Urban Education
46(5) 1056–1077

DOI: 10.1177/0042085911400323
http://uex.sagepub.com


Factors Associated With Low Achievement Among Students From Nairobi's Urban Informal Neighborhoods

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Abstract

This article contributes new evidence on factors associated with low achievement among pupils in urban informal neighborhoods in Nairobi, Kenya. The authors use three different data sets to examine the effect of residence in particular neighborhoods, pupil gender, primary school type, and household socioeconomic status on pupil achievement in the Kenya Certificate of Primary Education (KCPE) examination results for 2005 and 2006. Results suggest that residence in Nairobi's informal neighborhoods of Korogocho and Viwandani, enrollment in a public school, and one's gender, if female, are the strongest explanatory variables for low achievement. Policy implications from the study results are discussed.

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Keywords

academic achievement, urban informal neighborhoods, public schools, informal private schools, Nairobi, Kenya

Low academic achievement has been defined as failing to meet the average academic performance in test or examination scores, as determined by a set of cutoff points (Fletcher, Coulter, Reschly, & Vaughn, 2004; Fletcher et al., 1994). This article presents an analysis of achievement among pupils in two of Nairobi's informal neighborhoods of Korogocho and Viwandani, by comparing their achievement scores with those in two formal neighborhoods of Harambee and Ofafa Jericho. The comparison is based on the Kenya Certificate of Primary Education (KCPE) examination scores for the years 2005 and 2006. The examination is taken at the end of 8 years of primary education that marks the end of the primary education cycle and opens way for transition into secondary school education. By this comparison, this article seeks to determine factors associated with low achievement in KCPE among the pupils residing in the two informal neighborhoods. The motivation for this article arises from the longitudinal study by the African Population and Health Research Centre (APHRC) in the four neighborhoods. Research findings from this study indicate that performance in KCPE among pupils who live in the informal neighborhoods is consistently low compared with those of pupils who live in the nearby formal neighborhoods. For instance, the average KCPE score for students from Korogocho and Viwandani in 2006 was 238 out of a possible 500. This was 38 points lower than Nairobi province's average score of 272 (Ngware, Ezeh, Nderu, & Epari, 2008).

The rest of the article is organized as follows: (a) literature on achievement, (b) methods and data used in this article, (c) results, and (d) discussion and conclusion.

Literature Review

A number of factors are associated with low achievement. Tooley and Dixon (2006) suggested that the type of school in which a pupil is enrolled has an effect on the pupil's achievement. While exploring the nature and extent of what they call "private schools for the poor" in Ga (Ghana); Lagos State (Nigeria); Hyderabad, Delhi, and Mahbubnagar (India); Kibera (Nairobi, Kenya); and Gansu Province (China), Tooley and Dixon found that both registered and unregistered private schools had higher raw mean scores compared to government (public) schools. In Hyderabad, for instance, their results suggested that performance in mathematics was higher in privately run schools

(whether registered or unregistered) by up to 22 percentage points than in government schools. Their results also suggested that this difference between privately run schools and those run by the government seemed to be replicated in the English subject. Even after controlling for variables such as peer-group effects and school choice processes, they found that the differences were still large enough in favor of privately run schools. Using a different student achievement data set (Programme for International Student Assessment by the Organization for Economic Cooperation and Development), Fuchs and Wößmann (2007) also found that student performance was better in private schools.

Another factor associated with low achievement is the type of residential neighborhood that one lives in. For instance, while controlling for pupil ability, family background, and schooling in Scotland, Garner and Raudenbush (1991) found that residence in deprived neighborhoods was a major determinant of educational achievement. Similarly, Cassen and Kingdon (2007) used a national pupil database at the state secondary school–leaving age of 16 years in England and found that low achievers were commonly found in poor urban settings.

Gender is another factor that has been associated with low achievement. The results are however mixed. For instance, using data from Bangladesh, Asadullah, Chaudhury, and Dar (2007) combined fixed effects and instrumental variable estimation techniques and found that girls significantly had lower test scores compared to boys, even "after controlling for school and classroom-specific unobservable correlates of learning" (p. 648). Husain and Millimet (2008) used a nationally representative panel data set on students from kindergarten to third grade in the United States and found that White boys outperformed White girls in mathematics. But other studies have found the performance of girls to be better than that of the boys. In the United Kingdom, Cassen and Kingdon (2007) found that boys outnumbered girls as low achievers with nearly half of all such low achievers being White British males. Still in the United Kingdom, Strand (1997) found that girls posted better academic performance compared to boys. Kutnick (2000) explored attainments by sex in Barbados and St. Vincent and found that girls generally had better achievement scores than boys across the range of subject areas. Fuller et al. (1991) also found that girls who attended school in Ethiopia's urban centers had better scores in national examinations compared with boys. Using results from the standardized KCPE examination (Kenya National Examinations Council, 2007), this article explored these gender differences in achievement across the four neighborhoods.

The socioeconomic background of students is another factor that has been found to have an effect on achievement. It is one of the most widely used variables in educational research. The report by Coleman et al. (1966) is classic, and one of the earliest and widely quoted, work on socioeconomic status and achievement. The report argued that for the United States out-of-school variables such as family background and neighborhood characteristics accounted for the observed achievement difference among students. Building on this, researchers have consistently found that household socioeconomic background is an important explanatory variable for educational outcomes. For example, Sirin (2005) reviewed empirical journal articles on socioeconomic status and achievement published between 1990 and 2000 and found that parents' socioeconomic status had a strong impact on students' academic achievement. Research by Weinberg (2001), Fuchs and Wößmann (2007), and McEwan and Trowbridge (2007) also suggested a link between socioeconomic status and achievement.

Data and Methods

Description of the Study Sites

Since August 2002, APHRC has run the Nairobi Urban and Health Demographic Surveillance System (NUHDSS) in Korogocho and Viwandani. The nesting of the Education Research Program (ERP) onto the NUHDSS in January 2005 introduced Harambee and Jericho as comparison study sites. Harambee and Jericho are part of the Makadara administrative location, whereas Korogocho is an administrative location on its own. These three are located in Nairobi's Eastlands area, whereas Viwandani, which forms part of Viwandani administrative location, is within Nairobi's industrial area on the southern part of the City. Table 1 presents a comparison between the four neighborhoods on common variables.

As seen from Table 1, a large proportion of households in Korogocho and Viwandani (more than 88%) bought water from taps compared with those in Harambee and Jericho (more than 97%) who had piped water into their residences. A large proportion (more than 88%) of the dwelling units in Harambee and Jericho had the main material of their walls made of quarried stone compared with those in Korogocho and Viwandani that were made of mud (48.1%) and temporary iron sheets (90.6%), respectively. At 11.1%, Korogocho had the highest proportion of its population aged 18 years and above who had received no primary education.

Table 1. Comparison of Select Characteristics Between APHRC Research Sites, 2005

Characteristics	Korogocho	Viwandani	Harambee	Jericho
Number of households	9,072	12,114	599	1,412
Main source of drinking water	Buying from taps (94.5%)	Buying from taps (88.7%)	Piped into residence (97.7%)	Piped into residence (99.2%)
Main toilet facility	Shared traditional pit latrine (77.3%)	Flush trench toilet (55.5%)	Own flush toilet (76.8%)	Own flush toilet (79.5%)
Main material of the floor of dwelling unit	Earth/mud/dug (53.8%)	Cement (92.6%)	Polished wood/ tiles (85.1%)	Cement (71.4%)
Main material of the wall of dwelling unit	Mud wall (48.1%)	Iron sheets (90.6%)	Stone/quarry stones (88.0%)	Stone/quarry stones (88.4%)
Main material of the roof of dwelling unit	Iron sheets (99.4%)	Iron sheets (99.2%)	Asbestos (55.8%)	Asbestos (95.6%)
Main source of lighting	Kerosene/paraffin (85.6%)	Kerosene/paraffin (83.7%)	Electricity (99.0%)	Electricity (96.3%)
Owning dwelling unit	11.0%	7.6%	23.9%	0.7%
Renting dwelling unit	83.6%	90.1%	66.4%	98.7%
Population aged 18+ years without primary education	11.1%	2.2%	0.7%	1.6%
Population aged 24+ years with complete primary education	68.9%	91.0%	96.8%	95.4%
Population aged 24+ years with complete secondary education	24.3%	45.7%	93.5%	84.9%
Population aged 24+ years with postsecondary education	0.5%	1.4%	62.5%	26.4%

Collaborative research by Kenya's Central Bureau of Statistics and the International Livestock Research Institute used detailed information on household expenditures on food and a comprehensive range of other nonfood items such as schooling, health, transportation, and rent from a Welfare Monitoring Survey in Kenya in 1997 and found that Viwandani and Korogocho were among the poorest 20% locations in Nairobi. Harambee and Jericho were among the second richest 20% of all the 49 locations in Nairobi. Lavington, Parklands, Westlands, and Karen formed the richest 20% of the administrative locations (Central Bureau of Statistics, 2005).

Description of the Data

This article utilized data sets from the ERP, the Kenya National Examinations Council (KNEC), and the City Council of Nairobi Education Department (CCNED). Using the longitudinal framework of the NUHDSS as a nested study since January 2005, the ERP has been able to collect data five times at household level. Before ERP was scaled up in January 2005, the NUHDSS had already been operational in Korogocho and Viwandani and had been collecting basic education data for each individual enumerated through the census of August 2002 or through subsequent in-migration. The nesting of ERP onto the NUHDSS necessitated the administration of detailed education questionnaires starting with the Individual Child/Youth Schooling History Questionnaire (Q02_ISH) in Korogocho and Viwandani in January 2005. This was done in households with children and youths aged 5 to 19 years in order to capture the school-going age. The ERP has continued to update information for this sample but also admits new entrants, such as those turning 5 years, at the beginning of subsequent update rounds as well as in-migrants within the appropriate age bracket in such subsequent rounds. In 2007, this sample included all individuals aged 5 to 21 years.

Data collection in Harambee and Jericho began with a census of all households within the physical boundaries of these neighborhoods in June 2005. The Household Questionnaire (Q01_HHS) similar to the one administered in Korogocho and Viwandani in August 2002 was administered for this purpose. Again, households with children and youths aged 5 to 19 years were identified enabling the rest of the questionnaires to be administered in those households. These were the Q02_ISH, the Individual Youth Behavior Questionnaire (Q06_IBV), and the Parent/Guardian Questionnaire (Q05_PGI). The Primary Schools' Institutional Questionnaire (Q08_PSI) was administered to sampled schools in and around the four sites during the last school term of 2005 (between September and November). The Individual Child/Youth Schooling

Status Update Questionnaire (Q03_ISS) updates information collected through the Q02_ISH and has been routinely administered along with other questionnaires in the update rounds since January 2005.

In the absence of income and expenditure data, we used the social amenities and asset ownership data collected through the Q01_HHS for the determination of wealth quintiles as proposed by Filmer and Pritchett (2001). With this determination, we were able to examine the association between household socioeconomic status and low achievement. These amenities included the main source of drinking water, main type of toilet facility, main material of the roof, floor, or wall of the dwelling unit, main type of cooking fuel, main source of lighting, and whether or not the household owned that dwelling unit. There were distinct coding categories for these questions to capture all possible responses. For any other response outside these categories, interviewers specified and gave the code as 96. The household head was also asked whether or not the household owned any of the following assets: car, motorcycle, bicycle, refrigerator, television, radio, sewing machine, electric iron box, fan, electric gas cooker, and kerosene lamp or stove. Others were landline telephone, mobile phone, sofa set, mattress, wall clock, mosquito bed net, and livestock. The responses were coded as 1 = *yes*, 2 = *no*, 8 = *don't know*.

We also posed questions on drug and substance use to individual students aged 12 years. We hypothesized that drug and substance use would distract students from academic work and would, therefore, have a negative effect on their scores. We, therefore, asked the students whether they had used any drugs and substances, including cocaine, glue, paint, alcohol, cigarettes, cannabis sativa, and *khat*. The response categories were 1 = *yes*, 2 = *no*, 7 = *refused to answer*. For those answering "yes," we further sought to know how old they were when they first took these drugs or substances.

The schooling status of individual pupils was captured through the Q02_ISH and the Q03_ISS. Information was asked of the parent/guardian or the pupil himself/herself if aged 12 years or older. We sought to know whether they were enrolled in school as of the date of interview, and if the answer is "yes," they also provided the name of the school, its location, and whether it was public or private. We also asked information on the pupil's current grade/class of enrolment. This way, we were able to identify pupils in Class 8 (for 2005-2006), which is the last grade of primary education in Kenya. Each individual under demographic surveillance in the NUHDSS is assigned a unique identification number that links that pupil or individual to their respective social group (household). We have also assigned each school a unique identification number, making it possible to link pupils to their respective schools in our database.

We accessed standardized KCPE examination scores and data for all pupils countrywide from the KNEC for 2005 and 2006. The KNEC maintains countrywide data on all the candidates who took the examination in each of the years, their index numbers, and name of the school where such candidates took their examination. Such schools also have a unique identification number with the KNEC known as an Examination Centre Number (ECN). These data files from the KNEC also indicate the different mark and grade scored by individual candidates in each of the subjects, making it possible to get the cumulative scores for each candidate. The KNEC also works with the CCNED for administrative support in its preparation to examine candidates. On a yearly basis, and on behalf of the KNEC, the CCNED receives a listing of all pupils presented for the KCPE by their respective schools within Nairobi province. It also maintains and registers new examination centers within Nairobi province on a yearly basis. All these lists are then forwarded to the KNEC. So at any time, the CCNED maintains in its custody, the most updated data on examination centers, schools, and the number of pupils being presented for KCPE in any given year. We accessed this data set from the CCNED containing all the names of all such examination centers and schools as of 2008 that showed whether the school was public, private, or informal.

With these data sets, we first matched our listing of schools with lists from the KNEC and CCNED and proceeded to extract the KCPE examination marks from the KNEC listing for each of the pupils we had identified as being in Grade/Class 8 at specific schools in 2005 or 2006. We dropped candidates whose details could not match with those in the official KCPE listing in the schools they were said to have taken the examination in any of the 2 years. The KCPE examination presents five subjects, English, Kiswahili, mathematics, science and social studies, and religious education. It is a norm-referenced examination where scores are standardized so that their weighting is the same across the subject areas (Kenya National Examinations Council, 2008). Each subject is examined out of 100 marks, and so the maximum a candidate can score is 500 with the pass mark pegged at 250.

Model Specification and Analysis Techniques

This article set out to examine factors associated with low academic achievement in Nairobi's informal neighborhoods. The student score in the KCPE examination was the dependent variable and is continuous and normally distributed. We used it to model achievement in this examination. The independent variables were mainly categorical. Our preferred technique was to fit multiple regression models that would help us examine the

relationship between our dependent variable (low achievement) and a number of independent variables. But before fitting these models, we performed tests to satisfy the assumptions of linear regressions that prefer that dependent variables be normally distributed. To assess whether the determinants of the final score of marks in KCPE were the same, we proceeded to fit two models. We fitted one overall model for both the informal and formal neighborhoods and then one for the informal neighborhoods alone. We specified our model to enable us estimate and set the correct interpretation of the parameters. It also helped us include into the model only variables that were theoretically important to what we were predicting. In our empirical model, therefore, the achievement Y_i of student i depended on that student's neighborhood of residence, the type and location of the primary school attended by that student, and individual student and household characteristics. Unobserved random effects of household, school, and pupil characteristics were represented by the error term (ε). Our model, therefore, took the form of

$$Y_i = \beta_0 + \beta_i X_i + \varepsilon \text{ where } i = 1, 2, 3 \ldots n \text{ and } \beta_i \text{ are the independent variable } (X_i) \text{ coefficients.} \quad (1)$$

We fitted the model in steps to determine the effects of each group of variables. The second model had our main explanatory variables that were neighborhood effect, the type and location of the school attended by the pupil, and the gender of the pupil. It took the form shown below.

$$Y_i \text{ (score)} = \beta_0 + \beta_1 \text{ (informal neighborhood)} + \beta_2 \text{ (public)} + \beta_3 \text{ (boy)} + \beta_k X_k + \varepsilon \quad (2)$$

where X_k was a dummy variable for each of the study locations (Viwandani, Harambee/Jericho, and outside the study sites, with Korogocho being the reference).

The third model built on Model 2, but taking it further to include household characteristics consisting of household wealth index and the education level of the household head represented by vectors $\beta_m X_m$ and $\beta_n X_n$, respectively.

$$Y_i \text{ (score)} = \beta_0 + \beta_1 \text{ (informal neighborhood)} + \beta_2 \text{ (public)} + \beta_3 \text{ (boy)} + \beta_k X_k + \beta_m X_m + \beta_n X_n + \varepsilon \quad (3)$$

where X_m and X_n were dummy variables for each of the household wealth quintiles (middle and least poor with poorest as the reference category) and

Table 2. Variables Used in the Models and Their Description and Coding

Variable	Description	Codes
SCORE	Final KCPE examination mark	Continuous score of marks as obtained by pupils
SITE	Study site	0 = formal neighborhoods, 1 = informal neighborhoods
GEND	Gender	0 = female, 1 = male
SCHT	School type	0 = private, 1 = public
HWI	Household Wealth Index	1 = poorest, 2 = middle, 3 = least poor
DRUG	Ever used drugs	0 = no, 1 = yes
SHK	Comes home with homework	0 = no, 1 = yes
HHW	Helped to do homework at home	0 = no, 1 = yes
HEDU	Household head education level	0 = no education, 1 = primary, 2 = secondary, 3 = tertiary/higher
SCHL	School location	1 = lives and schools in Korogocho, 2 = lives and schools within Viwandani, 3 = lives and schools within the formal neighborhoods (Harambee/Jericho), 4 = schools outside the study site

household head level of education (primary, secondary, and tertiary, with no education as the reference category), respectively.

The overall model (Model 4) incorporated Model 2 and Model 3 and included other individual child characteristics such as use of drugs indicated by the vector $\beta_j X_j$.

$$\begin{aligned} Y_i\,(\text{score}) = {} & \beta_0 + \beta_1\,(\text{informal neighborhood}) + \beta_2\,(\text{public}) + \\ & \beta_3\,(\text{boy}) + \beta_k X_k + \beta_m X_m + \beta_n X_n + \beta_j X_j + \varepsilon \end{aligned} \tag{4}$$

Since our interest was to model low achievement among students in the informal neighborhoods, we fitted a model similar to Model 4 but restricted it to the informal neighborhoods. We hypothesized that residence in these informal neighborhoods, enrolment in a public school, and gender, if female, were associated with low achievement. We carried out a univariate regression analysis to examine whether the means between public and private school, boys and girls, study sites among other characteristics were significantly different from each other. To make comparisons, we stratified our analysis by type of school and location, study site, and gender. Table 2 describes the variables used in the analysis and their coding.

Results

Table 3 presents descriptive statistics for the students who took the KCPE between 2005 and 2006. At 49.4%, there was near gender parity between girls and boys who took the examination. Majority of the students (78.5%) were from the informal neighborhoods.

Sixty nine percent of the pupils from the informal neighborhoods scored below the average mark of 250 compared with 27.3% of pupils from the formal neighborhoods. Up to 50.7% of the boys scored 250 marks and above compared to just 28.9% of the girls. Our results also show that up to 46.4% of the pupils who took the examinations were enrolled in schools outside their residential neighborhoods. Majority of the students (79.4%) took their KCPE examinations in public primary schools.

Table 4 shows results of the univariate effects of school type and location, neighborhood of residence, and gender on performance. In the overall model, a student in the informal neighborhoods would on average score up to 73.5 points less than a student in the formal neighborhoods. Across the models, a pupil in a public school would score less marks than one in a private school. Boys consistently had higher scores compared with those of girls. For instance, a boy in the informal neighborhoods would on average score up to 29.8 marks more than what a girl in the same neighborhoods would score. Of the two informal sites, students who lived in Korogocho appeared to underperform in the KCPE examinations of 2005 and 2006 compared with their counterparts living in Viwandani. From a constant of 204.6 marks, a student residing and attending school in Viwandani would score up to 32.7 marks more than a student residing and attending school in Korogocho, which translated to about 237.3 marks. The underperformance in the KCPE became much wider if compared with the performance of a student who resided and attended school in the formal neighborhoods of Harambee and Jericho.

The regression results shown in Table 5 emphasize those shown in Table 4. These results suggest that the neighborhood of residence, type and location of school, and a student's gender, if female, were strong explanatory variables for low achievement. Model 2 suggests that a student in the informal neighborhoods of Korogocho and Viwandani would on average score less by 77.4 (95% confidence interval [95% CI]: –92.2, –62.6) marks from the constant of 300 marks. This would suggest a score of about 222.6 marks. This disadvantage was even larger and remained significant in the type of school a student attended. For instance, a student attending a public school, irrespective of the type of neighborhood, would

Table 3. Percentage of Pupils and Score Distribution in KCPE in 2005 and 2006 by Selected Variables

Variable	Description	Number of pupils	Marks				
			<200	200-249	250-299	300-349	>350
SITE	Formal neighborhoods	143 (21.5)	13 (9.1)	26 (18.2)	35 (24.5)	39 (27.3)	30 (21.0)
	Informal neighborhoods	523 (78.5)	203 (38.8)	158 (30.2)	105 (20.1)	43 (8.2)	14 (2.7)
GEND	Girls	329 (49.4)	122 (37.1)	112 (34.0)	54 (16.4)	22 (6.7)	19 (5.8)
	Boys	337 (50.6)	94 (27.9)	72 (21.4)	86 (25.5)	60 (17.8)	25 (7.4)
SCHT	Private	137 (20.6)	26 (18.9)	49 (35.8)	28 (20.4)	23 (16.8)	11 (8.0)
	Public	529 (79.4)	190 (35.9)	135 (25.5)	112 (21.2)	59 (11.2)	33 (6.2)
SCHL	Korogocho[a]	167 (25.1)	80 (47.9)	48 (28.7)	26 (15.6)	12 (97.2)	1 (0.6)
	Viwandani[a]	132 (19.8)	33 (25.0)	45 (34.1)	30 (22.7)	16 (12.1)	8 (6.1)
	Harambee/Ofafa Jericho[a]	58 (8.7)	5 (8.6)	10 (17.2)	14 (24.1)	16 (27.6)	13 (22.4)
	Outside DSA	309 (46.4)	98 (31.7)	81 (26.2)	70 (22.7)	38 (12.3)	22 (7.1)
HWI	Poorest	216 (32.4)	72 (33.3)	70 (32.4)	44 (20.4)	21 (9.7)	9 (4.2)
	Middle	223 (33.5)	76 (34.1)	55 (24.7)	50 (22.4)	28 (12.6)	14 (6.3)
	Least poor	227 (34.1)	68 (29.9)	59 (26.0)	46 (20.3)	33 (14.5)	21 (9.3)

Note: $N = 666$. SITE = study site; GEND = gender; SCHT = school type; SCHL = school location; HWI = household wealth index; DSA = demographic surveillance area; KCPE = Kenya Certificate of Primary Education. Percentages are in parentheses.
a. Students residing and attending school in the site denoted.

Table 4. Univariate Regression Coefficients for Selected Characteristics

	Overall			Informal neighborhood		
	Coefficients	95% CI	Constants	Coefficients	95% CI	Constants
Informal neighborhoods	−73.5***	−85.3, −61.6	281.7	—	—	—
Public	−25.2***	−38.3, −12	254.0	−36.5***	−48.9, −24.1	245.9
Boys	24.8***	14.2, 35.4	221.4	29.8***	19.2, 40.4	203.2
Korogocho[a] (reference category)	—	—	—	—	—	—
Viwandani[a]	32.7***	17.4, 47.9	204.6	32.7***	18.4, 49.9	204.6
Harambee/Ofafa Jericho[a]	89.5***	69.5, 109.5		—	—	
Outside DSA	32.6***	19.9, 45.2		12.5***	−0.3, 25.0	

Note: CI = confidence interval; DSA = demographic surveillance area.
a. Students residing and attending school in the site denoted.
***$p < .01$.

Table 5. Adjusted Regression Coefficients (95% CI) of KCPE Score for Pupils in Class 8 in 2005 and 2006

		Model 2		Model 3		Model 4	
Variable		Coefficients	95% CI	Coefficients	95% CI	Coefficients	95% CI
SITE	Informal neighborhoods	–77.4**	–92.2, –62.6	–74.8**	–91.4, –58.1	–73.9**	–90.5, –57.4
GEND	Boys	24.0**	15.0, 33.0	23.8**	14.8, 32.8	26.6**	17.4, 35.7
SCHT	Public	–49.5**	–61.2, –37.8	–48.7**	–60.4, –36.9	–48.9***	–60.6, –37.2
SCHL	Korogocho[a] (reference category)	—	—	—	—	—	—
	Viwandani[a]	47.5**	33.6, 61.5	46.2**	31.9, 60.4	43.1**	28.7, 57.4
	Harambee/Ofafa Jericho[a]	30.3**	7.1, 53.6	27.6*	4.4, 50.8	25.3*	2.1, 48.4
	Outside DSA	21.3**	9.2, 33.5	21.1**	9, 33.2	20.0**	7.9, 32.1
HWI	Poorest (reference category)	—	—	—	—	—	—
	Middle	—	—	8.1	–2.9, 19.2	8.3	–2.7, 19.3
	Least poor	—	—	17.6**	6.4, 28.8	17.3**	6.2, 28.5
HEDU	No education (reference category)	—	—	—	—	—	—
	Primary	—	—	–2	–15.9, 11.9	–1.2	–15, 12.7

(continued)

Table 5. (continued)

Variable		Model 2		Model 3		Model 4	
		Coefficients	95% CI	Coefficients	95% CI	Coefficients	95% CI
	Secondary	—	—	6.8	–8.3, 21.9	6.8	–8.3, 21.8
	Tertiary	—	—	7.2	–17.2, 31.5	8.5	–15.7, 32.8
DRUG	Yes	—	—	—	—	–22.9**	–39.2, –6.8
	Constant	300.0	280.5, 319.6	287.4	262.1, 312.7	288.4	263.3, 313.6
	R^2	.30		.31		.32	

Note: CI = confidence interval; KCPE = Kenya Certificate of Primary Education; SITE = study site; GEND = gender; SCHT = school type; SCHL = school location; HWI = household wealth index; HEDU = household head education level; DRUG = ever used drugs; DSA = demographic surveillance area.

a. Students residing and attending school in the site denoted.

*$p < .10$. **$p < .05$.

on average score less by 49.5 marks (95% CI: –61.2, –37.8) meaning that from our constant of 300 marks in the overall model, such a pupil would only score up to 251 marks, holding other factors constant.

Model 3 shows the effect of household characteristics on the final KCPE score. After including household wealth index and the education level of the household head, the model slightly improved, though neighborhood, gender, and school type coefficients remained significant and did not change significantly. Students from the least poor households scored significantly more marks than those from the poorest households.

Model 4 includes the other student characteristics such as use of drugs. With these in the model, neighborhood, gender, and school type coefficients slightly changed with a marginal improvement in the overall model. Students who had ever used drugs scored less by 22.9 marks (–39.2, –6.8) compared with those who had not.

To further assess the effect of gender and type of school on KCPE scores in the informal neighborhoods, we fitted similar models to those in Table 5 excluding the formal neighborhoods. The results are shown in Table 6 with Model 2, suggesting that boys would score 29.6 (95% CI: 19.6, 39.4) more marks than girls. Students in public schools would score 48.3 (95% CI: –60.3, –36.2) less marks than those in private schools, with those enrolled in schools located outside Korogocho or Viwandani scoring 20.6 (95% CI: 8.8, 32.5) more marks than their peers enrolled in schools located within these neighborhoods. The inclusion of household variables in Model 3 did not significantly change the direction of association seen in Model 2. However, household wealth index did not significantly influence the pupil score in the informal neighborhoods as seen in Table 5. The full model (Model 4) controlled for drug use, and the results suggest that students who had ever used these substances would score 21.7 (95% CI: –38.9, –4.4) less marks than those who had not.

The effect of household wealth on KCPE scores in Model 3 and Model 4 was not significant because there was no wide variation in wealth status between households in the informal neighborhoods. The significant effects of this variable in Model 3 and Model 4 in Table 5 disappeared in Model 3 and Model 4 in Table 6 when the formal neighborhoods that were more affluent were excluded. Among the informal neighborhoods, gender and school type played a greater role in explaining the low KCPE scores even after adjusting for other covariates like household and other child characteristics.

Table 6. Adjusted Regression Coefficients (95% CI) of KCPE Score in 2005 and 2006 for the Informal Neighborhoods

Variable		Model 2		Model 3		Model 4	
		Coefficients	95% CI	Coefficients	95% CI	Coefficients	95% CI
GEND	Boys	29.6***	19.6, 39.4	29.1***	19.2, 38.9	32.3***	22.1, 42.5
SCHT	Public	–48.3***	–60.3, –36.2	–47.6***	–59.8, –35.4	–48.0***	–60.1, –35.9
SCHL	Korogocho[a] (reference category)	—	—	—	—	—	—
	Viwandani[a]	47.0***	33.3, 60.7	45.1***	31.1, 59.2	42.3***	28.1, 56.5
	Outside DSA	20.6***	8.8, 32.5	20.5***	8.6, 32.4	19.4**	7.6, 31.3
HWI	Poorest (reference category)	—	—	—	—	—	—
	Middle	—	—	3.1	–9.2, 15.3	2.9	–9.3, 15.1
	Least poor	—	—	7.9	–4.2, 20	7.4	–4.7, 19.4
HEDU	No education (reference category)	—	—	—	—	—	—
	Primary	—	—	–3.7	–17.7, 10.3	–3.0	–16.9, 10.9
	secondary	—	—	8.1	–7.4, 23.7	8.0	–7.4, 23.5
	Tertiary	—	—	17.9	–62.9, 98.8	27.1	–53.7, 107.9
DRUG	Yes	—	—	—	—	–21.7**	–38.9, –4.4
	constant	219.4	207.2, 231.5	215.2	197.3, 233.1	217.1	199.2, 235
	R^2	.18		.18		.19	

Note: CI = confidence interval; KCPE = Kenya Certificate of Primary Education; GEND = gender; SCHT = school type; SCHL = school location; HWI = household wealth index; HEDU = household head education level; DRUG = ever used drugs; DSA = demographic surveillance area.
a. Students residing and attending school in the site denoted.
**$p < .05$. ***$p < .01$.

Discussion and Conclusion

Low academic achievement is an important topic for developing countries such as Kenya where in the last one decade, new policies such as FPE have been implemented and curricula reviewed to promote greater educational access and attainment. This article contributes to the understanding of the factors associated with low achievement among students in Nairobi's poor informal neighborhoods.

We anticipated that students who were enrolled in public primary schools serving the informal neighborhoods would perform better in KCPE compared with those enrolled in private informal schools. This is because public primary schools benefit from FPE inputs such as text books, professionally trained teachers, and better school infrastructure, usually provided by the government. Our results suggest the opposite: Students enrolled in informal private schools that have fewer inputs perform better in KCPE examination compared with their counterparts in public schools. Considering the informal neighborhoods alone, we found that students in public schools could score up to 48.3 less marks than their peers in private informal schools. One of our models suggests that at a constant of 219.4 marks, a child from the informal neighborhoods attending a public school could only score 171.1 marks in the KCPE examination, which is way below the maximum score of 500. The question to ask then is, why are public schools that have superior inputs underperforming in KCPE? Parental perceptions in Korogocho and Viwandani suggest that large class sizes in public schools is the main factor (see, for example, Undie, Mugisha, Epari, & Ezeh, 2008). The work of Ngware, Oketch, and Ezeh (2008) also suggests that after FPE, class sizes in public schools in the informal neighborhoods rose beyond recommended benchmarks.

We suggest that the Ministry of Education complete registration of these informal private schools and provide necessary policy support and space for them to thrive. This will improve public-private partnerships in the provision of education in the informal neighborhoods. It is evident that these schools are playing an important role in providing alternative enrolment opportunities and improving outcomes for children from the informal neighborhoods, though majority are not registered with the Ministry of Education. Low achievement in KCPE by students in public schools suggests that, beyond widening participation, the FPE policy should also begin to ensure that the quality of education offered in public schools is improved so as to produce better schooling outcomes.

Researchers have already found that residence in deprived neighborhoods does negatively affect academic achievement (see, for example, Brooks-Gunn, Guo, & Furstenberg, 1993; Case & Katz, 1991; Crane, 1991; Garner & Raudenbush, 1991). Our results suggest the existence of this negative effect of residence in poor and deprived neighborhoods on achievement. We find that, compared with Viwandani, Korogocho appears to be a worse neighborhood for a pupil to reside and attend school. Korogocho is the poorest of the four neighborhoods. Combined, students in the two informal neighborhoods of Korogocho and Viwandani score lower marks compared with their peers in the two formal neighborhoods of Harambee and Jericho. Improving living conditions in these informal neighborhoods could lead to better educational outcomes. If properly implemented, the ongoing informal neighborhoods' upgrading programs in Nairobi will improve infrastructure, living conditions, and provision of social services to the residents. These improvements might have positive spillover effects on schooling outcomes for students in these neighborhoods.

Acknowledgments

This article uses data form APHRC's Education Research Program, the Kenya National Examinations Council (KNEC), and the City Council of Nairobi Education Department (CCNED). We are grateful for the partnership with these institutions on data sharing. We also wish to thank our colleagues throughout the data processes of collection and entry for their diligence. We are also grateful to colleagues at APHRC who reviewed and gave critical input to this article through the "brownbag" sessions.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The author(s) received the following financial support for the research and/or authorship of this article: This work was supported by the generous financial grants and support from The William and Flora Hewlett Foundation (Grant Numbers: 2004-4197, 2004-4523, 2006-8376, 2008-2098), The Rockefeller Foundation (Grant Number: 200 3 AR 021), and The Wellcome Trust (Grant Number: GR 07830M).

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