Validation of the Infant-Toddler HOME Inventory among Households in Low Income Communities at the Kenyan Coast

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Abstract

The aim of this paper is to describe the adaptations made to the Infant-Toddler version of the Home Observation Measure of the Environment for use in a low income Kenyan population. A total of 425 (214 girls) children aged 6-35 months were involved in this cross-sectional study. Focus groups and in-depth individual interviews were used to generate culturally appropriate modifications. Translations and back translations of the HOME were carried out using a Panel Approach. A significant number of items from the original HOME (N = 26) showed limited variability and were excluded from the final schedule. Two more items were excluded because of negative item total correlations and ambiguity in scoring. The remaining 17 items had a modest internal consistency (α = .63). We failed to replicate the factor structure of the published measure. The measure did, however, demonstrate a theoretically meaningful relationship with antecedent (maternal education) and child outcome variables (psychomotor development) providing partial evidence for convergent validity. These findings support the idea of a universality of core features of environmental stimulation. However, they also illustrate the need for more in-depth studies of the home environment to identify culture-specific sources of variability between households.

The lack of a cognitively and social-emotionally stimulating environment has been identified as a leading restriction on optimal development among children in low income countries (Walker et al., 2007). It would, therefore, aid early childhood practitioners to have access to an instrument that will enable them to assess home stimulation opportunities in a standardized manner. The Home Observation Measure of the Environment (HOME) (Caldwell & Bradley, 2003) is such a measure. The potential sensitivity of the HOME across different cultural groups has been demonstrated through significant correlations with developmental outcomes, including motor, language, and socio-emotional functioning (Totsika & Sylva, 2004; Bradley, Corwyn, & Whiteside-Mansell, 1996). However, extensive reviews by its authors and others have also identified limitations in the applicability of the full HOME measure across cultures. In addition to the inclusion of items that are inappropriate to other cultural settings, limited reliability has been reported of the full measure (Bradley & Corwyn, 2005; Bradley, Corwyn, & Whiteside-Mansell, 1996). There is also no available literature to support the equivalence of the HOME constructs across contexts. Bradley et al. have suggested that there may be specific core concepts that are universal, while other relevant behaviours may be culturally specific. To develop a means of assessing home stimulation within the East African context, we identified appropriate core concepts from the full HOME protocol, and evaluated additions that were based upon information from the community members.

The original HOME was designed to measure the quality and quantity of stimulation and support available to children in low income households in the USA. The activities sampled mainly focus on the provisions being made by the child's mother. Four versions of the HOME exist, taking into account the changing influences and activities provided for children at different ages. The current study focused on children aged 0-36 months, employing the Infant-Toddler version (IT-HOME). The IT-HOME consists of 45 items which are divided into six aspects of child stimulation and support, described in its manual (Caldwell & Bradley, 2003) as:

- Responsivity – the extent to which a parent responds to the child's behavior, offering verbal, tactile, and emotional reinforcement for desired behavior, and communicating freely through words and actions;
- Acceptance – the degree to which the parent permits the child to elicit less than optimal behavior without resorting to restrictions and punishment;
- Learning material – deals with the provision of appropriate play and learning materials capable of stimulation development;
- Variety – the inclusion of people and events in the child's daily life that bring some variety (without disorganization) into the life of the child;
- Organization – the extent to which there is regularity and predictability (without monotony) in the family schedule, safety of the physical environment, the utilization of the community services as part of the family support system;
- Involvement – defines the extent to which the parent is actively involved in the child's learning and provides stimulation for increasingly mature behavior.

The IT-HOME is designed to be administered during a home visit that takes approximately 60-90 minutes. A binary-choice (yes/no) format is used to score the items through the combination of observation and a semi-structured interview.

The aim of this paper is to evaluate the extent to which the original IT-HOME provides a schedule of home-based stimulation activities appropriate for the specific cultural niche, consisting of low income households at the Kenyan Coast. We were primarily interested in establishing the validity of items through the exploration of their sensitivity to within-household variation and the association between full-scale scores and antecedent factors and outcomes (Bradley et al., 1996; Bradley & Whiteside-Mansell, 1998). We report on the psychometric properties of the resultant schedule of items.

Method

Study Sites

The study took place at two sites selected to represent both rural and urban settings at the Kenyan coast. The rural site was a designated study-area of the Kenya Medical Research Institute, Centre for Geographic Medicine Research (Coast), located in Kilifi District. The majority of the population in Kilifi belongs to the Mijikenda ethnic/linguistic group with most families depending upon subsistence farming. Low literacy levels and high poverty levels characterize the population (Government of Kenya, 2001). Many families are polygamous, and the care of children is shared within the homestead. As the child is weaned, increasing amounts of time are spent under the care of older siblings.

The urban site was Kisauni Location, Mombasa District. This is an area of informal settlements, with approximately 47% of the population living below the poverty line (Ministry of Planning and Development, 2001). The population consists of people from a variety of ethnic and linguistic backgrounds, but with Kiswahili the widely spoken *lingua franca*. Most families live in single-roomed households sharing facilities with other renters. The care of children in the absence of the mother largely falls on the 'ayah' (nursemaid) or older siblings.

The Kenya Medical Research Institute National Scientific and Ethical Committees approved the study. Prior to eliciting individual consent, we held a series of meetings with elders and leaders within the communities. We informed them of the study and obtained consent and cooperation at a community level. The consent form was read out to participants in the language with which they were most familiar, and written consent was obtained from all families and guardians of study participants prior to participation.

The Adaptation Process

We followed a four-stage process of test adaptation developed through extensive experience (Abubakar, 2008; Alcock, Holding, Mung'ala Odera, & Newton, 2008; Carter, Lees, Murira, Gona, Neville, & Newton, 2005; Holding, Abubakar, & Kitsao-Wekulo, 2008; Holding & Kitsao-Wekulo, 2009). Stage 1: Construct Definition; Stage 2: Preparation of the Item Pool; Stage 3: Developing the Administration Procedure; and Stage 4: Evaluation of Adapted Schedule.

Stage 1: Construct definition. The main aim of this stage was to identify ecologically valid expressions of the concept '***promotion of child development***'. This was achieved by defining activities relating to child stimulation and support in the target communities, as well as developing an appropriate vocabulary to express the concepts raised. Information on local beliefs and customs was generated through focus group discussions and direct observations of infants and young children. The six focus groups were used to define local child-rearing practices considered salient in shaping developmental outcomes in infancy. Four of the focus groups were composed of mothers from the community (N = 21, 4-7 per group), one of teachers (N = 7), and the sixth of paediatric nurses (N = 7). Each discussion group was led by a moderator (author EO/AA), and lasted for one hour. In addition to taking written notes, the note taker also recorded and transcribed the proceedings. The points raised were recorded if they were uncontested, or when consensus had been reached following further discussion. Thematic analysis was carried out and is summarized in Table 1.

Table 1

Themes Arising From the Focus Group Discussions on Child-Rearing Practices Considered Salient in Shaping Developmental Outcomes

Theme	Sub themes	Nurses	Teachers	Mothers			
	Group:	Town	Village 1	Village 2	Village 3	Town	
Proper feeding	Breastfeeding healthier than bottled milk	X	X	X	X	X	X
	Provide food that allows them to grow	X			X	X	
Play	Playing with the child	X	X	X		X	
	Let child play	X	X				
	Sing for the child before they sleep			X		X	
	Provide toys for child; bought or made	X	X	X	X	X	X
Good care	Sleep with child	X					
	Keep the child clean			X	X	X	X
	Toilet train	X		X		X	
	Clean sleeping place			X			
	Protect and keep child away from dangerous things						
	Medical care			X		X	X
	Monitor any changes in child's behaviour and health						
Discipline / Training	Spank moderately	X			X	X	
	Teach obedience	X	X				X
	Teach the child to behave well in the presence of visitors	X		X		X	X
	Avoid being too harsh	X			X		
	Teach the child to share	X					
	Try to use talk to avoid beating the child			X		X	
	Avoid the use of foul language	X				X	
	Teach good manners			X			
Experiencing new things	Go with the child everywhere you go	X	X			X	X
Train the child	Include in household chores at 3 yrs.		X				
	Send to school/ Madrassa			X		X	
Family harmony	Harmony between mother and family		X		X		
Show love to the child	Hug/ Play with them/ throw them up and down			X			

Relevant examples of available child-friendly equipment were collected through systematic field observations carried out by a doctoral level medical anthropology student and a field worker who is a member of the community. Older siblings were asked to demonstrate the toys used by their younger siblings, aged 6-35 months. The toys were photographed and then categorized based on the function they serve. Our field observations suggested that toys in this environment differ significantly from those referred to in the HOME manual (Taylor & Katana, 2004).

Stage 2: Preparation of the item pool. The aim was to produce a final schedule of items initially through the production of a conceptual translation of all original items/concepts from the IT-HOME (Caldwell & Bradley, 2003). The descriptions of the items in the original manual provided the guidelines for the conceptual translations. Possible replacement items and probes were identified through participant consultation as described above.

The cultural relevance of each original item was then evaluated by comparing its content to the child-rearing concepts described by community members. The original items were found to fall into three levels of adequacy, determining the degree of complexity of modification required. The highest level of adequacy consisted of activities that demonstrated a common purpose both in the HOME and in the local context. Even at this level activities may differ slightly in content, requiring different prompts or probes in our context. For example, the IT-HOME includes items such as "child is taken to grocery store at least once a week" and "child gets out of the house at least four times a week." Local mothers talked about taking the child with them when going out to sell things, to fetch water, to the 'shamba' (farm) or to visit relatives (31/45 items).

At the second level were items that represented activities appearing in both the HOME and our group discussions, but which have a different conceptual meaning in the two contexts. Items at this level required changes in the coding of responses in order to maintain item equivalence. The role of physical discipline is one example. While in the USA regular use of physical punishment is indicative of a negative relationship, among Kilifi mothers 'minimal spanking' is seen as an essential component of good parenting. Negative behavior was differentially defined by "not spanking every day," but also by "not being too harsh" (10/45 items).

Finally, some activities were context specific. Reading or owning children's books, present in the original HOME, was not an activity reported as important by householders in our community. Activities promoting good health/good grooming (brushing teeth, cutting nails, washing after meals, sleeping in a clean place, breastfeeding, and taking action when a child is ill) were not in the original, but were identified locally as important indicators of good child-rearing practices (4/45 items). Despite the lack of apparent cultural suitability, even items at this level were initially retained for inclusion, with four additional items taken from the community, extending the schedule.

Both the original items and the additional items were expressed in Kiswahili, as the most commonly shared language across the region of interest. The conceptual translation was then back-translated into English by four separate members of the field staff. A panel consisting of child development professionals (psychologists, a paediatric nurse, and educationalists) compared the scripts, paying particular attention to inconsistencies between them that may indicate ambiguities and conceptual errors. This process was continued until a final draft was agreed upon. The draft was submitted to a professional translator, who evaluated the language and content for semantic clarity, and suggested appropriate modifications to the vocabulary used.

Stage 3: Developing and refining the administrative procedure. To evaluate the acceptability of the interview procedure we completed ten in-depth individual interviews with mothers of children aged 3-36 months. Households were selected at random from a census database kept of the study area. Mothers were invited to talk about each item as it related to the target child and his/her family. Parents reported satisfaction with the questioning, suggesting both the content and the interview procedure were acceptable to the community.

Training in administration. A team of six field workers, fluent in the local dialect and familiar with the culture, was trained to administer the inventory. The team came from a diverse background (two males with training in special education, two female high school graduates, one female with background training in early childhood, and one female with background training in assisting with speech therapy). Direct instruction on administration began with role-play sessions, and continued with practice sessions in volunteer homes.

The training process included a sample of 70 children aged 6-35 months, randomly selected from the community. The field-based training began with the trainer acting as

interviewer, with trainees observing, recording and coding responses. Discrepancies in coding were discussed between the team and resolved until consensus was reached. Subsequently, the trainees carried out the interviews, sometimes observed by the trainer, and at other times independently. All answers were written on the interview forms, and coded by at least two team members for comparison. This process was carried out until the trainees attained 90% agreement with the trainer, as described in the U.S. manual (Caldwell & Bradley, 2001).

Responses collected through the training process were also used to further refine the instrument. Changes made included additional clarifications to the vocabulary, to minimize ambiguities. Additional probes and prompts were included to the interview schedule to provide context relevant examples. The responses received also suggested the need for a major revision of the coding system.

Identification of a coding scheme that aimed to maximize variability between households. A review of the responses indicated that only eleven out of the 45 items of the HOME showed adequate variability when we used the binary scoring system of the original. In other resource-limited settings, a three point Likert scale (0, 1, and 2) has been found to increase within-population variance (Baker-Henningham, Powell, Walker, & Grantham-McGregory, 2003). We used the detailed written responses recorded to develop such an approach. Features such as the regularity of an activity and the family member involved in the provision of the activity were used to separate out into the three-point scale. Table 2 provides examples of the extended coding system.

Table 2

Example for Scoring Guidelines

Item	Scoring guidelines
Parent tells child name of object or person during visit	No item is mentioned.
	One or two items mentioned.
	3+ items mentioned.
Parent caresses or kisses child at least twice	Does not caress/kiss child
	Caresses/kiss child once
	Caresses/kiss/stroke hair affectionately throughout/more than once
Parent or sibling structures child's play periods	Nobody structures child's play
	Parent structures child's play periods
	Siblings structures child's play
Parent or sibling keeps child in visual range, looks at him/her often	Nobody keeps an eye on the child
	Siblings keep an eye on the child
	Parent/caregiver keeps an eye on the child
Parent talks to child while doing housework	Child chased away
	Child allowed to watch parent
	Child involved in the activity

Stage 4: Evaluation of adapted schedule. The Kiswahili–IT HOME, consisting of adaptations of the original 45 items and four additional items, were administered alongside a battery of child development measures in households from Kilifi and Kisauni. The Kilifi sample consisted of 320 children (161 girls) with a mean age of 18.70 months (SD = 8.43, range: 6-35 months). A smaller sample of 105 children (53 girls) was recruited in Kisauni, with a mean age of 29.08 months (SD = 3.53; spread: 24-35 months). The Kisauni children were recruited from a larger test validation exercise, which accounts for the more restricted age range of this sample (Abubakar et al., 2008).

Additional Measures

1. *The Kilifi Developmental Inventory* (KDI) assesses psychomotor development in young children, including locomotion, manual dexterity, eye-hand coordination, and balance (Abubakar

et al., 2008). In administering the KDI, an assessor interacts with a child in series of standardized activities. Scores represent achievement in gross motor, fine motor and overall psychomotor development. The KDI has shown excellent internal consistency, inter-observer and retest-test reliability. Evidence for validity includes sensitivity to maturational change and to membership of at risk groups (Abubakar et al., 2009).

2. Socioeconomic status was represented by maternal education (the number of years in formal schooling). The mean number of years of schooling was 4.17, *SD* = 3.82; with 36% of the sample with no schooling.

Procedures

All instruments were administered in the child's home. The HOME interview was administered in a conversational manner with the child's main caregiver and in the presence of the child. The caregiver's responses were recorded during the interview (using written notes made by the interviewer). Both the original interviewer and a second member of the interview team used these notes to score the responses according to the coding guidelines provided, with final item scores achieved by consensus.

Data Management and Analysis Strategies

Data were double entered in FoxPro and verified before being transferred to SPSS (Version 12) for analysis. Item level analysis focused on selecting items demonstrating variability in response (defined as < 70% of responses endorsing one coding) (Gregory, 1992). The psychometric properties of the schedule of the remaining items were then evaluated. Cronbach's alpha was used to compute internal consistency, while Principal Component Analysis (PCA) was carried out to compare the underlying factor structure of the adapted scale to that of the original measure. The convergent validity of the tool was assessed in a path analytic procedure using Amos 5 (Arbuckle, 2003). The model explored the relationship between scores on the home stimulation interview, maternal education, and psychomotor outcome. The fit of the overall model was evaluated using the chi-square statistic, which tests the exact fit of the model, as well as various other fit indices such as the Root Mean Square of Approximation (RMSEA), which measures the discrepancy between the predicted and observed models per degree of freedom.

Results

Rural – urban comparison

Scores from the urban sample of children were compared to those of the rural children from the same age group (24-36 months). In terms of background characteristic mothers from the urban group were significantly more educated (M = 6.49 years of schooling SD = 3.6) than those from the rural group (M = 3.44 years of schooling SD = 3.67) *t.*(200) = -5.86, *p* < .001. However, there was no significant difference in either the modal response by item or in the overall HOME score between the urban and rural samples. The two groups were, therefore, combined for all analyses.

Analysis of the 45 items – three-point scale checklist

Restricted variance was demonstrated, with limited variability in response observed in 57.7% (26) of the original 45 items (see Table 3). The four introduced items also demonstrated little variability. Variance in response on one of these items, *breastfeeding*, was strongly related to age. Under one year of age 96.8% (*N* = 61) were breastfed, between 12-24 months, 82% (*N* = 126), with only 8.5% (*N* = 17) of those over two years still being breastfed. The internal consistency of the 45-item schedule was very low (Cronbach's alpha = .43). PCA identified 17 factors with an eigenvalue greater than 1, in contrast to the original six factors of the published HOME, which was also not replicated by a forced six-factor solution.

Table 3

Score Distribution per Item – 45 Original Items

Items	% endorsement at each level		
	0	1	2
Parent permits child to take part in messy play	2.4	3. 3	94.4
Parent spontaneously vocalizes to child at least twice	0.9	77.9	21.6
Parent responds verbally to child's vocalizations or verbalization	1.6	27.3	71.1
Parent tells child name of object or person during visit	7.1	67.3	25.6
Parents speech is distinct, clear and audible	0.2	0.2	99.5
Parent initiates verbal interchange with visitor	1.6	1.2	97.2
Parent converses freely and easily	0.5	0.2	99.3
Parent spontaneously praises child at least twice during the visit	68.5	17.6	13.9
Parent conveys positive feelings towards child	0.2	6.1	93.6
Parent caresses or kisses child at least twice	40.2	28.0	31.8
Parent responds positively to praise of child offered by visitor	0.9	89.4	9.6
No more than one instance of physical punishment during the past week	8.7	31.5	59.8
Family has a pet	37.2	59.3	3.5
Parent does not shout at child	1.2		98.8
Parent does not express overt annoyance or hostility to child.	0.9		99.1
Parent does not slap or spank child during visit	1.2		98.8
Parent does not scold or criticize child during visit	2.8		97.2
Parent does not interfere with or restrict child during visit	0.7		99.3
At least ten books are present and visible	78.4	19.3	2.4
Child care if used is provided by at least one of three regular substitute	8.5		91.5
Child is taken to grocery stores at least once a week	9.2	31.5	59.3
Child gets out of house at least 2 times a week	5.2	18.8	76.0
Child is taken regularly to doctor's office or clinic	42.4	0.9	56.7
Child has access to toys and treasures	7.8	64.5	27.8
Child's play environment is safe	2.8	0.7	96.5
Muscle activity toys and equipment	26.8	68.7	4.5
Push or pull toys	30.6	63.1	6.4
Stroller or walker or kiddie car, scooter or tricycles	40.0	52.7	7.3
Cuddly toys or role playing toys	34.6	43.8	21.6
Learning facilitators-mobile, table and chairs, high chair and play pen	97.9	1.9	0.2
Simple Eye Hand coordination toys	45.6	53.9	0.5
Complex Eye Hand coordination toys	78.6	18.1	3.3
Toys for literature and music	70.1	29.6	0.2
Parents provides toys for child to play with during visit	45.9	51.8	2.4
Parent talks to child while doing housework	34.4	6.1	59.5
Parent consciously encourages developmental	19.1	0.5	80.5

	% endorsement at each level		
Items	**0**	**1**	**2**
advances			
Parents invest maturing toys with value via personal attention	80.2	2.6	17.2
Parent or sibling structures child's play periods	24.5	62.4	13.2
Parent provides toys that challenge child to develop new skills	87.5	3.8	8.7
Parent or sibling keeps child in visual range, looks at him/her often	0.5	49.4	50.1
Father provides some daily care	11.5	84.5	4.0
Parent reads or tells stories to child	95.5	4.2	0.2
Child eats at least one meal a day with mother and father	70.1	0.9	28.9
Family visits relatives or receives visits once a month or so	8.7	72.7	18.6
Child has his or her own books	98.8	0.5	0.7

Evaluation of a reduced schedule

All items with limited variability were excluded from subsequent analyses. The children's relationship with the *"family has pet"* initially retained with reservations, continued to prove ambiguous and was also excluded. Another item *"mother spontaneously praises child at least twice during the visit"* was excluded for eliciting an extremely low and negative item total correlation. The remaining 17 items demonstrated a modest internal consistency (α = .63). Although PCA (with retention of factors with eigenvalues >1) identified six factors, factor loadings did not suggest any clear underlying structure. A forced single factor solution only accounted for 17% of the variance observed.

Convergent validity. Using a path analytic model we investigated conceptually meaningful associations between maternal education and psychomotor development. In our model, the score on the HOME was conceptualized as having an intervening role between maternal education (antecedent factors) and psychomotor development (outcome). The parameters of the model are presented in Figure 1. The chi square fit value of the model was non-significant (χ^2 (1, N = 425) = .15, p = .70, χ^2/df = .15), which supports a good fit of the predicted and observed relationships. Other statistical indices confirmed the appropriateness of the model: Tucker Lewis Index was 1.00 (recommended > .90), and RMSEA was .00 (recommended < .08). The model indicates that mother's schooling is positively associated with HOME scores (β = .17, p < .01), which in turn is positively associated with psychomotor skills (β = .17, p < .01). However, the amount of variance explained by the model is minimal. Differences in maternal education accounting for only 3.0 % of the variance observed in the HOME score, and the HOME score accounting for only 2.8% of the variance observed in psychomotor outcome.

Figure 1. *Relationship between scores from the brief HOME, maternal educational levels and psychomotor scores measures*

Discussion

The 45-item Infant-Toddler HOME did not provide a reliable instrument for identifying between-household differences in our target community. This was demonstrated by the restricted variability of response to the majority of items from the original schedule and the associated poor internal consistency. This is in contrast to the high internal consistency demonstrated in the population for which the schedule was originally devised (Caldwell & Bradley, 2003), but is consistent with other applications in diverse population groups (Van Baar, 1991; Vedder, Eldering, & Bradley, 1995). These discrepancies may be explained by both cultural differences and the specific socioeconomic context of the sample population being investigated. The different experience of the HOME across different contexts suggest that the original HOME items are relevant to the cultural niche of low income/low education households from societies with moderate to high prosperity, but that the range of activities sampled is less relevant to the extremes of economic conditions such as the target population of the present study.

Poor reliability has been found in contexts other than those where there is restricted availability of child stimulating equipment or activities. Limited variance in response on HOME items, low standard deviations, poor alpha values, and poor discrimination between risk groups is also found among middle-class European households, characterized by widespread availability of resources (Van Baar, 1991). Our premise is further supported by unpublished data from South Africa. Within a national context of relative economic advantage, a more acceptable reliability of the full instrument has been observed when applied to relatively disadvantaged communities (Kvalsvig, personal communication).

The restricted variation, in response to the activities sampled in the original HOME, also contributed to our inability to replicate the original factor structure (Bradley, Mundfrom, Whiteside, Casey, & Barrett, 1994; Bradley & Cadwell, 2001). When we limited our analysis to those items with a less restricted variability in response, the reliability of the measure was demonstrably improved, but we were still unable to demonstrate a meaningful conceptual structure underlying the remaining items. While, through participant consultation techniques, we were able to identify more relevant activities, our results suggest that modifications made to the schedule need to go beyond finding acceptable alternatives to the original activities (Van de Vijver & Tanzer, 2004).

Discussion with our Kenyan mothers indicated that there was a significant degree of overlap between the concepts central to the published HOME and those described by our mothers regarding child stimulation. Significant differences in child-rearing practices, as manifestation of the underlying constructs, may account for the many items from the original HOME that showed restricted variance in our sample. For example, studies show that among African caregivers the pattern of interaction and *responsivity* can differ from that observed more commonly in the West (Kilbride & Kilbride, 1983). When responding to children's request for attention, African caregivers are more likely to move towards the child, as opposed to the more western response of vocalizing support. More detailed observations within households may have more readily elicited alternative examples of the underlying constructs of interest.

One major area of divergence was the importance given to child health by the Kenyan sample. Only one item in the original HOME related to health care issues, namely *"regularity of visit to the doctor"*. In our sample population this item had a negative correlation with outcome, which may largely result from the fact that in resource-limited settings children are taken to a health care facility largely when they are ill, rather than for monitoring or evaluation. The manner in which we chose to expand this concept to reflect the interest of local participants resulted in restricted variability in response, and limited our ability to evaluate the sensitivity of these items as indicators of children at risk. Other manifestations of these activities, such as the timing or nature of weaning habits, may prove to be more sensitive to between-household differences in risk and resilience.

Another difference between the original schedule and our own modifications was the coding scheme. While there were improvements in variance observed by extending the scheme to a three-point scale, in future initiatives we would recommend a return to the binary approach, as being more straightforward to illustrate and to train. A return to a binary approach would require a radical change in coding to reflect true differences in regularity and approach between households. This, too, will require detailed observations at the household level to obtain the salient knowledge. For example, there is a need to address differences in family structure and family roles between communities. This study indicated that the focus on the input of the mother may lead to an inadequate sampling of the child's environmental experiences. In many collectivistic societies, a child's world is defined by multiple caregivers. We currently know little about ways to define key roles appropriately, although responses collected indicate that siblings were actively involved in organizing and structuring the child's daily life, especially for those aspects that relate to play. Indeed, the importance of the role of the sibling is vastly different in collectivistic societies to that found in western countries (Wenger, 1989; Zuckow-Goldring, 2002). The responsibilities of each family member in childcare need more careful documentation and integration into item construction. This observation is similar to that experienced in other collectivistic communities, where it has been concluded:

> "…the HOME was generally less ecologically valid with families from collectivist, interdependent cultures than with those from individualistic, independent cultures" (Bernstein et al., 2005, p. 248).

Despite the limitations described, the more restricted 17-item version was able to show differences between households in our target community. In our context, the suggestion is that the availability of child-friendly equipment in the home (a common feature of the remaining items) is sensitive to both between-household variation and differences in child outcome. The relationships observed, with the home environment measure mediating the relationship between maternal education and psychomotor development is consistent with findings from research across different populations (Bradley et al., 1996). However, in common with data from the US, much of the variability between households' remains unexplained, which suggests that the 17-item schedule provides no more than a core of potentially sensitive items. Future efforts in this population should begin with more detailed ethnographic work to identify other items that have a socio-cultural relevance and that capture child stimulation in a way not currently included in the HOME inventory.

Conclusion

The 45-item HOME inventory, despite extensive adaptations to fit the cultural context, demonstrated limited reliability and sensitivity to within-household differences in low income communities in coastal Kenya. Despite the problems experienced with the psychometric properties of the HOME measure (i.e., a large number of items with limited variance, poor internal consistency, and a lack of an identifiable factor structure), we were able to demonstrate theoretically meaningful relationships with antecedent factors and developmental outcome of a restricted 17-item schedule. This finding indicates that the adaptations made to the HOME were adequate enough to maintain similar levels of discriminant ability to those found in other contexts. Further development is required to incorporate a wider range of sample behaviours, in order to ensure acceptable psychometric properties and account for a greater proportion of variance in outcome observed. However, an adequate measure can only be developed after an extensive ethnographic search aimed at identifying context-specific items and procedures for assessing childcare and parenting behavior.

References

Abubakar, A. (2008). *Infant-toddler development in a multiple risk environment.* Ridderkerk: Ridderprint.

Abubakar, A., Holding, P., Van Baar, A. L., Newton, C., & Van de Vijver, F. J. R. (2007). Monitoring psychomotor development in a resource-limited setting: An evaluation of the Kilifi Developmental Inventory. *Annals of Tropical Paediatrics, 28,* 217-226.

Alcock, K. J., Holding, P.A., Mung'ala Odera, V., & Newton, C. (2008). Constructing tests of cognitive abilities for schooled and unschooled children. *Journal of Cross-cultural Psychology, 39*, 529-551.

Arbuckle, J. J. (2003). *Amos 5.0 user guide.* Chicago, IL: Smallwaters.

Bernstein, V. J., Harris, E. J., Long, C. W., Lida, E., & Hans, S. L. (2005). Issues in the multi-cultural assessment of parent-child interaction: An exploratory study from the starting early starting smart collaboration. *Applied Developmental Psychology, 26*, 241-275.

Baker-Henningham, H., Powell, C., Walker, S., & Grantham-McGregor, S. (2003). Mothers of undernourished Jamaican children have poorer psychosocial functioning and this is associated with stimulation provided in the home. *European Journal of Clinical Nutrition, 57,* 786-792.

Bradley, R. H., & Corwyn, R. F. (2005). Caring for children around the world: A view from around the world. *International Journal of Behavioural Development, 29*, 468-478.

Bradley, R. H., Corwyn, R. F., & Whiteside-Mansell, L. (1996). Life at home: Same time, different places-an examination of the HOME Inventory in different cultures. *Early Development and Parenting, 5*, 251-269.

Bradley, R. H., Mundfrom, D. J., Whiteside, L., Casey, P. H., & Barrett, K. (1994). A factor analytic study of the infant-toddler and early childhood versions of the HOME Inventory administered to White, Black, and Hispanic American parents of children born preterm. *Child Development, 65,* 880-888.

Bradley, R. H., & Whiteside-Mansell, L. (1998). *Home environment and children's development: Age and demographic differences.* Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Caldwell, B. M., & Bradley, R. H. (2001). *HOME Inventory Administration Manual.* Little Rock, AR: Center for Research on Teaching & Learning.

Caldwell, B. M., & Bradley, R. H. (2003). *HOME Inventory Administration Manual.* Little Rock, AR: Print Design, Inc.

Carter, J.A., Lees, J.A., Murira, G.M., Gona, J., Neville, B.G., & Newton, C.R. (2005). Issues in the development of cross-cultural assessments of speech and language for children. *International Journal of Language and Communication Disorders, 40*, 385-401.

Government of Kenya. (2001). *Poverty eradication strategy paper, Kilifi district 2001-2004.* Nairobi: Ministry of Finance and Planning.

Gregory, R.J. (1992). *Psychological testing: history, principles and applications.* Boston: Ally and Bacon.

Holding, P., Abubakar, A., & Kitsao-Wekulo, P. (2008). *Adapting tests and questionnaires for use in the African context.* Retrieved from http://www.csdiworkshop.org/index.php?option=com_content&view=article&id=52:adaptation-and-translation&catid=8:2008-3mc-conference&Itemid=40

Holding, P.A., & Kitsao-Wekulo,P. (2009). Is assessing participation in daily activities a suitable approach for measuring the impact of disease on child development in African children? *Journal of Child and Adolescent Mental Health, 12,* 127-138.

Kilbride, P. H., & Kilbride, E. (1983). Socialization for high positive affect between mother and infant among the Baganda of Uganda. *Ethos, 11*, 232-245.

Ministry of Planning and Development. (2001). *Mombasa district poverty reduction strategy paper*. Nairobi: Government Printers.

Taylor, N., & Katana, K. (2004). *Learning materials: Internal report.* Kilifi, Kenya: KEMRI-CGMR.

Totsika, V., & Sylva, K. (2004). The home observation for measurement of the environment revisited. *Child and Adolescent Mental Health, 9*, 25-35.

Van Baar, A. (1991). *The development of infants of drug dependent mothers.* Amsterdam: Swets and Zeitlinger.

Van de Vijver, F. J. R., & Tanzer, N. K. (2004). Bias and equivalence in cross-cultural assessment: An overview. *European Review of Applied Psychology, 54,* 119-135.

Vedder, P., Eldering, L., & Bradley, R. H. (1995). The home environment of at risk children in the Netherlands. In L. W. C. Tavecchio (Ed.), *Advances in family research* (pp. 69-76). Amsterdam: Thesis Publishers.

Walker, S. P., Wachs, T. D., Gardner, J. M., Lozoff, B., Wasserman, G. A., Pollitt, E., & Carter, J. A. (2007). Child development: Risk factors for adverse outcomes in developing countries. *Lancet, 369,* 145-157.

Wenger, M. (1989). Work, play, and social relationships among children in a Giriama community. In D. Belle (Ed.), *Children's social networks and social supports* (pp. 96-104). New York: Wiley.

Zuckow-Goldring, P. (2002). Sibling caregiving. In M. Bornstein (Ed.), *Handbook of parenting* (2 ed., Vol. 3, pp. 253-286). Mahwah, NJ: Lawrence Erlbaum.