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Housing conditions and mental health of orphans in South Africa

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Abstract

Literature from the developed world suggests that poor housing conditions and housing environments contribute to poor mental health outcomes, although research results are mixed. This study investigates the relationship between housing conditions and the socio-emotional health of orphans and vulnerable children (OVC) in South Africa. The results of the study are mainly inconclusive, although it is suggested that methodological considerations play a vital role in explaining the mixed results. However, a positive relationship was found between living in informal settlements and better socio-emotional health of the OVC. We speculate that the historical context of informal settlement formation in South Africa helps to explain this unexpected result.

Keywords

housing conditions; orphans; mental health; informal settlements

1. Introduction

Although a strong link has been established in epidemiological research between living environments and health, the causal relationship in this respect is less clear (Bradley, et al., 1992; Galea and Vlahov, 2005; Thomson and Petticrew, 2005). The same holds true for the relationship between urban living, housing and mental health (Evans, 2003; Galea, et al., 2009). The difficulty of determining causality increases in studies investigating the relationship between housing conditions and the mental health of children (Evans, et al., 2002). Although there is a growing body of literature on orphans and vulnerable children (OVC) in Africa and South Africa in particular (Cluver and Gardner, 2006; Cluver, et al., 2007; Cluver and Orkin, 2009; Hermenau, et al., 2011; Harms, et al., 2009; Musisi, et al.,

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2008; Sturm and Gresenz, 2002), the mental health status of orphans has been associated mainly with orphan-hood itself and to some degree with poverty and malnutrition (Cluver and Orkin, 2009; Makame, et al., 2002). These studies differ in their assessment of whether orphan-hood *per se* contributes to higher levels of mental health problems as compared to other groups of vulnerable children. Some authors report that distinct differences in the mental health of orphans and non-orphans are present (Atwine, et al., 2005; Cluver, et al., 2007; Cluver and Gardner, 2006; Cluver and Orkin, 2009), while others argue that no significant differences are visible (Musisi, et al., 2008). Considering the fact that South Africa has a growing population of OVC, an important question to examine is the relationship between housing environments and the mental health of OVC.

The built environment is an important factor in people's health (including mental health). Despite some exceptions, the majority of studies have been conducted in the developed world. Reasons for this are that human beings spend up to 90% of their lives indoors (Evans, 2003)[1], children spend most of their time inside their homes (Gifford and Lacombe, 2006), people invest financial, psychological and other resources in their houses and the home is the venue where the most significant contact takes place with other household members (Evans, et al., 2003). Despite these realities, Evans et al. (2003, p. 475) argue that "… research on housing and mental health is remarkably underdeveloped". Although some conceptual work has been done to understand the relationship between housing and mental health, "existing evidence on it is weak, mixed, and thin" (Gifford and Lacombe, 2006, p. 178). This inconclusiveness can be related to a range of methodological aspects (Hopton and Hunt, 1996), including the self-selection or drift of people into specific settings (Evans, 2003). In addition, Evans (2003) also mentions problems related to the measurement of environmental factors, poor estimations of the scale and time of exposure, a large degree of self-reporting, the difficulty of assessing non-linear relationships and the "embeddedness" of a range of factors (for example housing, neighbourhood and socio-economic status).

In an assessment of existing research, Evans concludes that the following five factors related to the built environment play a role in mental health status: housing, crowding, noise, indoor air quality and institutional settings. The first four aspects are discussed in more detail below; institutional settings are not discussed as none of the orphans we interviewed were residing in institutional settings such as orphanages or psychiatric institutions. According to Evans, a number of housing attributes play a role in mental health outcomes: house type, house quality, floor level (for example the 10^{th} floor of a double story building) and neighbourhood quality. In respect of housing type, a number of studies have found that living in high rise buildings contributes to poor mental health of mothers and most likely their children (Evans, et al., 2003). A number of studies have considered the relationship between mental health and living conditions (Araya, et al., 2003; Brown, et al., 1995; Elliott, 2000; Mullick and Goodman, 2005) or aspects of housing quality such as structural defects, maintenance, availability of amenities, dampness, cockroach and rodent infestation and levels of housing dissatisfaction (Evans, et al., 2003; Hopton and Hunt, 1996). Some of this research has shown relationships between poor quality in terms of these indicators and lower mental health outcomes, with Evans et al (2001) being one of only a few studies focusing specifically on children's mental health.

Finally, a number of studies have referred to the contextualisation of housing within a neighbourhood (Evans and Kantrowitz, 2002; Wandersman and Nation, 1998), with most of these studies embedded in theories of social disorganisation (Galea, et al., 2009).

[1]As we will argue later in this paper, this notion is probably biased towards countries in Europe and North America. Consideration should be given to the fact that in South Africa, people spend more time outdoors, and therefore the environment surrounding the house should also be viewed as an important factor.

Essentially, the argument is that poor housing conditions cannot be disassociated from decaying neighbourhoods, which themselves have negative impacts on children (Caspi, et al., 2000). Rogers et al. (2008:364) argue that decaying neighbourhoods lead to "… psychological distress because of exposure to the impact of uncontrollable events, psycho-social insults and the negative impact of unemployment, disruption, violence and crime and the lack of supportive relationships." In a similar manner, Weich et al. found positive associations between depression and specific neighbourhood features such as the presence of graffiti, while Gifford and Lacome found that housing quality and neighbourhood quality both had an impact on the socio-emotional health of children. Despite these studies, Evans and Kantrowitz (2002, p. 324) argue that the "role of housing and neighbourhood quality in cumulative risk exposure among low-income children is not adequately appreciated".

Crowding – commonly expressed in terms of the number of people per room – has been identified as one of the main housing-related factors that contribute to poor mental health outcomes (Evans, et al., 1998; Evans, et al., 2003), in particular for children (Maxwell, 1996; Evans, et al., 1998). The literature shows that crowded conditions lead to a larger degree of corporal punishment, a larger degree of conflict, a reduction in parent / caregiver responsiveness and subsequent behavioural problems and poorer mental health of children (Evans and Lepore, 1993; Evans, et al., 2002; Evans, et al., 2003). Crowding has also been associated with skin conductance amongst boys, delayed cognitive development, diminished reading ability, behavioural problems at school, relinquishing choice over reward and children being less likely to solve a puzzle, with female children being more profoundly affected (Evans, 2001; Evans, et al., 1998).Evans et al. (1998) rightfully point out that "although the vast majority of children in the world live in economically underdeveloped countries nearly all data on crowding and children emanate from the North". This highlights the need for studies exploring the relationship between crowding and mental health in developing world contexts.

Noise has commonly been associated with poor mental health (Evans, 2003; Lercher, et al., 2002). In this regard, Lercher et al. (2002, p. 380) state that "… the correlation between mental health and ambient noise is larger in children with early biological risk". At the same time, the availability of in-door lighting has been associated with good mental health outcomes (Evans, 2003).

Despite the above relationships discussed in the literature, causality seems to be inadequately explored. Evans (2003) proposes three explanatory frameworks, namely control, social support and restoration. Supported by other research, Evans (2003) first argues that people have better mental health outcomes when they are able to control their environment, more specifically their housing environment. This is because a lack of control can lead to helplessness. The link between helplessness and aspects of the built environment such as crowding, noise and pollution has been well-established for both children and adults (Evans, 2003). The relationship between social support and positive mental health outcomes is also demonstrated in the literature, and Evans (2003) argues that a range of design aspects promote or inhibit social interaction with neighbours or within dwellings. Finally, Evans (2003) points out that the physical / natural environment serves as a remedy for fatigue and stress, a phenomenon known in the literature as restoration. Despite attempts to explain this relationship, Evans (2003, p. 546) concludes that "…more thought and analyses are necessary on why and how the physical environment might affect mental health."

Other housing-related factors associated with mental health are urbanisation (Marsella, 1998; Rostampoor-Vajari, 2012; Turan and Besirli, 2008) and residential moves (Adam and Chase-Lansdale, 2002). Studies have shown that the uncertainty associated with residential moves has a negative impact on mental health, especially of children (Adam and Chase-

Lansdale, 2002). Although the relationship between urbanisation and overall mental health is still unclear, urbanisation has been linked with family disruption and an uncertainty about the future, mostly about employment (Marsella, 1998; Turan and Besirli, 2008).

In short, although the literature is somewhat inconclusive, a number of studies have indicated that improved housing and urban living conditions might contribute to improved mental health outcomes (Halpern, 1995; Evans, et al., 2000). This has even led some authors to offer urban regeneration as a mental health strategy. Considering the results of the above-mentioned literature, this current article focuses on two aspects. First of all, the paper investigates the relationship between the housing conditions and the socio-emotional health of orphans and vulnerable children in South Africa. Secondly, the paper contributes to the discussion about methodological concerns related to research on housing and mental health.

Methods

Participants

The current study was approved by all relevant institutional review boards and conducted in Mangaung Metropolitan Municipality, in the Free State province of South Africa. The Free State is the third largest province in the country in area, covering 10.6% of the country's surface area and containing 5.6% of the country's population (Marais and Pelser, 2006). It is also the third most urbanised province, with the Mangaung Metropolitan Municipality being the largest urban settlement in the province. Of the 747 431 people living in Mangaung, 622 383 (82%) are African (mostly Sesotho), 182 291 are White, 37 337 are Coloured and 3 204 are Indian/Asian (StatsSA, 2013). Currently, 31% of children in Mangaung are orphaned (Mangaung Municipality, 2010). In order to determine the socio-emotional health of orphans and vulnerable children, interviews were conducted with 609 OVC (between seven and eleven years of age), of which 466 were orphans and 143 were other vulnerable children (non-orphaned). The mean age of the children was 9.19 (SD 1.35), and the sample consisted of 51.2% females.

Measures

Strengths and Difficulties Questionnaire (SDQ)—The SDQ (Goodman, 1997) is a 25- item screening measure of emotional and behavioural disorders designed for children ages 3–17. It has been translated into more than 60 languages and is available as a free download from (www.sdqinfo.com). The SDQ utilises a three-point Likert scale ranging from *'not true', 'somewhat true',* to *'certainly true'*. Five subscales can be derived from the measure, each comprised of five items: Conduct Problems, Inattention-Hyperactivity, Emotional Symptoms, Peer Problems and Pro-social Behaviour. A Total Difficulties (TD) score can also be derived by summing across the four problem behaviour scales (i.e. Emotional Symptoms, Conduct Problems, Inattention-Hyperactivity and Peer Problems), and clinical cut-offs for the TD score have been suggested based on research conducted in the United Kingdom (see www.sdqinfo.com).

The measures used in the present study were the self-report, caregiver report and teacher report versions of the SDQ. All three questionnaires were translated into the local language, Sesotho. The SDQ was adapted and translated in accordance with published guidelines for translation of instruments in cross-cultural research (Gjersing, et al., 2010; Hambleton, 2001; Hambleton, et al., 2005; Van de Vijver and Hambleton, 1996). Following these guidelines, the SDQ was translated independently into Sesotho by two Sesotho native speakers, who then met and agreed upon a version, which a third native speaker then back-translated into English. Lastly, all translators met and agreed on the final version. Given the focus of the current paper on overall socio-emotional health, the Total Difficulties score was

used for the self-report, caregiver report and teacher report. Excellent reliability for the TD score has been demonstrated in European (Stone, et al., 2010), American (Kovacs and Sharp, revise and resubmit) and South African (Cluver, et al., 2007) samples.

Independent variables—The following independent variables were included in our data analysis: age (continuous, 7–11 years), gender (dichotomous, 0 = female), orphan status (dichotomous, 0 = not), dwelling type, water, sanitation, cooking, settlement type, neighbourhood, lighting, crowding, always lived here and whether house is brick (see Table 1). The housing variables had been identified in the literature review.

Data analysis

Data analysis was performed using STATA version 12. Following the SDQ manual, the categorical Total Difficulties score was used as a dichotomous variable: 0 = normal and 1 = clinically diagnosable. Data was analysed for all three measures of the SDQ: self-report, caregiver report and teacher report. Firstly, descriptive statistics for the three SDQ measures and correlation coefficients between the three SDQ measures were generated. Secondly, descriptive statistics of the study population and the housing variables were generated. Thirdly, bivariate analyses were performed using chi-square and one-way analysis of variance (ANOVA) for the entire sample of OVC and for the two main sub-samples: orphans and non-orphans. Fourthly, bivariate analyses were conducted for a sub-sample of OVC who had moved households. Fifthly, multivariate analyses were conducted using the housing indicators that had shown statistically significantly associations ($p < 0.10$) with the dependent variables in the bivariate analyses. The categorical variables of cooking and lighting had small sample sizes and were therefore not included in the multivariate analyses. Because the housing indicators are collinear, they were entered in separate multivariate regression models.

Results

Overview

The percentage of OVC that had a clinically diagnosable TD score on the SDQ scale differed across the three measures; only 20.6% of the self-report TD scores were clinically diagnosable, compared with 34.3% of the caregiver report TD scores and 29.3% of the teacher report TD scores. The relationship between the self-report TD scores and caregiver TD scores was statistically significant ($p < 0.01$). The relationship between the self-report TD scores and teacher TD scores was weakly statistically significant ($p = 0.06$), positive but weak (Spearman = 0.07), while the relationship between the teacher and caregiver TD scores was statistically significant ($p = 0.02$), again positive but weak (Spearman = 0.09). Only 25 (4.1%) of the OVC were clinically diagnosed by all three SDQ measures: self, caregiver and teacher reports. The self and caregiver SDQ measures identified 66 of the same OVC as past the clinical cut-off; the child and teacher SDQ measures identified 45 of the same OVC, and the caregiver and teacher SDQ measures identified 73 of the same OVC.

The mean age of the OVC was 9.19 years (SD 1.35), and 51.2% of the sample was girls. 30.8% of the OVC had a tap in the home that provided drinking and cooking water. Flush toilets were the main toilet facility in 63.2% of the homes, while 29.7% had access to a pit and 7.2% made use of other means. The vast majority of the households used electricity for cooking (90.2%), while 7.7% used paraffin and 2.1% used other energy sources for cooking. Similarly, electricity was the primary source of energy for lighting (93.4%), with candles and paraffin making up 2.6% and 4.0% respectively. Less than a tenth (8.4%) of the children lived in formal homes, whereas 40.5% lived in subsidised houses with four rooms, 12.5% in subsidised houses with two rooms, 36.6% in informal dwellings and 1.9% in other types of

dwellings. Seventy-two percent of the OVC lived in brick dwellings, while the remainder lived in dwellings made with non-brick materials. Just under half (48.6%) lived in a new neighbourhood (established since 2000), 42.5% in an intermediate neighbourhood (established between 1992 and 1999) and 8.9% in an old neighbourhood (established before 1991). Seventy two percent of the OVC lived in formal settlements and 28% resided in informal settlements. The mean number of people per room was 2.5 (SD 1.8; min 0.4 – max 12). Data on whether the OVC had *always lived here* was available for 522 of the 609 respondents. One hundred and sixty one OVC had changed households (most likely as the result of becoming an orphan), while 361 had not changed households.

Bivariate analysis

Only the results of the bivariate analyses that were significant at $p < 0.1$ are discussed in this section (see Table 3 below). None of the housing variables that had a statistically significant association with one of the three SDQ measures (self, caregiver or teacher report) were significantly associated with either of the other two measures. Therefore, there was no cross-cutting. Dwelling type was associated with the self-report TD score; water, sanitation and settlement type were correlated with the caregiver report TD score; and crowding was associated with the teacher report TD score.

The *SDQ self-report TD score* and *dwelling type* had a statistically significant association (Pearson $chi^2 = 9.41$; $p = 0.05$). As expected, there was a higher percentage of OVC with a clinically diagnosable TD score living in two-roomed subsidised dwellings (31.6%) compared to OVC living in four-roomed subsidised houses (20.6%). Unexpectedly, a higher percentage of OVC with a clinically diagnosable TD score were living in subsidised dwellings (subsidised 2 rooms = 31.6%; subsidised four rooms = 20.6%) compared to OVC living in informal dwellings (19.7%). The percentage of OVC with a clinically diagnosable TD score was similar for children living in four roomed subsided dwellings (20.6%) and informal dwellings (19.7%).

The *SDQ caregiver report TD score* and *water* were statistically significantly associated (Pearson $chi^2 = 3.74$; $p = 0.05$). Unexpectedly, a higher percentage of children with a tap in the home (39.8%) had a clinically diagnosable TD score than children who only had a tap outside their home (31.8%). *SDQ caregiver report TD score* and *sanitation* were also statistically significantly associated (Pearson $chi^2 = 5.7$; $p = 0.05$), with similar unexpected results. A larger percentage of OVC with flush toilets (36.6%) had a clinically diagnosable TD score than children with a pit toilet (33.1%) or other type of sanitation (8.33%). The *SDQ caregiver report TD score* and *settlement type* also had a statistically significant relationship (Pearson $chi^2 = 5.23$; $p = 0.02$). As with the prior findings, this association produced surprising results. A larger percentage of OVC living in formal settlements (37.0%) had a clinically diagnosable TD score compared to children living in informal settlements (27.2%). For the sub-sample of orphans only, the *SDQ caregiver report TD score* and *settlement type* had a correlation that was weakly statistically significant (Pearson $chi^2 = 2.81$; $p = 0.09$). As with the whole sample, a larger percentage of orphans living in formal dwellings (37.3%) had a clinically diagnosable TD score than orphans living in informal dwellings (28.9%).

The *SDQ teacher report TD score* and *crowding* were statistically significantly associated ($F = 3.99$; $p = 0.04$). The mean number of people per room was higher for those children clinically diagnosed by their TD score than those with a normal TD score (2.76 versus 2.42). The association between *SDQ teacher report TD score* and *crowding* for the sub-sample of orphans was weakly statistically significant ($F = 2.79$; $p = 0.09$). The mean number of people per room was higher for those orphans clinically diagnosed by the their TD score

(mean = 2.72) than for those with a normal TD score (mean = 2.39). Multivariate logistic regression analysis:

The multivariate logistic regression analyses for the SDQ self-report, caregiver report and teacher report TD scores did not identify any housing variables that were cross-cutting across all three dependent measures. The only variable that had a statistically significant association with the three dependent variables was gender, but because gender was not a focal point of this article, it will not be discussed.

The results of the multivariate logistic regression analysis, model 1 were not statistically significant (p = 0.14), therefore the results are not discussed (variables included SDQ self-report TD score, age, gender, orphan status and dwelling type) (see Table 2). Model 2 had a sample size of 609 and was statistically significant (p=0.08). The model correctly classified 65.6% of the caregiver SDQ. This analysis showed a statistically significant relationship between caregiver report TD score and water. Those OVC living in a household with an outside tap for drinking and cooking water were less likely to have a clinically diagnosable TD score than the OVC who had a tap inside the house (OR = 0.69: CI 0.48 – 1.00). Model 3 had a sample size of 609, was statistically significant (p = 0.04) and correctly classified 65.6% of the caregiver SDQ. Sanitation was statistically significantly associated with the caregiver report TD score. OVC who used other toilet facilities (bucket or none) were less likely to have a clinically diagnosable TD score than OVC who made use of a flush toilet. This unexpected result may be due to the small number of OVC using other toilet facilities (n = 43).

Model 4 was statistically significant (p = 0.04), the sample size was 609, and the model correctly classified 65.6% of SDQ caregiver. Settlement type had a statistically significant correlation with caregiver report TD score. OVC living in an informal settlement were less likely to be clinically diagnosed than OVC living in a formal settlement (OR = 0.62: CI 0.42 – 0.93). The last model, model 5, was also statistically significant (p < 0.001). The sample size was 604 because of missing data, and the model correctly classified 70.2% of teacher SDQ. Orphan status and crowding were both statistically significantly associated with teacher report TD score. An orphan was more likely to be clinically diagnosed by the teacher report TD score than a non-orphan (OR = 1.73: CI 1.10 – 2.73). Crowding – the more people per room in a dwelling – was also associated with a greater likelihood of being clinically diagnosed by teacher report TD score; however, the odds were very small (OR = 1.09: CI 1.00 – 1.19).

Discussion and conclusion

This paper aimed to assess the impact of housing conditions on the socio-emotional well-being of OVC in South Africa. Three different versions of the Strengths and Difficulties Questionnaire were used to collect data: a self-report, a caregiver report and a teacher report version. The results demonstrate that different housing variables were associated with each of the three SDQ measures (self-report, caregiver report and teacher report). The reason for this is that the different SDQ measures identified different children with clinically diagnosable Total Difficulties scores. This leads us to ask two questions: (1) Whose measure of socio-emotional well-being should be used – the children's, the caregivers' or the teachers'? and (2) Do we address the housing factors associated with all three measures? The complexity of the results shows that methodological aspects play a considerable role with regard to understanding the socio-emotional well-being of children.

The analyses found that being an orphan and living in crowded conditions were both associated with a greater likelihood of having a clinically diagnosable TD score on the

teacher report measure. This finding confirms previous research which identified crowding as a factor contributing to the poor mental health of children in the developed world (Evans et al., 1998; Maxwell, 1996), thus helping to bridge the gap in the literature regarding the link between crowding and mental health in developing countries (Evans et al., 1998).

Although the above results might be expected, it was also found that having an outside tap (instead of one inside), not having a flush toilet, living in an informal house and residing in an informal settlement were all associated with a decreased likelihood of a clinically diagnosable TD score. These findings are unexpected and prompt a speculative discussion of possible mediating factors. To start, it is potentially possible that the connection between better socio-emotional health and poorer housing conditions could be considered in the historical context of informal settlement formation in South Africa. Aspects such as social capital and relocation for economic benefits (proximity to work) may also play a role in this respect.

Historically, South Africans living in informal settlements first lived in extremely crowded conditions in formal houses or the backyards of formal housing units (Marais and Krige, 1997). This can be attributed to the apartheid-era influx control policies which largely prevented black South Africans from moving to (white) urban areas. Thus, moving into informal settlements has been a way for poor South Africans to take control (as opposed to being helpless), despite the fact that the structural quality of informal housing might be inferior. A second factor is that settling in an informal settlement in South Africa is one way of increasing your chances of accessing a government housing subsidy. Therefore, by settling in informal settlements, people generate hope for themselves and their families to access a new housing structure in the near future. This is also one of the main reasons why household size in South Africa has remained largely stable over the past two decades.

Finally, much of the literature in the developed world (North America and Europe) assumes that people spend a large percentage of their time inside the home, partially because of cold weather. It may be that, due to warmer weather, virtually no snow and many more sunny days, people in South Africa spend considerably less time indoors than their counterparts in the global North. If this is true, then the relationship between housing conditions and the mental health of children might be less significant in developing nations with warm climates. Therefore, perhaps future studies in South Africa and other developing countries should not have a narrow focus on the house itself, but should instead consider the wider housing environment.

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Table 1

Overview of the independent variables used in the paper

Factors influencing mental health	**Indicators from the literature**	**Indicators used in this study *(with variable information noted)***
Institutional settings		Not considered in this paper
Housing	1) Housing type	Three types of categories were used: • Five different types of housing units were identified: Formal *(reference)*, subsidised housing (4 rooms)[2], subsidised housing (2 rooms), informal and other (backyard room, etc.) • A distinction was made between formal *(reference)* and informal housing areas • A distinction was made between brick *(reference)* and other types of material used for the walls
	2) Housing quality	
	Structural defects	Not considered in this paper
	Maintenance	Not considered in this paper
	Availability of amenities	Toilet facilities: Flush *(reference)*, pit and other (including none or bucket) Water access: Tap inside *(reference)*, tap outside
	Dampness	Not considered in this paper
	Tenure	Not considered in this paper
	Cockroach and rodent infection	Not considered in this paper
	Housing satisfaction	Not considered in this paper
	3) Floor level	Not considered in this paper
	4) Neighbourhood quality	The area was divided into three age groups: Old neighbourhoods, intermediate areas which were upgraded between 1994 and 2000 (Marais and Ntema, 2013) and new settlements built since 2001 (these could include informal settlements)*(reference)*
Crowding	Average number of people per room	Average number of people per room *(continuous)*
Noise	Noise levels	Not considered
Indoor air quality		The source of cooking and lighting was considered to be an indicator: electricity *(reference)*, paraffin and candles for lighting; electricity *(reference)*, paraffin and other (wood/coal) for cooking
Urbanisation / movement		Whether the child had moved between households *(had moved is reference)*

[2]The post-apartheid government embarked on a subsidised housing programme in 1994. Approximately 2.7 million housing units (we refer to these as subsidised units) have been erected since the inception of the programme. The size of these housing units differs between provinces, towns and projects due to different funding models and local conditions.

Table 2

Multivariate logistic regression analyses for SDQ caregiver report TD scores and SDQ teacher report TD scores

	Model 2			Model 3			Model 4			Model 5		
Variables:	**SDQ caregiver report**			**SDQ caregiver report**			**SDQ caregiver report**			**SDQ teachers report**		
	OR	P-value	95% CI	OR	P-value	95% CI	OR	P-value	95% CI	OR	P-value	95% CI
Age	0.99	0.89	0.87 – 1.12	0.97	0.70	0.86 – 1.10	0.98	0.85	0.87 – 1.11	0.93	0.35	0.82 – 1.07
Gender	1.37	0.06	0.98 – 1.93	1.43	0.03	1.01 – 2.00	1.41	0.04	1.00 – 1.98	2.05	<0.001	1.43 – 2.94
Orphan status	1.23	0.30	0.82 – 1.85	1.24	0.29	0.82 – 1.86	1.16	0.46	0.77 – 1.74	1.73	0.01	1.10 – 2.73
Dwelling type												
Water	0.69	0.05	0.48 – 1.00									
Sanitation (comparison group = flush)												
Pit				0.85	0.4	0.58 – 1.24						
Other - bucket				0.36	0.01	0.16 – 0.81						
Settlement type							0.62	0.02	0.42 – 0.93			
Crowding										1.09	0.04	1.00 – 1.19
Statistical diagnostics:												
Sample size	609			609			609			604		
P-value	0.08			0.04			0.04			<0.001		
% correctly classified	65.6 %			65.6 %			65.6 %			70.2 %		

Table 3

Bivariate analyses of SDQ self-report TD scores, SDQ caregiver report TD scores and SDQ teacher report TD scores by housing indicators

	SDQ Self-report			SDQ Caregiver report			SDQ Teachers report		
Indicators from data set	**OVC**	**Orphans**	**Non Orphans**	**OVC**	**Orphans**	**Non Orphans**	**OVC**	**Orphans**	**Non Orphans**
Water: Tap inside or Outside dwelling	Pr = 0.18 Pearson chi2 = 1.74	Pr = 0.28 Pearson Chi2 = 1.16	Pr = 0.37 Pearson chi2 = 0.77	**Pr = 0.05 Pearson chi2 = 3.74**	Pr = 0.10 Pearson chi2 = 2.56	Pr = 0.21 Pearson chi2 = 1.53	Pr = 0.87 Pearson chi2 = 0.02	Pr = 0.49 Pearson chi2 = 0.45	Pr = 0.54 Pearson chi2 = 0.36
Sanitation:	Pr = 0.99 Pearson chi2 = 0.01	Pr = 0.91 Pearson chi2 = 0.18	Pr = 0.53 Pearson chi2 = 1.24	**Pr = 0.05 Pearson chi2 = 5.72**	**Pr = 0.07 Pearson chi2 = 5.11**	Pr = 0.32 Pearson chi2 = 2.24	Pr = 0.45 Pearson chi2 = 1.56	Pr = 0.28 Pearson chi2 = 2.49	Pr = 0.48 Pearson chi2 = 1.46
Cooking: Electricity or paraffin or other	Pr = 0.47 Pearson chi2 = 1.47	Pr = 0.67 Pearson chi2 = 0.79	Pr = 0.59 Pearson chi2 = 1.04	Pr = 0.68 Pearson chi2 = 0.75	Pr = 0.56 Pearson chi2 = 1.12	**Pr = 0.005 Pearson chi2 = 10.62**	Pr = 0.16 Pearson chi2 = 3.63	Pr = 0.26 Pearson chi2 = 2.63	Pr = 0.88 Pearson chi2 = 0.25
Lighting: Electricity or paraffin or candles	Pr = 0.62 Pearson chi2 = 0.94	Pr = 0.48 Pearson chi2 = 1.45	Pr = 0.51 Pearson chi2 = 0.41	Pr = 0.62 Pearson chi2 = 0.95	Pr = 0.35 Pearson chi2 = 2.08	Pr = 0.18 Pearson chi2 = 1.76	**Pr = 0.05 Pearson chi2 = 5.91**	**Pr = 0.06 Pearson chi2 = 5.49**	Pr = 0.63 Pearson chi2 = 0.23
Dwelling type:	**Pr = 0.05 Pearson chi2 = 9.41**	Pr = 0.14 Pearson chi2 = 6.79	Pr = 0.46 Pearson chi2 = 3.61	Pr = 0.18 Pearson chi2 = 6.23	Pr = 0.20 Pearson chi2 = 5.95	Pr = 0.62 Pearson chi2 = 2.59	Pr = 0.50 Pearson chi2 = 3.30	Pr = 0.21 Pearson chi2 = 5.77	Pr = 0.71 Pearson chi2 = 2.08
Brick house:	Pr = 0.45 Pearson chi2 = 0.56	Pr = 0.49 Pearson chi2 = 0.46	Pr = 0.76 Pearson chi2 = 0.08	Pr = 0.10 Pearson chi2 = 2.61	Pr =0.17 Pearson chi2 = 1.83	Pr = 0.38 Pearson chi2 = 0.75	Pr = 0.33 Pearson chi2 = 0.93	Pr = 0.54 Pearson chi2 = 0.36	Pr = 0.31 Pearson chi2 = 0.31
Neighbourhood: New or intermediate or old	Pr = 0.43 Pearson chi2 = 1.66	Pr = 0.57 Pearson chi2 = 1.12	Pr = 0.73 Pearson chi2 = 0.69	Pr = 0.15 Pearson chi2 = 3.74	Pr = 0.57 Pearson chi2 = 1.12	Pr = 0.69 Pearson chi2 = 0.73	Pr = 0.30 Pearson chi2 = 2.40	Pr = 0.43 Pearson chi2 = 1.65	Pr = 0.60 Pearson chi2 = 1.01
Settlement type: Formal or informal	Pr = 0.66 Pearson chi2 = 0.19	Pr = 0.85 Pearson chi2 = 0.03	Pr = 0.63 Pearson chi2 = 0.23	**Pr = 0.02 Pearson chi2 = 5.23**	**Pr = 0.09 Pearson chi2 = 2.81**	Pr = 0.11 Pearson chi2 = 2.45	Pr = 0.28 Pearson chi2 = 1.14	Pr = 0.10 Pearson chi2 = 2.67	Pr = 0.62 Pearson chi2 = 0.23
Crowding:	P = 0.31 F = 1.03	P = 0.37 F = 0.78	P = 0.64 F = 0.21	P = 0.14 F = 2.15	P = 0.20 F = 1.62	P = 0.49 F = 0.46	**P = 0.04 F = 3.99**	**P = 0.09 F = 2.79**	P = 0.20 F = 1.61