

Institution: University of Liverpool		
Unit of Assessment: UoA2		
Title of case study: The Malawi Developmental Assessment Tool (MDAT): A cheap, globally accessible, open-access child developmental assessment tool enabling robust investments to improve child outcomes.		
Period when the underpinning research was undertaken: 2006-2012		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Professor Melissa Gladstone	Honorary Research Fellow (2006-2010) Clinical Lecturer in Child Health (2010-2015) Senior Lecturer (2015 – 2019) Professor (2019 -)	2006 onwards
Professor Gill Lancaster	Lecturer in Medical Statistics	1998-2007
Professor Rosalind Smyth	Professor of Paediatric Medicine	1990-2012
Period when the claimed impact occurred: 2014 onwards		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact		
<p>Poor child development affects over half of all children globally leading to poor future human capital. Sustainable Development Goals (SDG) set by United Nations strive to address this but agencies are hindered by available tools to measure change. Most tools are costly, culturally inappropriate and complex. Malawi Developmental Assessment Tool (MDAT) is currently used in more than 25 countries enabling agencies (World Bank, Save the Children, Medicins Sans Frontiers) and Governments to measure early child development (ECD), promoting investment of more than USD90,000,000 and benefitting approximately 400,000 children. MDAT methodology underpins new ECD measurement tools for WHO, UNICEF, World Bank for future tracking of SDG 4.2.1.</p>		
2. Underpinning research		
<u>LACK OF A SUITABLE TOOL TO MEASURE CHILD DEVELOPMENT IN LMIC SETTINGS:</u>		
<p>Gladstone's early clinical research in Malawi identified worrying developmental delays in children sick with HIV, malaria and malnutrition. Improved medical care globally meant that more children than ever were surviving but suffering developmental delay and associated disorders. The major problem, Gladstone realised, was the lack of a robustly validated tool to measure early child development (ECD) in a simple, cheap, culturally specific way for young children (0-5 years). Such an assessment tool is essential for the evaluation of children and their response to interventions in an African context. Existing tools were complex, primarily American (not culturally relevant), and prohibitively expensive (approximately GBP1,500/ kit). It was thus impossible to measure ECD or quantify improvement following clinical or public health interventions.</p> <p>Our multidisciplinary University of Liverpool team, Gladstone (Neurodevelopmental Paediatrics), Smyth (Paediatrics) and Lancaster (Biostatistics), conducted preliminary studies detailing difficulties using Western tools [3.1], and used qualitative studies to unravel the conceptualization of child development in African contexts. We then iteratively developed Malawi Developmental Assessment Tool (MDAT), a valid tool relevant to motor, language and social development of young children in Malawi and elsewhere in Africa [3.2]. We then refined and robustly tested MDAT using detailed psychometric techniques creating population-based age-bands for developmental milestones for 1,446 children from 0-6 years (PLoS Med 2010) [3.3]. MDAT has a simple-to-use scoring system [3.3], is sensitive to differences between children with different medical conditions and is predictive of later school achievement [3.4][3.5]. MDAT has now been validated in over 200 published studies and the versatility of the tool has resulted in widespread use, spanning Africa, South East Asia, South America and the Middle</p>		

East.

MDAT USE IN MAJOR INTERVENTION PROGRAMME EVALUATIONS LEADING TO FURTHER INVESTMENT:

The NEEP-IE study (Save the Children) in Malawi, (with Liverpool involvement), used MDAT to evaluate impacts of childcare centre-based integrated nutritional and agricultural interventions on diet, nutrition and development in young-Malawian children [3.6]. This work, alongside other studies in Malawi (including the PECD study, an evaluation of children's development with improved access to Community-Based Child Care Centres, independent of UoL MDAT team), utilised the MDAT and the evidence has led to further investment and significant impact. Similar studies in the Gambia (World Bank and without UoL MDAT team involvement) also used MDAT to evaluate children's development in hundreds of Community-Based Child Care Centres, also leading to a scale-up of investment.

Adaptions of the MDAT to produce separate evaluation tools, widening scope and application are ongoing. These include the development of a mobile app for use in Kenya, Haiti and Uganda (the UNICEF IDEC project). The MDAT app incorporates the MDAT red flag system to support decisions on individual child referrals and over 150 community health workers are receiving training to use the tool. Also, in Uganda and Malawi, the MDAT is used as a screening tool for new interventions to support mothers of children with disabilities. This has already provided clear evidence as to the prevalence of child disability within these settings, identifying where improved services and support are required.

3. References to the research

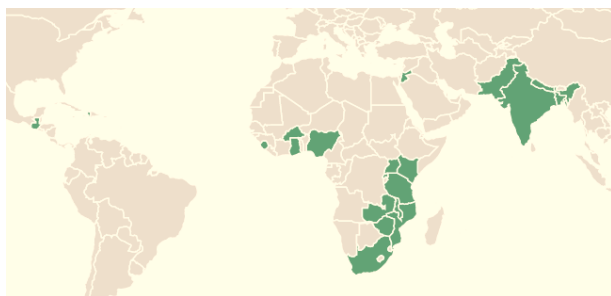
- [3.1] Gladstone, M., Lancaster, G.,** Jones, A., Maleta, K., Mtitimila, E., Ashorn, P. & **Smyth, R. L.** 2008. Can Western developmental screening tools be modified for use in a rural Malawian setting? *Archives of Diseases of Childhood*, 93, 23-29.
<http://dx.doi.org.liverpool.idm.oclc.org/10.1136/adc.2006.095471>
- [3.2] Gladstone, M., Lancaster, G.,** Umar, E., Nyirenda, M., Kayira, E., Van Den Broek, N. & **Smyth, R. L.** 2010a. Perspectives of normal child development in rural Malawi - a qualitative analysis to create a more culturally appropriate developmental assessment tool. *Child Care Health Dev*, 36, 346-53. <https://doi.org/10.1111/j.1365-2214.2009.01008.x>
- [3.3] Cheung, Y. B., Gladstone, M.,** Maleta K., Duan, X. & Ashorn, P. 2008. Comparison of four statistical approaches to score child development: a study of Malawian children. *Trop Med Int Health*, 13, 987-93. doi: <https://doi.org/10.1111/j.1365-3156.2008.02104.x>
- [3.4] Gladstone, M., Lancaster, G. A.,** Umar, E., Nyirenda, M., Kayira, E., Van Den Broek, N. R. & **Smyth, R. L.** 2010b. The Malawi Developmental Assessment Tool (MDAT): the creation, validation, and reliability of a tool to assess child development in rural African settings. *PLoS Med*, 7(5), e1000273. <https://doi.org/10.1371/journal.pmed.1000273>
- [3.5] Gladstone, M,** White S, Kafulafula G, Neilson JP, Van den Broek N. Post-neonatal mortality, morbidity, and developmental outcome after ultrasound-dated preterm birth in rural Malawi: a community-based cohort study, *PLoS Medicine*, 2011 Nov;8(11):
<https://doi.org/10.1371/journal.pmed.1001121>
- [3.6] Gelli, A., Margolies, M. Santacroce, K. Sproule, S. Theis, N. Roschnik, A. Twalibu, G. Chidalengwa, A. Cooper, T. Moorhead, M. Gladstone, P. Kariger, and M. Kutundu.** 2017. 'Improving child nutrition and development through community-based childcare centres in Malawi - The NEEP-IE study: study protocol for a randomised controlled trial', *Trials*
<https://doi.org/10.1186/s13063-017-2003-7>

4. Details of the impact

Since 2014, Malawi Developmental Assessment Tool (MDAT) has enabled the assessment and monitoring of development in over 37,000 young children in numerous low and middle-income countries. The MDAT has been translated into over 20 languages and used in over 25 countries. Over 300 community workers, doctors and nurses are trained to use the tool (shown in the map below). The MDAT has been highly evaluated in a major systematic review identifying it as one of the most promising tools to both identify and monitor young children with disabilities at primary healthcare level in Low Middle Income Country settings [5.1].

This global use of the MDAT includes adoption by leading international agencies, underpinning

decisions to invest in public health interventions and programmes to measure child development. The resulting investment of more than USD90,000,000 (2018), as described below, will benefit approximately 1,600,000 children in Malawi and Gambia.



Map showing the global use of the MDAT including Africa, South East Asia, South America and Middle East

EXAMPLES OF THE MDAT INFORMING FURTHER INVESTMENT IN EARLY CHILD DEVELOPMENT INTERVENTIONS:

The inclusion of the MDAT to provide a primary outcome measure of child development as a result of an intervention has resulted in large-scale investments to expand early child development (ECD) interventions involving the Liverpool team, notably:

- World Bank Malawi preschool quality improvement study, using community-based child care to improve ECD. MDAT outcomes underpinned subsequent large scale USD60,000,000 (11-2018) investment, with the investment benefitting over 1,200,000 children across 10 districts in Malawi [5.2]. The importance of identifying and quantifying child development in the early years and strategically investing to benefit ECD is recognised by the Ministry of Gender, Community Development and Social Welfare. The Chief Child Development Officer has stated *“having used the MDAT for our initial studies, we have discovered that the tool provides all the important features for identifying how our community based child-care centres are supporting the development of children in Malawi”* [5.3].
- A similar World Bank USD30,000,000 (04-2018) investment in Gambia has also benefitted over 400,000 children [5.4]

Correspondence (e-mail) from a Senior Economist from the World Bank who was involved in the programmatic work in Gambia stated:

“...the government is expanding the ECD programs in the country. The work, using the MDAT testing has certainly played a role. I believe there is a room to get them to adopt it as a measure of quality going forward” [5.4]

MDAT USEABILITY AND COST SAVINGS:

Due to its proven accessibility, validity, reliability, and low cost, MDAT has enabled programmatic evaluations to include child developmental measures as a primary outcome. The MDAT was included in the first version of the World Bank Tool kit in 2009 and is included in the updated version published in 2017 [5.5]. As described by a research specialist (University of California, Berkeley) and Independent consultant, who has used the tool in research and programmatic evaluations, within multiple country settings since 2009 [5.6]: *“We have found that the MDAT can provide us with the important information about what the children can do, in a more typical and familiar environment and using items that they are familiar with. Items in the MDAT draw on some of the skills that are measured using Western tools, but in a more organic way and at a lower cost”*

Similarly, the economist at the World Bank Mozambique Office found the flexibility of the MDAT and the adaption to the local cultural context was invaluable while conducting assessments in rural Mozambique during the Education Sector Support Project (ESSP), supporting the Mozambique government [5.7]: *“I really appreciated the use of local pedagogical material that we could find on the field. We didn’t need to import from Europe or the States, we could go to the market and find it or adapt to what we could find locally”*. Sourcing local materials is also much cheaper, for example, a local MDAT kit costs approximately GBP45 per child (versus

approximately GBP2,000 for UK or US based tools such as Griffiths or Mullen, plus training costs for ensuring reliability and validity). Assessing 3,500 children in the World Bank Malawi evaluation (2014-2017) would cost approximately GBP73,000 to use the Bayley III tool for evaluation (at GBP2,000 per kit), whereas the MDAT evaluation cost approximately GBP2,400 in total, with a cost saving of over GBP70,000 for the duration of the study.

IN COUNTRY TRAINING EXPERTISE:

Further advantages are the lower cost to train Assessors to use the MDAT, which is cheaper than for comparable tools and also enables a diverse range of healthcare workers to train in conducting MDAT assessments. The MDAT training packages are easily accessible through our website, along with videos for each item, training manual and downloadable presentations. The open access nature of the MDAT and tablet app options has widened the use through capacity building within countries. The MDAT systems of “Training of Trainers” and “Expert Trainers” has been utilised in Mozambique [5.7], Rwanda [5.7], Malawi [5.3] and Uganda [5.8], where local Expert trainers and Training of Trainers are able to provide training within their home country and native language(s), reducing the cost and time taken to train assessor teams, community health workers or enumerators.

COMMUNITY MONITORING AND TABLET BASED APPLICATION:

The availability of tablet-based and app-based data collection tools and computer assisted scoring systems facilitate data collation, analysis and dissemination, the ease of use and analysis has made the MDAT widely accessible. The tablet app REFER has been developed and used in Kenya, with over 150 community health workers trained to screen and identify children with disabilities which then triggers appropriate support from services and community workers [5.8]. Similarly, in Mozambique, using the MDAT in the field for the Education Sector Support Project, the provision of the MDAT in a tablet-based app, made the assessments easy to implement in varied rural settings [5.7].

Currently, the MDAT has also been adapted and developed to ensure better monitoring and identification at community level, of children with developmental disorders in an easy to use format, the MDAT-IDEC. This project (the Intervention for Disability in Early Childhood, IDEC), run by UNICEF and the Uganda team, has been rolled out in Mubende & Kasanda districts in March 2020 and to date 16 countrywide National Master trainers, 72 district-based frontline workers and supervisors, along with 50 Village Health Teams have now been trained and are routinely assessing children. Since March 2020 and despite the pandemic, 64 children identified through the “red flag” system have benefitted from referral and individual intervention plans to date, with NGO financial support enabling access to interventions for all [5.8].

MDAT METHODOLOGY AND EXPERTISE UNDERPINS NEW GLOBAL INDICATORS AND MEASUREMENT TOOLS (GSED) FOR SCREENING AND EVALUATION:

The MDAT team is co-leading work to create new evaluation tools and MDAT methodology has significantly contributed to the development of new indicators which are quicker for assessing children and will allow better assessments at both programmatic and population level. The MDAT team worked with WHO to first create the IYCD (Infant and Young Child Developmental Indicators) which now has contributed to the short form of the GSED (Global Scales of Early Development) [5.9], [5.10]. The new GSED Global Scales of Early Development aims to enable measurement of child development of populations of young children at a programmatic, local and global level [5.10]. The work is funded by Gates Foundation and Bernard Van Leer and is currently being standardised for the WHO, on 7,400 children in six countries initially (Pakistan, Bangladesh, Tanzania, Ivory Coast, Holland and Brazil), using MDAT expertise including methodology and training procedures, training materials and field-based work. [5.6], [5.9], [5.10].

5. Sources to corroborate the impact

[5.1] Fischer, V. J., Morris, J. & Martines, J. 2014. **Developmental screening tools:** feasibility of use at primary healthcare level in low- and middle-income settings. *J Health Popul Nutr*, 32,

314-26.

[5.2] Investment in Malawi:

World Bank Project Appraisal Document: INVESTING IN EARLY YEARS FOR GROWTH AND PRODUCTIVITY IN MALAWI PROJECT November 27, 2018 (Public Disclosure Authorised)
<http://documents.worldbank.org/curated/en/172701545534083794/pdf/MALAWI-PADf-11302018-636811128679250963.pdf>

[5.3] Statement: Chief Child Development Officer, Ministry of Gender, Community Development and Social Welfare: Investment in Malawi Community based child-care centres and investment.

[5.4] Investment in Gambia: i.Senior Economist: Correspondence by e-mail ii. World Bank Press Release iii. World Bank Project Appraisal Document:
<http://documents.worldbank.org/curated/en/710131522702161197/The-Gambia-PAD-P162890-corrected-9-Mar-2018-03092018.docx>

[5.5] World Bank ECD Measurement Toolkit 2018: Fernald, L., Prado, E., Kariger, P. & Raikes, A. 2018. A Toolkit for Measuring Early Childhood Development in Low- and Middle-Income Countries. International Bank for Reconstruction and Development /The World Bank, Washington DC 20433: Strategic Impact Evaluation Fund, the World Bank.
<https://www.worldbank.org/en/programs/sief-trust-fund/publication/a-toolkit-for-measuring-early-child-development-in-low-and-middle-income-countries>

[5.6] Statement: Research Specialist at the University of California, Berkeley and Independent Consultant. Experience of Using the MDAT across multiple programmes in multiple Countries and the development of the Global Scales of Early Development.

[5.7] In-country expertise and MDAT training provision:

i.Statement: Economist, World Bank, Mozambique Office: Training and MDAT assessments in the World Bank support of the Mozambique Government Education Sector Support Programme.
 ii.Research Manager, Laterite, Rwanda: Use of the MDAT to support evaluations in Rwanda and in country development and benefits of MDAT expertise through Training the Trainers.

[5.8] Community based monitoring and referral:

i.REFER project in Kenya using the MDAT as a tablet based app for community monitoring of ECD

<https://esrc.ukri.org/news-events-and-publications/impact-case-studies/the-mobile-app-supporting-kenyan-healthcare>. ii.UNICEF IDEC model Uganda statements: a) Clinical Psychologist (MDAT Expert Trainer) and b) Health Specialist ECD, UNICEF, Uganda: Creating the MDAT-IDEC and training within the community: Training the National Master Trainers and Community Assessors.

[5.9] MDAT Team expertise in the development of the WHO Indicators of Infant and young Child Development (IYCD) and WHO Global Scales of Early Development (GSED):

i.Lancaster, G. A., et al. 2018. **Creation of the WHO Indicators of Infant and Young Child Development (IYCD):** Metadata synthesis across 10 countries. BMJ Global Health 3(5).

<http://dx.doi.org/10.1136/bmjgh-2018-000747> ii.Hyperlink for IYCD webpage:

<https://ezcollab.who.int/iycd/terms> iii.Inter-American Development Bank Blog: Hyperlink: <https://blogs.iadb.org/desarrollo-infantil/en/assessing-early-childhood-development-remotely/> Screenshots and further page hyperlink: <https://bernardvanleer.org/app/uploads/2016/06/Early-Childhood-Matters-2016.pdf>

[5.10] WHO GSED and IYCD tool development: Testimonial from the Head of the Brain Health Unit in the Department of Mental Health and Substance Use, WHO, Geneva, Switzerland