



# Frontiers of Development Report

**Inclusivity and wellbeing in the first  
2,000 days of life**

**10 to 13 March 2019**



## **Introduction to the Royal Academy of Engineering**

As the UK's national academy for engineering, the Royal Academy of Engineering brings together the most successful and talented engineers from across the engineering sectors to advance and promote excellence in engineering.

The Academy is a delivery partner of the UK government's Global Challenges Research Fund (GCRF), that supports cutting-edge research to address the challenges faced by developing countries. The GCRF funds the Joint Resilient Futures Initiative that consists of a group of programmes run across the four national academies. The Frontiers of Development programme is one such programme, run by the Royal Academy of Engineering with support from the Royal Society, The Academy of Medical Sciences and the British Academy.

## **Introduction to Frontiers of Development**

The Frontiers of Development programme brings together participants from engineering, medical, social and natural science backgrounds from across industry and academia. It encourages interdisciplinary collaborations that tackle global challenges with the Sustainable Development Goals (SDGs) at their heart.

Themes for each event are created with input from the four national academies via a cross-academy steering group to ensure that they are interdisciplinary. At each symposium, three themed sessions take place over two and a half days featuring talks, roundtables and interactive activities aimed at sparking collaborations. At the end of the symposium participants have the opportunity to apply for seed funding awards of up to £20,000 to help build on collaborative partnerships established at the event.

More information can be found at [www.raeng.org.uk/fod](http://www.raeng.org.uk/fod)

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## Support



**National Institute  
for Health Research**

The Royal Academy of Engineering is grateful for the support received from the Wellcome Trust and the National Institute for Health Research with organising this event.

## Symposium overview

The third event in the Frontiers of Development series took place from Sunday 10 March to Wednesday 13 March 2019 at the Wellcome Genome Campus near Cambridge. This was the final event in the Inclusivity and Wellbeing series. Approximately 60 leaders from different disciplines and countries came together to discuss the challenges associated with the first 2,000 days of life. This event was hosted with support from the Wellcome Trust and the Department of Health and Social Care.



Ensuring good health and well-being, providing quality education and advocating gender equality were some of the Sustainable Development Goals explored by this symposium. Participants looked at factors that affect the first five years of a child's life. Drawing on the [UN Global Strategy for Women's, Children's and Adolescents' Health \(2016-2030\)](#) to create a framework, participants looked at what can be done to help future generations survive and thrive in an environment that promotes sustainable, prosperous childhood development.

## Comments from the event chairs

Every symposium has two event chairs who are late-career experts in the field. The role of the event chairs is to identify themes for the sessions, nominate session chairs, and lead the event in order to draw together the different disciplines.



*"Frontiers of Development brings people from diverse backgrounds together to address some important questions about enabling children to flourish in the first 2,000 days of their life and beyond. The beauty of this programme is that we have some seed corn funding to allocate. This means that some of the ideas discussed can be taken forward in an exciting way. In a few years' time we will be able to sit back and say: "It started at Frontiers of Development and now these ideas are changing the world!"*

### **Professor Sir Ian Diamond FBA**

*"Frontiers of Development has been a brilliant event. There's been a lot of interaction, group discussions, a lot of social networks created and, even better, some money is being put up to seed fund new efforts. There were several people looking at the ways in which technologies from quite high-tech labs could be transplanted into poorer settings. There's a lot of material about early childhood development, how you can measure and assess whether children are developing at the right speed. There were also some clever techniques, using video, for example, to study interactions between mothers and children. I think it will be very interesting to see what develops."*

### **Professor Anthony Costello FMedSci**



## Session one: Survive

Reducing child mortality – learning from the past and lessons for the future

Session co-chairs: Queen Dube and Victoria Nakibuuka

1. How can we accelerate reductions in neonatal mortality in order to reduce childhood deaths?

**Queen Dube, Queen Elizabeth Central Hospital, Malawi**

2. What is the role of technology in reducing child mortality?

**Stephen Tashobya, CEO of Wekebere**

3. To what extent do social determinants affect child mortality?

**Alexander Manu, Liverpool School of Tropical Medicine**



*'I think it's wonderful how interdisciplinary this event is. I have learned a lot and the seed funding opportunity allows me to do the kind of interdisciplinary work that I have always wanted to do, but have not had the right contacts and opportunity to do so.'*

*Participant*

## **Overview of session one: Survive**

Over the past 25 years there has been tremendous progress made in reducing child mortality globally. However, this progress has not been universal and the majority of high child death rates are concentrated in two regions: Southern Asia and sub-Saharan Africa. With this context in mind, Victoria Nakibuuka introduced the session by describing a visit she made to a baby in rural Uganda who was born at 29 weeks into the pregnancy and weighed only 900 grams. The baby was born in hospital, which should have improved chances of survival, but died due to complications related to inadequate technology in the hospital.

Queen Dube told the symposium that though the main causes of infant mortality are known and that it is well understood that 80% of newborn deaths are preventable, at the current rate of change it will be nearly 100 years before a baby born in Africa has the same chances of survival as one born in North America today. She spoke of importance of having the right equipment in place and ensuring that it is tailored for the environment where it will be used in order to ensure a high standard of quality of care.

This led into Stephen Tashobya's talk which focused on the role of technology in reducing child mortality, specifically diagnostics and monitoring. Stephen explained that one in five pregnancies have complications that result in the deaths of one million preterm babies each year. His technology, Wekebere, aims to tackle this issue. It is a low cost, low power, reusable device that gives auditory feedback in real-time. This enables early detection of fetuses in distress and gives a red/green light that indicates whether or not the mother should seek further help. Crucially, this technology can be used anywhere and at any time. Alexander Manu concluded the session by focusing on social determinants that affect child mortality. He advocated change to models that demonstrate the 'inverse care law' whereby care is least accessible and most rarely provided for the populations that are the most in need.

Alexander talked about the Ghana Newhints Trial, a study aimed at evaluating the effectiveness of home visits for the survival of newborn children in Ghana, following a model of community-based approaches that have been implemented in South Asia. The study concluded that the effectiveness of home visits in improving survival is determined by the matched improvement in facility quality of care.

Participants were then split into groups to consider the barriers and solutions to implementation of evidence-based interventions; what innovations already exist and how they can be scaled up; and how professionals can use a multidisciplinary approach to combat the high rates of child mortality.

Common themes from these discussions included the importance of engagement with stakeholders from the beginning of a project. These should include patients, the community, professionals from other disciplines, or policy makers at governmental level in order to align the donor agenda with the community needs and ensure that the language and terminology used are understood by everyone involved. Related to this concept, further engagement would help professionals understand what has already been addressed, researched or trialled so that they are not starting from scratch with every project. There were also discussions around funding and how the sustainability of projects often suffers when funding runs out. Microfinancing and social impact bonds were suggested as means of maintaining the provision of funds.



The session ended on a positive note with participants joining hands and stating 'Together we can', highlighting the significance of multiple disciplines coming together to discuss innovative solutions to reducing global child mortality.



## Session two: Thrive

Reaching full developmental potential

Session co-chairs: Gabriella Conti and Pasco Fearon

1. Can participatory groups and home visits improve children's growth in rural India?

**Suchitra Rath, Ekjut**

2. How can we co-design play areas to ensure children can truly thrive?

**Marie Williams, Dream Networks/UCL**

3. Can we measure love?

**Rob Hughes, Children's Investment Fund Foundation**



*'This was an eye-opening opportunity about how to build synergy between disciplines to enhance support to children in the first 2,000 days of a child's life.'*

*Participant*

## Overview of session two: Thrive

The [World Health Organisation's Nurturing Care Framework](#) underlines the importance of healthy nutrition, responsive caregiving, and opportunities to play and learn in early life for long-term economic growth and the achievement of peaceful, productive and poverty-free societies around the world.

One third of stunted children in the world live in India. This was the context set by Suchitra Rath who gave an insight into her work with an Indian NGO, Ekjut. She explained how community-based strategies of participatory groups and home visits to mothers can improve children's growth. The results showed that where interventions had been implemented there was a small improvement in stunting, more infants survived until 12 months, fewer children were underweight at 18 months and more caregivers washed their hands before feeding children. Though the interventions proved beneficial to children's diets, weight and ultimately their survival, Suchitra acknowledged that more intense efforts are required to reduce stunting significantly. For example, she described how impacts could be made by addressing challenges such as the low age of mothers at their first pregnancy, maternal under-nutrition, infections in the postnatal period, and families' financial barriers to improving children's diets.

Marie Williams introduced her research into how play areas that are co-designed by children can enable them to thrive. Play is recognised as a fundamental requirement for childhood development and a right for all children. However, in rural and urban communities across the world, children repeatedly lack access to engaging and inclusive play areas. Marie's research focuses on understanding the users (children) and their cultural contexts, how they interact with the environment and their behaviour patterns. She explained that by involving children in the design process their overall playing experience can be improved and made more inclusive.

She gave examples of this process in action the UK and sub-Saharan Africa, where Marie has worked with her social enterprise, Dream Networks

'Can we measure love?' was the question posed by the final speaker, Rob Hughes, a Senior Fellow at the Children's Investment Fund Foundation. Responsive caregiving is a crucial part of brain development and recent research is enabling us to better understand and describe the mechanisms through which poverty and deprivation can impact growing babies' and toddlers' brains. Increasingly, new tools are being developed to measure, in near real time, what matters (or at least good proxies) in early childhood. For example, Rob questioned if a 'fit bit' or thermometer for care could be developed to measure what matters in near real time using machine learning.

Participants were then split into groups to consider questions and challenges that had been posed by the speakers. These covered topics such as the most effective methods to integrate stimulation into existing nutrition and health interventions in the first 1,000 days; how to better measure early childhood interaction, in order to enhance it; and creating and presenting a tool or approach that enables children to express their opinions on the challenges they have with playing outdoors within their local environment.



## Session three: Transform

Realising an environment for sustainable, prosperous childhood development

Session co-chairs: Kevin Chan and Joni Pegram

**1. What are the impacts and opportunities at the climate-child health interface?**

**Rebecca Philipsborn, Emory University School of Medicine**

**2. How can we protect and empower children in a changing climate? A perspective from UNICEF.**

**Meghna Das, UNICEF UK**

**3. Does government have a role to protect children's rights by preventing climate change?**

**Gita Parihar, Independent legal consultant**



*'Thanks for bringing together people from several disciplines. It is easier to generate ideas from this kind of symposium. It was good that the delegates were willing to share knowledge with one another, no matter what their levels of experience.'*

*Participant*



## Overview of session three: Transform

'You can look at every single factor, every single development indicator for children – it will be impacted by climate change'  
Joni Pegram, Session Chair.

This quote set the context for the third session which examined the impacts of climate change, the drive towards gender equality, and the role of government in childhood development.

The first speaker, Rebecca Philipsborn, talked through the projected changes in the global climate and explained how this is already impacting on the lives of children. Heat exposure, poor air quality, infections, drought, flooding and displacement are examples of climate-related impacts on child health that can begin even before they are born. Rebecca reminded the audience that children are not small adults; they are more vulnerable to climate change events because of their anatomic, cognitive, immunological, and psychological differences. She recommended that child health and climate researchers should seek areas of common ground for improving child health in the context of a changing climate.

Meghna Das, Senior Programme Specialist for Sustainability at UNICEF UK, followed by sharing UNICEF's priorities and some case studies. She explained how climate change is a child-rights issue, and presented stark statistics in evidence of this position. For example, more than half a billion children worldwide live in extremely high flood-risk zones, more than 160 million live in high or extremely high drought-risk zones, while close to 300 million children live in areas where the outdoor air is toxic, exceeding international limits by six times. In 2014, 87% of all disasters were climate-related and children represent 50-60% of natural disaster victims. Despite the fact that children are the least responsible for climate change, Meghna explained that they will be the most affected by it.

UNICEF advocates that more countries should implement child-sensitive national plans for climate change adaptation or mitigation, and to take action to reduce air pollution for improved child well-being, for example through UNICEF-supported programmes.

Gita Parihar, an environmental and rights advocate, concluded the discussions by outlining the broad obligations of governments in relation to climate change with particular reference to the Paris climate agreement signed in December 2015. She explained how the human rights framework applies to both climate change and children. It was discussed what these two frameworks mean for the protection of children overall, and the gaps in their implementation. Gita concluded by highlighting two case studies where children have taken legal action against their home countries in the context of climate change – in the USA and Colombia.

Participants were then split into groups to look at three case studies from China, Bangladesh and sub-Saharan Africa. In the context of climate change, participants workshopped a set of interventions that could be taken to tackle the challenges faced by children. All groups considered the following questions:

- What can be done?
- Which actors need to be involved?
- What can your community contribute?

### **Case study 1: Air pollution in China**

Participants decided that the first step was to identify the predominant source of pollution and then to increase public awareness using mass media. Suggestions to overcome pollution included using technology to create protective masks, avoiding vigorous exercise on high-pollution days and promoting the use of electric vehicles.

### **Case Study 2: River erosion in Bangladesh**

Participants mapped the consequences of river erosion, from the loss of homes and crops through to displacement and loss of status. The consequences can lead to early marriage, early pregnancy and a number of child risks including disease and drowning. The delegates recognised the need for an integrated response at all levels, from the very localised through to national levels.

### **Case Study 3: The challenge of growing socioeconomic growth and energy requirements with climate change in sub-Saharan Africa**

Participants suggested that governments fund large-scale solar projects in order to increase the amount of sustainable energy available, but also recognised that smaller-scale solutions would be necessary for more rural environments. They discussed the importance of education within the community by raising awareness about energy usage.

## **Keynote – Cyril Engmann**

### **PATH and University of Washington**

Cyril is the Global Program Leader at PATH, a practising attending neonatologist and Professor of Paediatrics and Public Health at the University of Washington. He is credited with initiating numerous global initiatives in the health and nutrition of mothers, newborn babies and children, including the UN's Every Woman Every Child strategy. Aided by a number of country case studies Cyril outlined the science of implementing evidence-based best practices at scale. He talked about the effectiveness of purpose-driven partnerships between academia, industry, medicine and health, non-governmental agencies and governments. He also gave an insight into his own personal career and lessons he has learnt along the way.





## Keynote – Mercy Musomi Girl Child Network

Mercy is the Executive Director of Girl Child Network, an organisation that works with children, young people and women to promote child rights and empower them to learn and lead. Joining the symposium remotely from Kenya, Mercy spoke about her work designing and implementing innovative projects that respond to the needs of the most vulnerable. These enable quality of life and inclusion, particularly for children from hard-to-reach and resource-poor households. The initiatives included promoting registration of children at birth as well as promoting and supporting families to register any child born with disabilities to enable them to access social protection programmes from the government.



## Frontiers Insights

The Frontiers Insights session was run as a plenary by the two event chairs enabling all participants to be part of the same conversation. Six questions were presented and participants had approximately 10 minutes per question to contribute. Key outputs from the discussions were:

### **(1) How can we improve the quality of care for newborn infants, including pre-term infants?**

- **Provide key, simple messaging**

There is a huge amount of confusion about what women 'should' be doing when caring for new infants.

- **Include neo-natal care training in medical schools**

Medics-in-training need to focus on more than diseases such as malaria. Specialist training is required for newborn care and Level 2 care for neonatals needs to be standardised in district hospitals.

- **Improve community interventions**

There is a need to strengthen the supply-side of community interventions. The bond between the doctor and the mother is important for ensuring that the quality of care given is respectful.

### **(2) How can we improve detection, prevention and treatment of infectious diseases?**

- **Improve data for low-resource settings**

This will help to create more appropriate solutions and expedite the learning and scaling-up processes. An example given of a solution for rural settings was that of drones that transport blood supplies in rural Rwanda.

- **Promote social and behavioural change**

Not enough research funding is spent on disease prevention. There is scope for great improvements through the promotion of good practices for health in the community. Proper hand washing is a leading example.

### **(3) How to tackle slow growth in the first year of life?**

- **Improve pre-conception nutrition**

This has been proven to have significant impacts on child growth.

- **Provide cheaper breast milk banks and fortifiers**

Fortifiers are very expensive but are necessary for mothers to provide the nourishment that babies need.

- **Support mothers under stress**

Stress plays an important role on growth both pre- and post-pregnancy. Rather than using this against mothers it needs to be seen as a marker for identifying where support is required.

- **Support mothers with post-natal depression**

Standardised social intervention points in place, were suggested as a way to better support affected families.

### **(4) How can we ensure nurture and care in infancy?**

- **Embrace the role that technology can play**

There are applications that can indicate various measures of a baby's wellbeing during pregnancy. These can be adapted for local contexts, cultures and languages.

- **Promote the importance of parents being present**

It is not inherent in all cultures that parents will play the most significant role in early caregiving. In some communities, working mothers have to use unregulated day-care centres and employ untrained people to care for their children. Participants discussed the creation and/or promotion of workplace nurseries as a potential solution.

## **(5) How can we refocus water, sanitation and hygiene (WASH) improvements in the SDG era?**

- **Pitch WASH as part of an integrated approach**

WASH should be factored into integrated, microeconomic strategies for improving community health and nutrition.

- **Learn about the environment**

Effective WASH services in humanitarian contexts can only be provided by knowing the physical environment and learning what could contaminate clean water.

- **Engage with, and capitalise on, political will**

High level government interventions on infrastructure and political will can be influential. For example, in India there has been a large increase in political will to provide access to toilets over the last five years. New technologies such as Chinese solar technology may be of huge benefit in an African context where there is supportive political will.

## **(6) How can we tackle gender discrimination in children under five-years-old?**

- **Use older generations to set the desired trend**

Children need to see gender equality, whether that be in the make-up of students studying a specific subject at school, or in the decision-makers they see in the media.

- **Educate at every level**

Shared parental leave is a relatively new concept that needs to be normalised through educating employers about what it is and how it functions. Perceptions about the breadwinner model need to be challenged.

- **Be aware of unconscious bias**

In many children's books the active character is often male. This is an easy place to make a change, for example by encouraging children's authors to use gender-neutral language.



## **Seed Funding Awards**

**July 2019 – July 2020**

### **WASH environments, sanitation policies and health outcomes during the first 2000 days of life**

- Melanie Luhrmann
- Alex IfeOluwa Akinwumi
- Isaac Akinwumi

### **Low-cost and lightweight sensing platform for monitoring sleep quality and posture for infants in Vietnam**

- Sung-Hwan Jang
- Stephen Tashobya
- Hoang Minh Tu Van

### **Improving early childhood development in Ghana's Inner cities/"Zongos": A child-centred perspective**

- Alexander Ansah Manu
- Sunil Bhopal
- Rob Hughes

### **Communities' languages, identities and belonging in participatory health care interventions**

- Sabine Little
- Sneha Krishnan
- Ines Varela-Silva

### **Neonatal sepsis monitoring in sub-Saharan Africa with a microbial cell-free DNA sequencing approach**

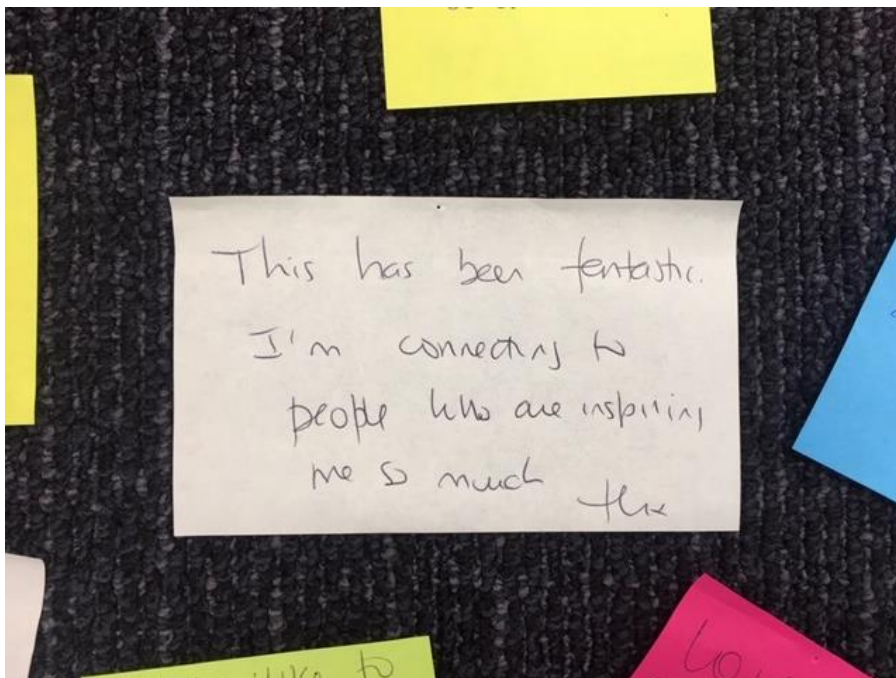
- Maiwenn Kersaudy-Kerhoas
- Alex Akinwumi
- Ronita Luke
- Victoria Nakibuuka
- Motlalepula Pholo
- Queen Dube
- Fiona Denison

### **Developmental care packages to improve neonatal outcomes – a multidisciplinary approach**

- Fiona Denison
- Queen Dube
- Victoria Nakibuuka
- Zelee Hill

### **Automated measurement of responsive caregiving at scale using machine learning**

- Caspar Addyman
- Zelee Hill
- Brian Turyabagye
- Rob Hughes
- Gabriella Conti
- Sunil Bhopal
- Pasco Fearon



## Annex A: List of Attendees

<b>Name</b>	<b>Organisation</b>
Abdul Rahman Faiyah Bah	Life for African Mothers (LFAM)
Akinwumi Ifeoluwa Alex	Obafemi Awolowo University Teaching Hospitals Complex
Alexander Ansah Manu	Liverpool School of Tropical Medicine
Professor Anthony Costello	Lancet Countdown for Climate Action and Health
Arindam Bit	National Institute of Technology, Raipur, India
Brian Turyabagye	MamaOpe Medicals
Caspar Addyman	Goldsmiths, University of London
Catherine Draper	University of the Witwatersrand
Cyril Engmann	PATH & University of Washington
Emma Jolley	Sightsavers
Fiona Denison	University of Edinburgh
Gabriella Conti	University College London
Gita Parihar	Environmental Advocate
Hoang Minh Tu Van	Oxford University Clinical Research Unit
Sir Ian Diamond	Plan UK

## List of Attendees

<b>Name</b>	<b>Organisation</b>
Inês Varela-Silva	Loughborough University
Isaac Akinwumi	Covenant University
Janette Chow	Department of Experimental Psychology, University of Oxford
Jolene Skordis	University College London
Joni Pegram	Project Dryad
Judith Kimiywe	Kenyatta University
Kevin Chan	Memorial University
Lisa Morriss	Lancaster University
Maiwenn Kersaudy-Kerhoas	Heriot Watt University
Marie Williams	Dream Networks/University College London
Mbu Enow Robinson	Ministry of Public Health, Yaounde, Cameroon
Meghna Das	UNICEF UK
Mehran Moazen	University College London
Melanie Luhrmann	Royal Holloway & Institute for Fiscal Studies
Mercy Musomi	Girl Child Network
Momodou K Darboe	MRC Unit The Gambia LSHTM
Monica Lakhanpaul	University College London, GOS Institute of Child Health

## List of Attendees

<b>Name</b>	<b>Organisation</b>
Motlalepula Pholo	Department of Agricultural Research, Botswana
Muki Shey	University of Capetown
Muzalema Mwanza	Safe Motherhood Alliance
Pamela Wadende	Kisii University
Pasco Fearon	University College London
Priti Parikh	University College London
Queen Dube	College of Medicine
Rebecca Bright	Therapy Box
Rebecca Philipsborn	Emory University
Rob Hughes	Children's Investment Fund Foundation & LSHTM
Ronita Luke	COMAHS, University of Sierra Leone
Rosalyn Archer	mOm Incubators Ltd.
Sabine Little	University of Sheffield
Siddharudha Shivalli	London School of Hygiene and Tropical Medicine
Sneha Krishnan	London School of Hygiene and Tropical Medicine
Stephen Bayley	University of Cambridge
Stephen Tashobya	Wekebere



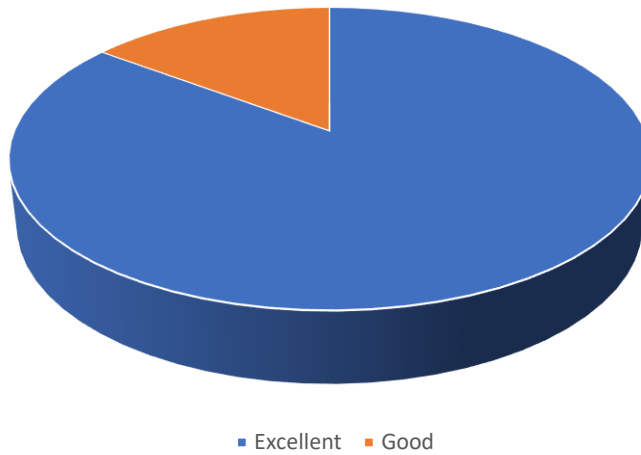
## List of Attendees

<b>Name</b>	<b>Organisation</b>
Suchitra Rath	Ekjut
Sung-Hwan Jang	University of Plymouth
Sunil Bhopal	Royal Victoria Infirmary, Newcastle upon Tyne/LSHTM
Teresa Mwoma	Kenyatta University
Tina Chowdhury	Queen Mary, University of London
Victoria Nakibuuka	Nsambya Hospital
Vijayata Sengar	Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda, Vadodara, India
Viji Velusamy	Manchester Metropolitan University
Zacharia Kimengich	Kenyatta National Hospital
Zelee Hill	University College London

## Annex B: Evaluation Form Feedback

(Based on 27 respondents)

Please rate the event overall



Would you recommend attending a Frontiers of Development symposium?

