in addition to substituting to untaxed products. This has important implications for the design of future SSB taxes, especially given potential trade-offs between public health effectiveness and tax collection efficiency.

Christopher Proctor, Johnny Habchi Pietro Sormanni

GCConnect: connecting developmental problems with solutions

Resolving the world's most pressing development challenges requires strong connections between communities across disciplines and continents to enable careful framing of problems and deliverable solutions with tangible outcomes.

GCConnect is a new initiative from the University of Cambridge that aims at bringing together interested problem solvers with solution seekers around the developing world. The core of GCConnect consists in developing a generally applicable framework to decompose and re-formulate problems into specific questions, sensibly articulated to address and appeal to diverse communities of experts, both within academia and the private sector. The aim is to rigorously define the problems that need solving, and articulate why these issues are important and how addressing them will deliver value both to local communities and to the very same experts that may find a solution.

We will introduce the concept and aims of GCConnect including the potential impact on accelerating progress in meeting the SDGs by making community-scale problems tractable and accessible. We envisage that deploying the GCConnect platform will generate novel opportunities to expand the role of the Cambridge community in addressing global challenges.

Giulia Torino

Southern urbanism(s) and the Goal 11: building inclusive cities and communities

The Urbanism in the Global South (UGS) is an inter-departmental working group at the University of Cambridge, founded in October 2017 by PhD students Giulia Torino (Architecture/Urban Studies), Shreyashi Dasgupta (POLIS/Development Studies) and Noura Wahby (POLIS/Development Studies). The group currently counts on 85 members, from over 15 departments. It works with the support of a multi-disciplinary Sounding Board of Cambridge academics, and it is further supported by the departments of Architecture, Geography, POLIS/Centre for Latin American Studies and Centre of Development Studies.

Our aim is to foster South-South dialogues in urban studies by sharing region-based knowledges and a critical literature review on Southern scholars which are often not included in conventional debates and urban studies curricula, also given the persistency of language barriers. This also seeks to contribute to the ongoing decolonising struggles within the urban academia, in Cambridge and nearby universities, and a refusal to regard the South as a mere site of data collection (e.g. fieldwork), with little recourse to theory generation. At the same time, the format of our sessions seeks to contribute towards the unmaking of academic hierarchies and disciplinary boundaries in a constructive way.

Some of the main issues affecting Southern cities nowadays are tackled by the Goal 11 of the SDG: Sustainable Cities and Communities. We locate our intellectual, academic, and in some cases even individual activist endeavours within such goal. At the same time, we are critical towards the lack of Southern epistemologies and intellectual diversity embodied by the New Urban Agenda and the SDG. Drawing on Professor Susan Parnell's "Defining a Global Urban Development Agenda" (2016),

among others, we will present some reflections on the idea that “there is no longer a question of whether cities are important for sustainable development, but rather why and how the urban condition affects our common future”; in doing so, we will raise the question of the representation of Southern knowledges and urban experiences in the New Urban Agenda and the SDG.

Andrew Caines, Ianthi Tsimpli, Zhilin Wang, Russell Moore and Paula Buttery

Automatic assessment and teaching of numeracy skills to Indian schoolchildren

We present a web-based application aimed at children in India aged 9-10 years. The web-app is designed to test and develop children’s verbal reasoning and numeric problem-solving skills. Solving word problems in mathematics depends on not only students’ understanding of mathematical concepts but also their level of literacy so that they may fully comprehend the wording of the question (Dahm & de Angelis, 2018). In an example question, Jake runs at 2 metres per second. If Jane is _____ than Jake by 1 metre per second, at what speed is Jane moving at? It is not possible for us to answer this question if we do not understand the meaning of the word “faster”, which was blanked out above. This situation, however, is not uncommon when word problems are posed in a language that is not of the child’s native language (Abedi & Lord, 2001). This is the struggle faced by many Indian children who are taught and tested in English but speak another language, or languages, as their mother tongue.

We chose India as the target of this web-app because (a) we have experience working in the region, and (b) demand for literacy in English is especially high in the Indian school system, as evidenced by the increase in (low-cost) English-medium instruction schools across the country. Although many schools teach in English, teachers’ English proficiency is not universally high and learning outcomes can be lower than expected given the age of the children and their years of schooling. We therefore designed a web-app with scaffolding for students’ learning and improvement. The scaffolding includes dictionary definitions for complex English words, machine translation into Indian languages such as Hindi and Telugu, and video lessons to accompany each question; thus the learner may independently select the type of help necessary and learn to solve the questions they find difficult.

Students’ use of these scaffolding features is logged for user analysis, which can in turn help to personalise such guidance in the future. Our web-app is a scalable solution that currently includes a thousand questions from an open-source dataset and is available as an online demo at http://zw322.pythonanywhere.com

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Luke Meredith

DEPLOY - 'Diagnostics to Empower Pathogen-detection in a LOw-income CountrY'

Infectious diseases are consistently among the major causes of global mortality according to the WHO, and disproportionately affect low and middle-income countries (LMICs). Diarrheal diseases are the second leading cause of mortality in LMICs, and despite recent progress, HIV/AIDS, malaria and tuberculosis are still among the top ten killers in these countries. Many of these infections are preventable, with effective diagnostics and subsequent treatment being available. However, current diagnostics systems to identify infectious pathogens are in many cases expensive and complex, requiring access to extensive infrastructure, resources and expertise. This can reduce their penetration and uptake in the environments that need them the most.

DEPLOY ('Diagnostics to Empower Pathogen-detection in a LOw-income CountrY') seeks to develop and deploy innovative field diagnostic solutions that empower low and middle-income countries (LMICs) to combat infectious diseases. The team, led by a group of Borysiewicz Biomedical Fellows of the University of Cambridge, will develop a series of field systems including novel sampling technology and pathogen identification techniques. DEPLOY has been designed to target WHO Global Priority Diseases, but it will be expandable to other emerging health threats. Packages will aim to be cost-effective, portable and broadly deployable, incorporating basic serological assays (ELISA), quantitative PCR and portable sequencing technology, with minimal dependence on power or cold-chain considerations, which often limit the accessibility to technology in developing countries.

The team will also develop training and awareness packages about the risks of disease and the benefits of vaccination, delivered from and included in the platform. Within the pilot phase of this project, DEPLOY is actively seeking to partner with government and non-government institutions and healthcare professionals in Tanzania to prioritise diagnostic solutions and co-create training and educational content.

Catherine Hasted

Bridging the gap: crossing the academic boundary to build global partnerships

The higher education research literature is replete with metaphors of boundaries or borders, usually imagined as structural constraints in need of removal or circumvention. Escaping those boundaries is a common discursive prescription for those pursuing agendas as diverse as conflict resolution, health inequalities or achieving equitable access to education. But while the scholarship emphasises national and transnational frameworks, the decisive roles of political leaders, and strategic funding considerations, it is relatively subdued about how these boundaries are actually dealt with at ground level. How do practitioners come together, day by day, across the boundaries of academia, and what is required for such collaborations to produce desirable outcomes for society? It is on this issue that the author will focus, specifically the theory of Relational Working.

Relational Working theory emphasises three core concepts of common knowledge, relational agency and relational expertise, which, it is suggested, are pre-requisites if ground-level collaboration across practice boundaries is to be 'built',

'nurtured' and 'sustained'. Pioneered by Professor Anne Edwards in a series of projects focussed on school-community links, collaboration across Children's Services, and interprofessional working in hospitals, the theory has only recently started to appear as a frame for accounts in the higher education scholarship.

A number of projects will illustrate how the three concepts have proved useful to researchers and practitioners in changing practice and building partnerships at grass-roots level. They will also highlight the challenges that require consideration before introducing Relational Working principles into transdisciplinary HE settings to address global challenges. These include reflecting on how to embed interactions, the need for a shared focus of activity and attending to the balance of power within partnerships.

Arfa Karani

Opportunities to make a difference in the Off-grid solar market in Tanzania

Off-grid solar market is growing rapidly in Tanzania. In order to understand the contributing factors to this growth, we went down to Tanzania to meet with various stakeholders in the sector. We met with the UNCDF, World Bank and International Financial Corporation's joint project (Lighting Africa) executives, Azuri (manufacturers and suppliers of home-kits) and RISE (solar products distributor).

Through this poster we would like to shed light on the intricacies of the Offgrid solar market in Tanzania and other developing countries. Finally we will highlight the open opportunities for collaborations with various organizations we met.

Simon Frost, Rebecca Kinsley and Jonathan Heeney

One Health and accelerating Vaccines for Ebola and Lassa (OVEL)

The One Health and accelerating Vaccines for Ebola and Lassa (OVEL) is a focused comparative One Health vaccine project based on the need to understand future threats of zoonotic virus spill-overs from their natural animal reservoirs to humans. This information is important to develop the most effective protective vaccines to prevent future human outbreaks.

A disproportionally high number of emerging and re-emerging diseases are caused by RNA viruses and many are carried naturally by animals (JL Heeney, Internal Med, 2006). Their genomes are notoriously variable due to the high mutation rate that occurs during replication. These accumulate over time and results in evolvolution of the viruses as they circulate in their natural animal reservoir populations. Thus, these variant viruses carried by animals are a risk to human health and may spill-over to people who share the same environment. If some viral variants arise and are able to adapt to use human cell receptors and if they are able to escape immune defences, they may become highly infectious and cause large disease outbreaks.

Vaccines are only as good as the immune targets (the viral protein (antigen) presented by vaccines) of the pathogen that they are designed for. If the antigen changes, vaccines fail to protect. In most cases current vaccine candidates against RNA viruses are from past human outbreaks with little or no information of future risks from viral variants carried in animal reservoirs, especially those with the potential for animal to human (zoonotic) transmission.

We propose to establish an extended viral sequence database derived from animal reservoirs for two virus families which cause viral haemorrhagic diseases in geographically overlapping regions of West Africa. By gaining new molecular/genomic and antibody data from animal hosts, we will acquire an understanding of the infection dynamics and viral persistence in their natural reservoirs, while providing essential viral diversity data in reservoirs to discover new vaccine antigens and accelerate truly protective vaccine design.

We will acquire Lassa/Arenavirus sequence diversity data from a comprehensive survey of the natural rodent hosts (Mastomys natalensis and other rodent reservoir species) in Nigeria where documented Lassa outbreaks occur in states with cases caused by diverse isoaltes of Lassa fever virus. A second reservoir viral sequence database is likely to arise from a complementary study funded by the UK GCRF, JN Wood) from sampled bat colonies in Ghana which Ebolavirus antibody and antigen positive animals have been found.

Equipped with this information on the sequence diversity of viruses in animal reservoirs which threaten to spill-over to humans, we will be able to design better vaccine antigens for more effective and broadly protective vaccines. We will achieve this using a new accelerated vaccine development platform using cutting edge technologies to achieve dramatic improvements in vaccine efficacy and the speed of vaccine development.

We will use the new EVAC (Emerging viral Vaccine Antigen Construct) platform vaccine technology we previously developed with Innovate-UK funding. The EVAC platform, which significantly accelerates vaccine development, merges computational modelling methodologies, synthetic gene technology, and in vivo immune selection and vaccine efficacy readouts. The end products are novel vaccine antigens to trigger the broadest spectrum of protective immune responses using Digitally Designed, Immune Optimised and Selected (DIOS) vaccine antigens against re-emerging RNA viruses Lassa Fever and Ebola viruses.

Eleanor Turner-Moss

The determinants of diet and physical activity in Africa and the Caribbean: a scoping review

Background

Poor diet and physical inactivity are two major contributors to the increasing burden of non-communicable disease in low-and middle-income countries (LMICs). However, context differs and research from high-income countries cannot be assumed to be relevant to LMICs. There is consensus on the need for evidence from LMICs to inform policy making(1,2). To inform the new Global Diet and Activity Research Group and Network (GDAR), this review aims to identify existing reviews investigating the determinants of diet and physical activity in LMICs in Africa and the Caribbean.

Methods

A scoping review of reviews was conducted according to the method described by Arksey & O'Malley(3). Papers identified by the search strategy were doubled screened using Rayyan QCRI systematic review software. Data were charted by multiple

reviewers into a pretested data abstraction form capturing population, determinant, intervention, methodology and outcome.

Results

Several similarities and differences with high income countries from distal to proximal determinants of behaviour were split by categories of the Dahlgren and Whitehead model(4) and by diet and physical activity. Determinants included climate, colonisation, economic development, aid, globalisation, the epidemiological transition to a more western model with co-existing over and under nutrition, infectious disease and road traffic accidents. Gendered cultural and socioeconomic differences around practices and understandings of body size and healthy lifestyles were also outlined.

Conclusions

This scoping review describes an important and policy-relevant area of work that is now well appreciated and prioritised. In summarising reviews, we identify a broader range of potential determinants than would have been possible in a search of primary literature. Further, in identifying a lack of reviews, we are concluding that the primary literature has not yet been summarised to offer take home messages for policy makers. Therefore, this review offers focus to inform questions for systematic reviews of primary literature going forward.

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Session 3 – Co-creation for challenges faced by ODA-target countries

Emanuele Di Angelantonio, Rajiv Chowdhury and John Danesh

Cambridge Alliance to Protect Bangladesh from Long-term Environmental Hazards (CAPABLE)

Bangladesh, a country of ~165M people, is facing a major and rapidly growing burden of non-communicable diseases (NCDs), including cardiovascular, metabolic, respiratory, and neoplastic diseases. A key contribution is Bangladesh's distinctive environmental and lifestyle risk profile, one of the worst worldwide exemplified by:

- Water and air pollution: According to the WHO, arsenic-contaminated water in Bangladesh, which affects ~100M people, is "the largest mass poisoning of a

human population in history". Furthermore, a 2016 WHO report on ambient air pollution judged Bangladesh to be the fourth worst polluted country worldwide.

- Nutritional disorders: Micronutrient deficiencies are widespread, including iron-deficiency. An evolving and complex background of persisting undernutrition and emerging obesity also increase NCD risks.
- Risk behaviours: Risk behaviours for NCDs that can lead to metabolic dysfunction (eg, unhealthy diets, physical inactivity, tobacco consumption) are either common, increasing rapidly, or both. "Western" lifestyles may act synergistically with traditional behaviours to amplify disease risk.

Cambridge Programme to Assist Bangladesh in Lifestyle and Environmental risk reduction (CAPABLE) programme aims to address this challenge by focusing on intertwined risk factors for NCDs related to social, environmental, and behavioural factors not previously considered in an integrated framework. These factors tend to cluster in households, shared determinants, exert additive and synergistic effects, and involve co-dependencies and are mediated by contextual variation – such as across rural, urban, and slum settings. The programme will create new research platforms and use a multidisciplinary approach in Bangladesh to address two key Sustainable Development Goals ("Clean air, water and sanitation" and "Sustainable health and wellbeing").

TBC and Nicholas Thomas
Heritage Matters: Culture and Development in the Pacific Museums

Nigel Unwin
The Co-creation of Methods to Assess the Impact of Community Food Production on the Risk of Non-communicable Diseases, Social and Economic Wellbeing and the Environment

Nigel Unwin[1] on behalf of the Community Food and Health (CFaH) Project[2]
[1]MRC Epidemiology Unit, University of Cambridge
[2]Investigators: Vili Iese, Morgan Wairu (University of the South Pacific); Connie Donato-Hunt, Joije Fesaitu (Pacific Community); Alafia Samuels, Ian Hambleton, Neela Bardie, Catherine Brown (University of the West Indies); Cornelia Guell, Emily Haynes (Exeter University); Nita Forouhi (University of Cambridge); Sarah Benjamin Neelon (John Hopkins University); Flo Kroll (Witwatersrand University)

Background

The Small Island Developing States (SIDS) of the Caribbean and Pacific have some of the highest rates globally of obesity, type 2 diabetes and related non-communicable diseases (NCDs). Underlying this picture is an increasing reliance on food imports dominated by highly processed foods, and an increasing loss of local production. Governments of SIDS have identified the need to reverse these trends as part of reducing the high burden of NCDs, improving food sovereignty and resilience to climate change. However, there is very limited evidence, to inform policy, on the impact of food production interventions in SIDS on NCD risk and other aspects of wellbeing.

To develop a theoretical framework and methods for evaluating the impact of community food production initiatives (CFPIs) on risk factors for NCDs, social and economic wellbeing and the environment. These methods will be used to support the development of a research programme in SIDS and other low- and middle-income countries, and thus provide evidence to support and evaluate policy intended to reduce NCD risk through promoting local food production.

Approach

A mixed methods approach has been taken, including evidence reviews, qualitative data collection (in-depth interviews and focus groups), and a household nutrition, food source and health survey. The data collection tools were designed and agreed at an initial partners' workshop in Cambridge in September 2017. Data collection was undertaken in St Vincent and the Grenadines (SVG) and in Fiji, and initial findings were reviewed at a second workshop in SVG in October 2018. At this second workshop were leaders of Community Food Production initiatives in Fiji and SVG, who contributed to a critical evaluation of the methodological approaches and an interpretation of the findings.

Outcomes

The project has collected pilot data in SVG and Fiji, including data on nutritional quality and food sources on 150 households, and used qualitative approaches to investigate barriers and facilitators to CFPIs, and the cultural, social and economic factors driving and limiting dietary patterns. Following further analysis of these data, it will refine its suite of assessment tools, and publish an evaluation framework to inform future work.

Alex Patto and Jeremy Baumberg

Open-source hardware for Official Development Assistance countries

The inequality between high-end equipment in well-funded Western experimental labs and only basic apparatus in developing nations limits their local development to theoretical but not experimental research capabilities. More urgently it deprives their health systems of crucial lab-based diagnostic tests. Lacking experimental capabilities stifles local innovation, preventing them from adapting and maintaining equipment to match local needs. Here we develop the underpinning science to make high-quality optical instruments that can be manufactured, improved, and maintained at very low cost in developing nations where they are needed, focussing first on Tanzania.

The major research challenge is how to exploit cheap 3D printing to produce high-precision systems, potentially from recycled plastic bottles, enabling us to combine low cost lasers, sensors, and microcontrollers into reliable optical instruments, co-developed with Tanzanian local partner STICLab. Central to the project is the development and refinement of the OpenFlexure Microscope Stage, an open-source microscope developed in Jeremy Baumberg's lab by Dr Richard Bowman. With STIClab we have co-designed a low-cost version of the OpenFlexure Microscope, reducing the cost from $50 to less than $10, whilst still easily sourced in-country. We are conducting fatigue testing of the OpenFlexure Stage in Tanzania, which has identified numerous failure modes, which we can mitigate to increase the robustness of the system. A

baseline of microscope performance is currently being established to investigate performance consistency; to this effort STIClab to date have printed over 100 microscopes.

The OpenFlexure Microscope has uses in educational, environmental and medical contexts. For example with STIClab we are working with Ifakara Health Institute in Tanzania to develop a Malaria diagnostic. Further the OpenFlexure Microscope has empowered local initiatives, including Tech4Trade, who have optimised the open-source design file for their needs, and sold over 50 microscopes to schools in Kenya. In addition, through University Spin-out WaterScope, we are working to develop a low-cost, optics based, rapid, user-friendly, bacterial testing system. This will enable community-based water testing and mapping of contaminated water sources. In collaboration with Oxfam, WaterScope will be going on a field trial in January to India and Bangladesh to further test their system.

TBC and James Ajioka
LCVD: Low-cost Cell-extract Viral Diagnostics

Pietro Cicuta
Experiences in scientific collaboration and education in developing countries: malaria diagnostics and basic science

In my 5 minutes I will mention our ongoing experience with EPSRC-GCRF funding, aimed at improving the diagnosis of malaria in the field, in collaboration with a health institute in Tanzania.

I will also mention a >10 year effort at developing the capacity for experimental science in developing countries, through a unique hands-on graduate school currently run with support of ICTP (UNESCO).

John Carr
Targeting virus transmission in crops vital for African food security

John P. Carr[1], Josiah M. Mutuku[2], Sita R. Ghimere[2], Hodeba D. Mignouna[2], Ken O. Fening[3], Jane Waimatha[4] and Paul Kuria[4]
1. Cambridge University Department of Plant Sciences 2. BecA-ILRI Hub, Nairobi Kenya 3. University of Ghana, Kpong Ghana 4. Kenya Agricultural and Livestock Research Organisation.

Plant viruses – especially those vectored by insects - are major threats to food security in sub-Saharan Africa. This talk will discuss in a small number of case studies how collaborative projects have been generated between the Plant Virology Group and scientific partners in Kenya and Ghana. Work on insect-vectored diseases of key staples such as common bean and maize and on an increasingly important cash crop, cabbage, will be described. The ultimate aim of all these projects is to generate sustainable solutions that will benefit resource-poor farmers in the region. We gratefully acknowledge the financial assistance of Cambridge in Africa (Caprex and Alborada), GCRF/SCPRID and Cambridge Impact Acceleration Account grants.

Rafael Mitchell, Samuel Asare and Pauline Rose

Equity and the sustainable development agenda: evidence from the African Education Research Database

This presentation focuses on equity in relation to what and how research is conducted. Bibliometric analysis of ~3000 education research outputs from 49 countries in SSA reveals patterns in the thematic foci of research, which are considered in relation to the Sustainable Development Goal for Education. Overall we find that greatest attention is paid to tertiary and secondary levels of education which are largely beyond the reach of the most disadvantaged groups in society. However, collaborative research conducted through international partnerships (such as Global Challenges Research Fund) is significantly more likely to focus on the earlier phases of education, where improvements in access and learning have the potential of benefitting the greatest number.

Evidence from the quantitative dataset is considered alongside interviews with 26 African researchers based in the region. This presentation focuses on their experiences of donor-funded international research partnerships, and implications are considered for equity in addressing the sustainable development agenda.

Jake Reynolds

Clean fuel switch: piloting biogas for multiple SDG benefits

Cambridge Institute for Sustainability Leadership (CISL) is leading a major study on the impact of a clean cooking at Dunga Beach, Lake Victoria, Kenya, with support from AstraZeneca. The project takes an innovative approach to tackling smoke-related respiratory illness through the replacement of firewood and charcoal with clean, green, biogas technology. The primary focus is household cooking and commercial women fish-fryers in a peri-urban fishing community. Over 4m people die prematurely worldwide each year through toxic smoke inhalation in their homes from wood, charcoal and kerosene burning. A 'clean fuel switch' from wood fuel to biogas addresses this problem while delivering multiple related SDG benefits from time saving, production of fertiliser for gardens, reduced demand for wood resources, and microenterprise development.

Session 4 – Implementation of research for the SDGs in ODA-target countries

TBC and **Ian Goodfellow**

Utilisation of field deployable genomics as part of epidemic response

Tariq Masood

Operational excellence for disaster management

Disaster management (DM) is getting substantial attention from practitioners and academia. This is partly in response to a series of natural and human-made global disasters in recent times, which have affected many countries including Pakistan, China, Nepal, Bangladesh, India, Philippines and USA to name a few. Millions and more people

are being affected by natural and human-made disasters with increasing worldwide economic damages in billions of dollars every year. DM is a global challenge that is directly linked to the United Nations' Sustainable Development Goals.

For any disaster (e.g. earthquake, flood, tsunami, heat wave or heavy snow), DM operations are launched to provide medicine, food, water and shelter at the least. However, DM (response-recovery-mitigation-preparation) practices face challenges of operational disruption partly due to disconnectedness in commercially established and ad-hoc supply chain setups for managing a disaster. Even though operational excellence has been studied in more detail in other commercial sectors, there is limited evidence of such programs in DM. The concept of achieving operational excellence through building resilience for DM and its quantification is still novice due to its high complexity and uncertainty, so there is still substantial confusion about what it means.

This necessitates operational excellence and resilience approaches to be integrated in DM aimed at saving lives, rebuilding infrastructure and society. The resilience in DM deals with two main issues: (1) bouncing back to the original functionality following exposure to a disaster e.g. national rail up time following heavy flooding; and (2) change management by DM organisations due to anticipated or unanticipated changes e.g. meeting product and service demands post an earthquake.

This talk provides an overview of results from four recent projects, using several case studies from Asia, aimed at developing operational excellence through developing resilience in DM. It is proposed that DM organisations focus on achieving operational excellence through building resilience that can help DM operation to channel products and services in a more responsive, efficient, and economical manner.

Eiko Yoneki

UGALERT: Pest and Disease Monitoring in Greenhouses in Kenya

BUGALERT provides early-warning signs for pest and diseases in greenhouse crops before untreatable infestation occurs. It provides valuable and timely indicators to farmers to treat crops and thus sustain healthy growth and minimise loss.

Sub-Saharan Africa depends heavily on agriculture, providing income to almost 80% of its population. Small holder farms grow under open irrigation and constantly face pests and diseases that cause 50% loss of their yield on average. Greenhouses are therefore catching up as a means to protect crops from pests and diseases. Farmers can thus reduce crop losses by almost 20%. But further improvements are limited, because farmers have to spot pests and diseases by eye to take appropriate measures. Farmers also try to prevent the use of chemicals in order to keep the crops organic. A majority of these pests are difficult to spot and may only become apparent once they have fully infested and treatment is difficult. BUGALERT is a continuous greenhouse monitoring solution, using image recognition to readily detect pest and disease infestation and alert the farmers. The resulting plant images can also be used to advice on proper feeding patterns to ensure leaves remain green and healthy. The proposed system uses networked Raspberry Pis (RPs), which are inexpensive, tiny computers. RPs can be powered by battery packs or solar power. We install a camera and sensors to each RP to take pictures of crops and sense environmental data. RPs can

communicate with each other for data transfer. The collected data will be aggregated at the gateway-node in the greenhouse, where data can be partially analysed and sent to the cloud-based

BUGALERT data processing system via wireless communication. Various advanced data analysis techniques, such as machine learning, are used for analysis. The whole operation will be integrated as a pest/disease alert system to proactively communicate with farmers.

BUTGLAERT will greatly benefit small holder farmers, with the potential for wide-reaching improvements of agriculture and associated economic implications. BUGALERT tools will be placed in an open source repository to widely disseminate the smart monitoring technology for maximal impact.

Jon Crowcroft

(Re-)decentralisation of communications systems for fun and societal profit

Research and development of decentralised networks has come a long way and we now see community mesh network deployments (e.g. Guifi) as well as relevant applications. We have personal communication platforms (e.g. firechat) sophisticated systems for peer-to-peer content distribution and even for smart contracts (e..g for decentralized crowdfunding campaigns). These systems benefit the developed world by offering lower entry to cost, but they also provide lower latency to access information, and are more sustainable than large centrlized cloud-based networks services. They are also designed to be survivable (in the sense that while anything goes on working during a disaster, communications progresses too). This makes these technologies eminently suitable for deployment in regions where there is little communications infrastructure, or else where it is locked in to limited/monopolised walled gardens (c.f. https://manypossibilities.net/2018/10/fibre-feudalism/), offering the chance to leapfrog those barriers to entry.

Rosalind Parkes-Ratanshi, Carol Brayne

Building sustainable projects towards sustainable health solutions for Uganda

LMIC countries are still very dependent on overseas aid to support health related work, and this is especially evident in HIV with over 80% of the HIV response in Uganda being funded by international government agencies. This puts people living with needing support for their health in Uganda and elsewhere in sub-Saharan Africa in a vulnerable position, especially at this time of global political shifts and uncertainty. Traditionally research projects are led by high income country researchers, and whilst ideally they may have impact on national or international policies, they do not leave behind a lasting footprint within the local communities. The Picture of Ageing project (PI Prof Carol Braye) is a multi-disciplinary project based in a peri-urban community outside of Kampala, Uganda. It involves ageing researchers from medical backgrounds, demographers and artists. It aims to build up a picture of what it is like to be an older person in this setting. As well as the data collection elements in all 3 disciplines, the project works works an NGO; HealthNest Uganda who will establish peer support groups of older persons in the community. These older persons will receive general help and

advice as well as specific support on health matters and income generating using the arts by study team members. The groups will be given advice on how to be self-funding and sustaining by older people from another district who already run successful groups. At the end of the project we will hold an exhibition curated using findings of all 3 disciplines, and displayed in the community first. Our aim is that our peer support groups will continue to exist beyond the project leaving a lasting positive contribution in the community. We see this as the first step in generating impact from the project, by directly positively impacting our research community. We aim for impact in the development of ageing research through capacity building of young researchers. And of course, our ultimate goal is to impact by advising on policy at a National (and international) level. "Building sustainable projects towards sustainable health solutions for Uganda" LMIC countries are still very dependent on overseas aid to support health related work, and this is especially evident in HIV with over 80% of the HIV response in Uganda being funded by international government agencies. This puts people living with needing support for their health in Uganda and elsewhere in sub-Saharan Africa in a vulnerable position, especially at this time of global political shifts and uncertainty. Traditionally research projects are led by high income country researchers, and whilst ideally they may have impact on national or international policies, they do not leave behind a lasting footprint within the local communities. The Picture of Ageing project (PI Prof Carol Braye) is a multi-disciplinary project based in a peri-urban community outside of Kampala, Uganda. It involves ageing researchers from medical backgrounds, demographers and artists. It aims to build up a picture of what it is like to be an older person in this setting. As well as the data collection elements in all 3 disciplines, the project works works an NGO; HealthNest Uganda who will establish peer support groups of older persons in the community. These older persons will receive general help and advice as well as specific support on health matters and income generating using the arts by study team members. The groups will be given advice on how to be self-funding and sustaining by older people from another district who already run successful groups. At the end of the project we will hold an exhibition curated using findings of all 3 disciplines, and displayed in the community first. Our aim is that our peer support groups will continue to exist beyond the project leaving a lasting positive contribution in the community. We see this as the first step in generating impact from the project, by directly positively impacting our research community. We aim for impact in the development of ageing research through capacity building of young researchers. And of course, our ultimate goal is to impact by advising on policy at a National (and international) level.

Rahul Goel and James Woodcock

Delegates

Mojtaba Abdi Jalebi	Department of Physics
Dr Nebil Achour	Anglia Ruskin University
Shafiq Ahmed	Energy @ Cambridge IRC
Abir Al-Tabbaa	Department of Engineering
Corinna Alberg	Department of Pathology
Miriam Alvarado	MRC Epidemiology Unit
Paulo Amaral	Gurdon Institute
Saloni Atal	Department of Psychology
Tiago Azevedo	Computer Science Department
Bridget Bannerman	Department of Biochemistry
Alessandra Barreto da Silva	Department of Veterinary Medicine
Tugba Basaran	Institute of Criminology
Tom Bashford	Department of Engineering
Melisa Basol	Department of Psychology
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Sarah Dalzell	MRC Elsie Widdowson Laboratory
Isabelle de Wouters	Energy @ Cambridge IRC
Tammy Dougan	Cambridge Immonology SRN
Helen Dye	Anglia Ruskin University
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Rose Eichenberger	Department of Plant Sciences
Matthew Evans	Department of Physics
Silvia Fernandez	Research Strategy Office

Tim Forman	Centre for Sustainable Development
Anke Friedrich	Office of Postdoctoral Affairs
Ljiljana Fruk	Department of Chemical Engineering and Biotechnology
Jacqueline Gallo	Faculty of Education
Rebecca Gordon	Faculty of Education
Brett Gusteit	Computer Lab
Johnny Habchi	Department of Chemistry
Kerstin Hacker	Anglia Ruskin University
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