

Measuring child development in low and middle income countries

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1 Background

Recent advances in healthcare have seen a substantial reduction in infant mortality across the world, however, despite a larger proportion of children surviving, they are not necessarily thriving in their early childhood [1]. The early years of a child's life are key to development and therefore it is essential to promote long-term health outcomes [2]. While there are a range of tools to measure Early Child Development (ECD) in Western cultures, less exist specifically for low-and-middle-income countries (LMIC). ECD can be inhibited by poverty, lack of stimulation, and nutritional deficiencies.

2 Early Child Development (ECD) Data

The Malawi Developmental Assessment Tool (MDAT) [3] is a tool specifically designed to address the gap of culturally appropriate development tools in low-and-middle income countries. The validated tool contains 136 items split equally across four domains of development: gross motor, fine motor, language and social skills. Data are also available for MDAT items not administered in other studies (Table 1). A range of additional contextual information was also collected across studies.

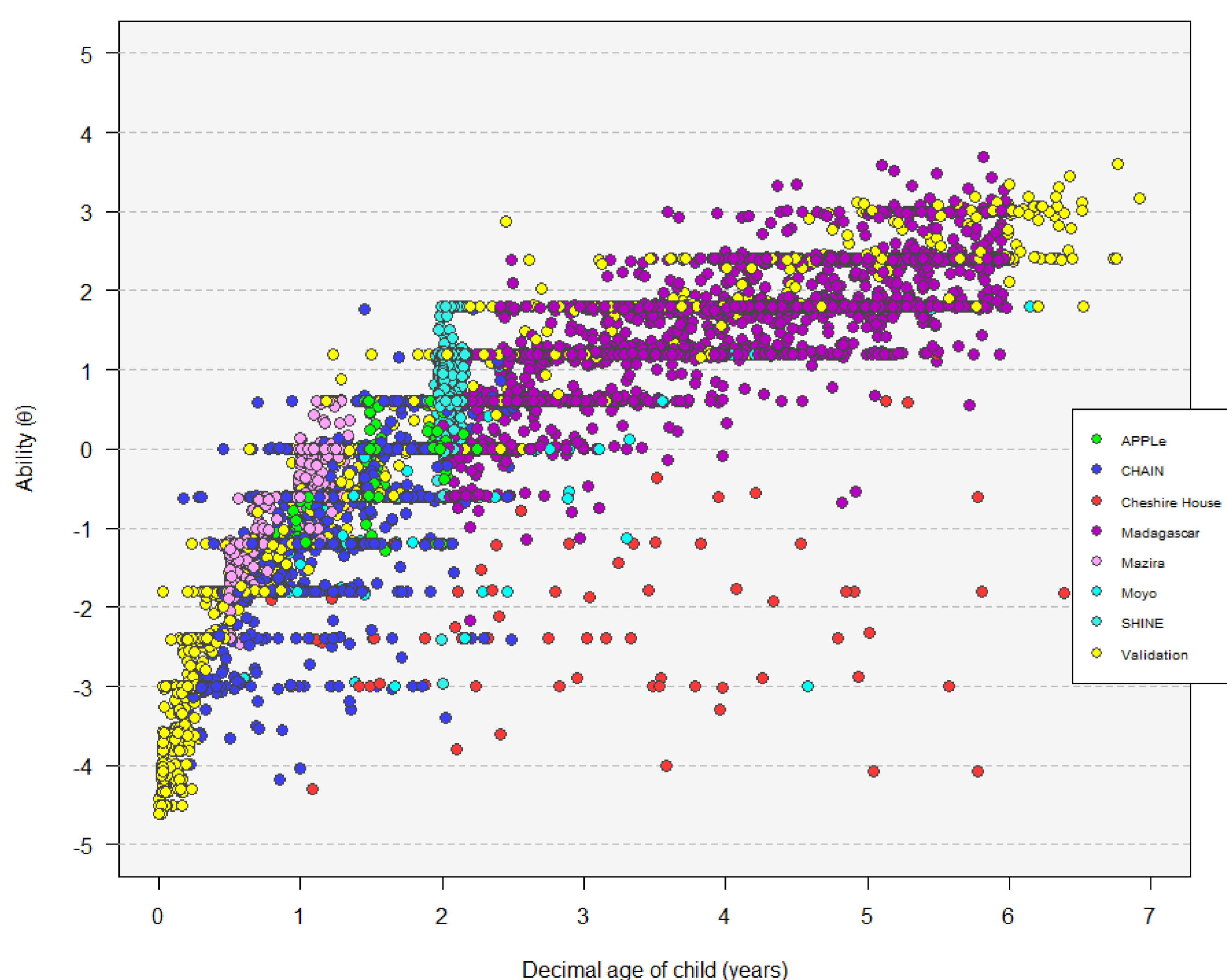


Figure 1: Plot showing estimated child ability based on responses to the MDAT, split by study, by age (in years)

3 Aims

1. My project will assess the performance of statistical methods used for test development, specifically, the Rasch and Item Response Theory (IRT) approaches, in a child development setting.
2. ECD data is modelled as unidimensional, and a total score on the tool reflects their ability, i.e. development. Domain subscales are also of interest, and analyses will assess whether domain specific subscales are justified and reliable.
3. Relationships between external contextual variables and development scores from the MDAT will be explored. Factors at both the child and care-provider levels will be considered.

Study	Number of children	Age range	Domains
APPLE	563	1yr-2yr	GM, FM, LA, SO
CHAIN	1068	2mth-2.5yr	GM, FM, LA, SO
Cheshire House	80	9mth-6.4yr	GM, FM, LA, SO
Madagascar	2319	18mth-6yr	FM, LA, SO
Mazira	1231	5mth-16mth	GM, FM, LA, SO
Moyo	120	6mth-6yr	GM, FM, LA, SO
SHINE	1996	1.8yr-2.4yr	GM, FM, LA, SO
Validation	1513	0yr-7yr	GM, FM, LA, SO

Table 1. A summary of studies where the MDAT has been administered

4 Methods

Item Response Theory (IRT) or Rasch analysis [4] are alternative statistical methodologies for item analysis and test development, compared to Classical Test Theory. The MDAT data is scored as pass/fail, therefore, dichotomous models will be used. We see a non-linear relationship between age and ability (see Figure 1), showing that children develop more quickly in the very early years. To account for this, suitable adjustments need to be made to scores to take out the effect of age in the modelling approaches. IRT models will be developed that better explain children's development measured by ECD tools, including multidimensional models and spline-based approaches.

5 Summary

Culturally relevant and up-to-date developmental assessment tools are needed to inform researchers/government bodies how to tackle the large number of under developing children in LMIC. This requires sound statistical and psychometric methodology to be implemented to produce informative and reliable development scores.

References

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