Quality and Access to Education in Urban Informal Settlements in Kenya

October 2013

APHRC

African Population and
Health Research Center

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Abbreviations

ACS	Average Class Size
APHRC	African Population and Health Research Center
CI	Confidence Interval
CK	Content Knowledge
EA	Enumeration Area
ECD	Early Childhood Development
EFA	Education For All
FGD	Focus Group Discussion
FI	Field Interviewer
FPE	Free Primary Education
GER	Gross Enrollment Rate
HH	Household
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KESSP	Kenya Education Sector Support Programme
KIE	Kenya Institute of Education
KNBS	Kenya National Bureau of Statistics
KSHS	Kenya Shillings
MoE	Ministry of Education
MoGSS	Ministry of Gender and Social Services
NAC	National Assessment Centre
NER	Net Enrollment Rate
NUHDSS	Nairobi Urban Health and Demographic Surveillance System
PCA	Principle Component Analysis
PCK	Pedagogical Content Knowledge
PCR	Pupil Completion Rates
PGP	Parental Guardian Perception
PK	Pedagogical Knowledge
PTR	Pupil Teacher Ratio
SSA	Sub-Saharan Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPE	Universal Primary Education
USA	United States of America

Acknowledgements

Executive Summary

To achieve its objective of increasing accessibility to schooling and education, the Kenyan government introduced the Free Primary Education (FPE) policy in 2003. Although the introduction of the policy led to dramatic increases in enrollment, provision of adequate school places in densely populated urban areas as well as delivery of quality primary education remains a challenge. Kenya urban informal settlements are characterized by a myriad of challenges including inadequate provision of infrastructure and social amenities.

In a 2008 meeting with education policy stakeholders, African Population and Health Research Center shared research findings showing a shift in enrollment among children from two informal settlements of Nairobi. Policy stakeholders present at the meeting noted the need to know whether the shifts in enrollment to non-government schools observed in Nairobi slums were also occurring in other urban informal settlement in different towns; the driving forces of the shift; whether the reasons that push the poor to non-government schools are similar in different urban informal settlements; and the experiences and perceptions of students, teachers, and stakeholders with FPE. The purpose of this study therefore was to examine the patterns of schooling and the quality of education received by children living in urban informal settlements in Kenya. The study had four broad questions: **1)** What are the impacts of FPE on schooling patterns among poor slum households in urban slums in Kenya? **2)** What are the qualitative and quantitative explanations of the observed patterns? **3)** Are there any differences in achievements as assessed by performance on a standardized test on literacy and numeracy administered to early grade pupils in FPE public and non-public schools? and **4)** What are the main classroom teaching and learning process variables that determine learning outcomes in early grades? Evidence generated through this research is expected to inform improvements in the provision of education for all children including those living in resource-poor urban settlements.

Data collection for this study was carried out between January and March in 2012 in seven slum settlements in six towns in Kenya: Eldoret, Kisumu, Mombasa, Nairobi, Nakuru and Nyeri. These towns have the highest number of enumeration areas categorized as slums in the 2009 National Population and Housing Census. A total of twelve instruments were administered at household and school levels. To measure achievement, pupils in grades 3 and 6 completed Math and literacy assessments. Math teachers also completed a Math knowledge assessment. In addition to quantitative surveys and assessment tools, 21 focus group discussions were conducted with teachers and parents to establish community perceptions on schooling and education in the context of FPE. During the survey, 230 schools were visited (89 public, 94 formal private and 47 low-cost schools) and 671 Math and language teachers who taught grades 3 and 6 assessed and/or interviewed. In

addition, 15,030 pupils and 5,854 households participated in the survey.
Descriptive, bivariate and regressions analysis techniques were used to analyze quantitative data.

For the qualitative data analysis, we generated codes from the concepts that emerged from the research question that guided the study. The classroom observation data were analyzed using a rubric developed to systematically analyze the video recordings.

Key Findings

Household Characteristics
- Overall, about 30% of households were headed by females. However, there were marked regional variations with the lowest proportion of female-headed households in Mombasa (20.3%) and the highest in Nyeri (43%).
- Notable regional differences in the education level of the household head were also ob served. The highest proportion of household heads with at least some secondary educa tion was reported in Kisumu town (67%). In contrast, the household head in more than 70% of households in Nyeri had only primary level or no formal education.
- Overall, about 47% of children in the study sites attend non-government primary schools. A high proportion of children in Nairobi (63%), Mombasa (52%) and Eldoret (52%) attend non-government primary schools compared to about 4% in Nakuru, 7% in Nyeri, and 13% in Kisumu.
- There is a significant positive association between high household socioeconomic status (measured by level of education and wealth index) and enrollment in private formal primary schools.

Students' Achievement in Literacy and Numeracy
- Grade 3 pupils attending formal private schools outperformed their counterparts in the public and low-cost schools across all study sites in the literacy assessments. Letter and syllable knowledge items were highly performed while listening comprehension and creative writing were poorly performed across all schools.
- In literacy assessments among grade 6 pupils, those in low-cost private schools in Nairobi performed better than those in public and formal private schools. In other study sites, pupils in formal private schools performed better in literacy than those in public schools. Across all schools, performance in listening comprehension and word writing knowledge was significantly higher than in reading comprehension.
- Overall, in the literacy assessments, pupils performed well on knowledge and comprehension domains (above 60% for grade 3) but performed poorly on items related to application.
- Across the Math curriculum outcomes areas, pupils performed better on items related

to number concepts and operations (above 50%) and performed poorly on items related to patterns, algebra and measurement (below 40%).

Teachers' Knowledge and Teaching Styles

- Grade 6 students in formal private schools taught Math by a certificate (P1 or P2) trained teacher scored 6 percentage points more than those who are taught by an untrained teacher.
- Grade 6 pupils taught by a teacher with degree level training scored 16 percentage points more than those taught by untrained teachers. These significant effects could be explained by the improved teacher pedagogical knowledge skills acquired through teacher training.
- Overall, there was no difference in teachers' performance on a Math test that assessed their content knowledge (CK), pedagogical knowledge (PK) and pedagogical content knowledge (PCK) based on the type of school.
- Although the contents of teachers' Math assessment were not grade-specific and tested knowledge in Mathematics that a teacher teaching Math in a primary school should possess, grade 6 Math teachers outperformed (56%) their counter parts in grade 3 (46%).
- The mean score on the pedagogical Math knowledge assessment ranged between 43% and 47% in low-cost and formal private schools, respectively. The low mean score among teachers in low-cost schools may partially be explained by the higher (59%) proportion of untrained teachers in this school category.
- Across all the study sites and school types, more than half of the teachers utilized individual seat work as the dominant classroom activity during Math lessons in grade 3 and 6. Teachers who utilized individual seat work scored lower than those using highly teacher-centered methods.

Parents' Experience with FPE

- Quality of education continues to be an important consideration in parents' choice of school. On average, perceptions of the quality of learning and teachers' performance were similar across all the sites. Overall, parents perceived that the quality of learning and teachers' performance was higher in private schools than in government schools. However, high proportions of parents perceived that government schools showed higher improvement in terms of school building conditions and availability of textbooks than formal private schools.
- Generally, parental perceptions of quality were related to inputs into the education process. For instance, 84% of parents in Kisumu assessed the quality of learning in a school by the type of buildings present in a school, while 72% of parents in Mombasa assessed the quality of learning in a school by the presence of textbooks.
- A major finding from the FGDs was related to the presence of the Early Childhood

Development (ECD) sections in government schools. Parents were categorical that their choice of schools was influenced by the presence or absence of ECD centers in government schools where the younger children can begin to acclimatize to schooling.

Conclusions

Towns with larger slums have inadequate supply of government schools hence the proliferation of non-government schools whose direct fee-charges are slightly higher than those of government schools. In large urban informal settlements such as those in Nairobi, Mombasa and Eldoret, more than half of the children attend non-government schools. Enrollment in fee-charging non-governmental schools in low-resource settings such as urban slums appears to be driven primarily by parents' perception that the quality of education is better in non-government schools compared to government schools. In addition, safety concerns for younger children and availability of Early Childhood Development centers close to 'home' attract parents to non-government schools.

The higher performance in literacy in low-cost schools in Nairobi may partially be explained by greater availability of learning materials – specifically textbooks – supplied by development partners in low-cost schools. This supply of textbooks has enabled these schools to achieve a 1:1 textbook ratio compared to 2:1 in both government and formal private schools.

Skills acquired by teachers during training are important for the learning and teaching process and they contribute to improvements in learning outcomes. However, not all knowledgeable and experienced teachers translate their skills and experience to better learning outcomes largely due to ineffective teaching behavior. For example, the dominant teaching activity during Math instruction is individual seat work, which is only suitable for high achievers as it assumes that a learner needs little facilitation from the teacher.

This study finds that teachers teaching lower grades are less knowledgeable than their counterparts in upper primary – they scored significantly lower than their counterparts in upper primary. Improving teacher knowledge is critical in improving learning outcomes. This is an important consideration when designing strategies to address learning barriers.

Recommendations for Policy and Practice

- Government should explore public-private partnerships in education service delivery to ensure access to quality education for all. In particular, the government may need to consider stepping up support to formal private and low-cost schools serving marginalized communities as they complement the government's effort of taking

school closer to the children. As for the low-cost schools, they should register with the Ministry of Education in order to benefit more from government support.

- Continuous professional and academic development among teachers needs to be made mandatory. Professional development courses should go beyond mere sensitization. Online professional development courses may be one important avenue to ensure that teachers continually update their teaching skills. This professional development initiative can provide for teacher training programs targeting the untrained teachers especially in low-cost schools. At classroom level, teachers require feedback on how effectively they are facilitating pupils to learn.

- Teacher competency assessment may need to be considered as part of the envisaged education reforms. To achieve this, education stakeholders including but not limited to Teacher Service Commission, Kenya National Union of Teachers, Ministry of Education, Kenya Institute of Education, Kenya Institute of Education Management, researchers, head teachers associations and teacher training institutions can develop minimum competency levels in pedagogy and subject content that can be periodically assessed. In addition, teachers should sign measurable annual teaching and learning goals aimed at improving learning outcomes; and MoE and school management should assess teacher performance using such goals.

- Teacher teaching assignments need to be based on individual competence (content and pedagogical knowledge).

- The central and county governments should consider prioritizing the creation of Early Childhood Development centers that are linked to or feed primary schools and spearhead the establishment and entrenchment of pre-primary sections as an important component of public basic education. This is timely in the sense that the government has re-emphasized this in the new Education Bill with a call for the establishment of pre-primary institutions alongside primary and secondary institutions within reasonable distances in respective counties.

Preface

Quality and Access to Education in Urban Informal Settlements in Kenya

Today, Africa stands on a precipice where the actions we take today will determine whether the continent joins the rest of the world in achieving significant improvement in human wellbeing. African cities today provide a glimpse into that future. By 2050, Africa's urban population is projected to increase to 1.26 billion from the current 450 million. Barely 25 years ago in 1990, only 203 million people lived in urban areas in Africa. The implications of this rapid urban growth amidst poor economic performance are already evident in most urban centers across sub-Saharan Africa where growth of unplanned urban settlements has become a common feature. The informality of these settlements and the complete absence of basic public services create a vicious circle that constraints human development. Kenya, in many respects, typifies this new reality of urbanization in Africa. Disparities in access to basic social services between informal and formal urban settlements are highly visible. Yet, the nature of cities, especially large agglomerations with high densities of settlement; continuing economic growth in the region; advancements in science and technology; political renewal and most importantly, a burgeoning youth population, are creating unique opportunities for sustained improvements in the lives of Africans, including those in urban informal settlements.

In endeavoring to unlock these opportunities, the continent has made laudable strides towards achieving Millennium Development Goal 2 - universal primary education. Kenya has gone a step further and in its Vision 2030, singles out education as the vehicle that will drive Kenya into becoming a middle-income economy. In addition, the 2010 Constitution provides for free and compulsory basic education as a human right to every Kenyan child. Now, every Kenyan child can get basic education for free.

Despite this progressive Free Primary Education policy introduced by the government in 2003, APHRC's research shows that in Nairobi's informal settlements of Korogocho and Viwandani, over 60% of children attend fee-charging non-government schools. One limitation of that study was that it only covered two informal settlements in Nairobi. Larger questions regarding experiences in other cities in Kenya could not be answered until now. This current study presents a timely and authoritative assessment of the impact of the free primary education policy on access and education outcomes in six urban towns in Kenya - Nairobi, Kisumu, Eldoret, Mombasa, Nakuru and Nyeri – with data collected from 5,854 households, 230 schools and 15,030 grade 3 and 6 pupils. The result is a detailed analysis and evidence of the conditions that impact quality and access to education among the poorest urban residents in Kenya.

This study into the Quality and Access to Education in Urban Informal Settlements in Kenya has been shared with key educationists including senior officials at the Kenyan Ministry of Education. Their questions, comments and suggestions have enriched the study analysis and contributed to the well-reasoned recommendations for policy and practice.

This research is undertaken by APHRC's Education Research Program (ERP) to inform policy and improve educational outcomes in the country. Findings from ERP's research over the past five years have raised serious concerns about the quality of primary education accessible to children in sub-Saharan Africa. These concerns range from poor performance of pupils in standardized literacy and numeracy tests in early grades to primary school teachers' limited content knowledge and pedagogical skills.

We are profoundly grateful for the support, which APHRC continues to enjoy as we drive Africa's progress through research, and appreciate the confidence and goodwill from our study communities, partners and funders.

Dr. Alex Ezeh,
Executive Director, APHRC

Map 1: Map of Kenya Showing the Six Sampled Towns
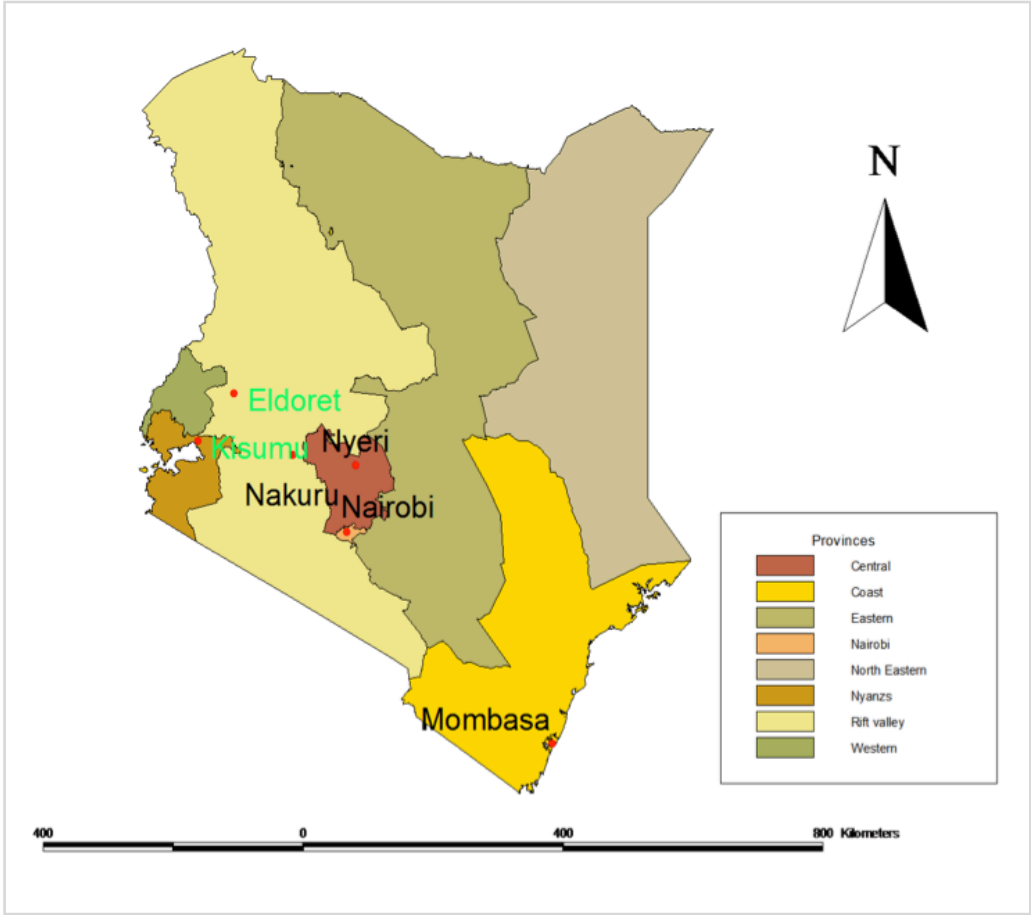
1.0 Introduction

Access and quality of education have been part of the key challenges of Kenya's education system. Although the Kenyan government has made key improvements in ensuring increased access to schooling, challenges remain in ensuring quality of education. To achieve the objective of increased accessibility to schooling and education, the Kenyan government introduced Free Primary Education (FPE) policy in 2003. The implementation of FPE led to increased enrollment of children in schools from 5.9 million in 2002 to 7.6 million in 2006 and 9.9 million in 2011 (Government of Kenya, 2012). There was also observed growth in the number of Kenya Certificate of Primary Education (KCPE) candidates, from 540,069 in 2002 to 704,520 in 2007, followed by a slight decline to 695,701 in 2008 (UNESCO, 2005).

However, existing studies show that the implementation of the FPE policy has been marred by questions about the quality of education. For example, Ngware, Oketch, Mutisya & Abuya (2010) found that the mean score on a standardized Math test was less than 50%, and some teachers of grade 6 pupils scored as low as 17% in a teacher Math knowledge test. Oketch, Mutisya, Ngware & Ezeh (2010) observed that in two slums in Nairobi, many parents perceive that the quality of education in public schools is poor and that most prefer to send their children to fee-charging private informal schools rather than government schools. This implies that the Ministry of Education (MoE) may not achieve its objective of providing FPE to all children under the current policy framework.

Kenya Education Sector Support Program (KESSP) 2005 - 2010 policy initiative was primarily focused on the attainment of Education for All (EFA) and, in particular, Universal Primary Education (UPE). KESSP's broad objective is to give every Kenyan the right to quality education and training regardless of his/her socio-economic status through provision of an all-inclusive quality education that is accessible and relevant to all Kenyans. KESSP addressed issues pertaining to retention, equity, quality and relevance, and internal and external efficiencies within the education system. However, achieving quality remains a major task and evidence at the local level of the quality of education is inadequate. Official government documents observe that quality education is constrained by inadequate infrastructure and a shortage of permanent classrooms, particularly in resource-poor districts; the poor state of existing school infrastructure due to limited investment, poor construction standards and inadequate maintenance; the limited number of primary schools serving marginalized populations including those in rural areas and low-income and in other pockets of poverty zones; and the huge discrepancies in needs depending on local conditions (UNESCO, 2005; Government of Kenya, 2005). The listed constraints are input indicators of quality that are at school level and not at the individual child level.

These inputs are important factors in the quality debate, but they alone do not give us an accurate picture of quality unless combined with evidence of actual performance of pupils in the core subject areas of literacy and numeracy.

Building on the above literature, the challenge of access and quality especially among the marginalized populations still remains. It is also evident that in spite of the pro-poor focus of the FPE program, children from disadvantaged urban populations continue to enroll in low-cost non-government schools. In a 2008 meeting with education policy stakeholders, African Population and Health Research Center (APHRC) shared research findings showing a shift in enrollment among children from two informal settlements of Nairobi. Policy stakeholders present at the meeting noted the need to know **(i)** whether the shifts in enrollment to non-government schools observed in Nairobi slums are also occurring in other urban informal settlements in different towns; **(ii)** the driving forces of the shift, and whether the reasons that push the poor to non-government schools are similar in different urban informal settlements; and **(iii)** the experiences and perceptions of students, teachers, and stakeholders with FPE. This prompted the need to investigate patterns of enrollment and quality of education in urban slums to provide a more generalized conclusion on access to schooling and quality of primary education in urban Kenya. The study was conducted in seven urban informal settlements (slums) spread across six towns in Kenya namely Eldoret, Kisumu, Mombasa, Nairobi, Nakuru and Nyeri.

1.1   Contextual Issues

Study Site Profiles
This section gives a brief overview of the study sites.
Majengo is an urban informal settlement with a total of 8,168 households and a population of 25,018 persons in an area of 6.5 km2. It is located in Nyeri municipality, Mukaro location, Nyeri South District, Kenya, as stated in the Kenya Population and Housing Census, 2009 (KNBS, 2010). Nyeri, the headquarters of Nyeri South District, is located in the central highlands and is the largest town in the newly-created Nyeri County. Nyeri town is situated about 150 km north of Kenya's capital city, Nairobi. As an administrative town, the population has a high proportion of government and corporate workers. Kikuyu, English and Swahili are the widely spoken languages. Located in Kenya's fertile highlands, food and water are plentiful and relatively cheap. Small-scale business activities are vibrant in the town.

Maweni is an urban informal settlement situated in the outskirts of Mombasa city in Kongowea Location, Kisauni Division, Mombasa District (Kenya Population and Housing Census, 2009). The informal settlement which occupies an area of 6.4 km2 has a total of 12,742 households with a population of 42,187 people. Mombasa, the second largest

city in Kenya, is situated in the southeast and is home to the country's only seaport. Mombasa residents derive their livelihoods from a variety of economic activities including formal employment in industries, tourism, and fishing.

Langas is an urban informal settlement in Eldoret municipality, Pioneer Location, Kapseret Division. Langas is situated less than 10 km from Eldoret town (Kimani-Murage & Ngindu, 2007). Eldoret town is located about 330 km northwest of Nairobi. Eldoret, the administrative center for Wareng District (Uasin Gishu County), is surrounded by a large agricultural area and for this reason it is home to many farmers. Langas covers an area of 46.5 km2 and is occupied by 12,525 households with a population of 28,252 persons (Kenya Population and Housing Census, 2009). Langas falls under the high density, low-income areas of the Eldoret municipality, and the settlement began in 1965 (Kimani-Murage & Ngindu, 2007).

Baharini informal settlement is located in Nakuru municipality in Bondeni location. Nakuru municipality is located 160 km northwest of Nairobi and it is the headquarters of Nakuru County. The municipality is cosmopolitan and populated by people from all over Kenya and other parts of the world with a sizeable number of Kenyans of Indian origin. The main economic activities are manufacturing and tourism, with agriculture dominating the surrounding areas. Baharini occupies an area of 2.6 km2. It has a total of 4,829 households with a population of 17,078 people (Kenya Population and Housing Census, 2009).

Manyatta 'A' is an informal settlement in Kisumu municipality. Kisumu is a port and serves as the headquarters of Kisumu County. Fishing is the largest economic activity in the town due to the presence of the fresh water Lake Victoria. Manyatta 'A' is located in Kondele Location, Winam Division, Kisumu East District. The slum covers an area measuring 2.4 km2 with a total of 12,525 households and a population of 48,004 (Kenya Population and Housing Census, 2009).

Korogocho and Viwandani: Korogocho is in Nairobi North District occupying an area of 0.9 km2, located within Kasarani Division. It is situated approximately 11 km from Nairobi's central business district. The informal settlement has a total of 12,909 households (Kenya Population and Housing Census, 2009). Most residents operate small businesses to earn their living as wage employment is difficult to come by. The slum is characterized by high levels of insecurity, poor accessibility, inadequate housing, poor sanitation and water quality, and low access to basic services like health care and education. Viwandani is located in Nairobi East District occupying an area measuring 5.7 km2. Viwandani has a total of 17,926 households (Kenya Population and Housing Census, 2009). It is located within the industrial area part of Nairobi, about 7 km from Nairobi city center. The informal settlement is characterized by overcrowding, insecurity, poor housing and sanitary conditions, and inadequate social amenities (Ochako, Wawire & Fotso, 2011). The population density of the two informal settlements is about 86,000 people.

Trends in Enrollment and Transition in Kenya

In the recent past, universal education policies have led to an increase in school enrollment in most developing countries, particularly at the primary level. For instance, as indicated in Figure 1.1, gross enrollment rate (GER) in Kenya has been on the increase from as low as 91% in 1999 to about 110% in 2009. Pupil completion rates (PCR) have also increased but at lower rate than the enrollment rates implying some pupils drop out of school before completion. However, transition to secondary education remains below 50% and in some sub-Saharan African (SSA) countries, transition to secondary school is as low as 30% (UNESCO, 2008). Figure 1.1 shows that transition to secondary school in Kenya has been on the increase but the rates still remain very low, with the transition rate for 2009 at 64% compared to a target of 70% and against a PCR of 83.2% in the same year.

Figure 1.1: Gross Enrollment, Transition and Pupil Completion Rates in Kenya 1999-2010
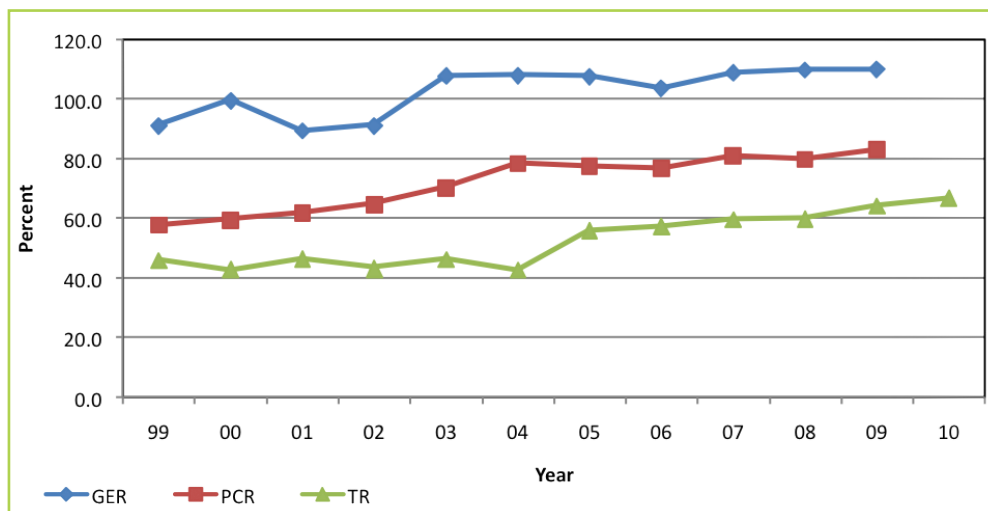
Consequently, despite increased enrollment at primary school level in Kenya, challenges relating to primary completion and transition to secondary school still remain. Further, as noted by Sifuna (2007), maintaining quality education remains a challenge as well, due to overstretched facilities, congested classrooms, and a shortage of teachers, among others. Previous studies (UNESCO, 2005; Abagi & Sifuna, 2006; Oketch & Rolleston, 2007) have reported teachers handling large classes of 60–80 or even 100 pupils per class. Large classes make it difficult to ensure that pupils receive adequate attention and, hence, compromise learning. This implies that a quantitative increase in enrollments may have been achieved at the expense of quality. Majanga, Nasongo & Sylvia (2011), while elaborating on the challenges of large class sizes, argue that such classes influence teaching and learning during interaction; this is especially in core subjects like Mathematics which require frequent teacher attention. They further conclude that, within classrooms,

teachers have resorted to lecturing activities as one way of handling large classes thus leading to minimal teacher-pupil interaction during instruction time.

Beyond large class sizes is the challenge associated with over-age pupils, which is a common phenomenon in schools attended by children from disadvantaged populations. Most of these over-age pupils find it difficult to cope with the learning process and, at times, have a negative influence on other pupils (Sifuna, 2007).

Overall, although access to education has improved, quality education remains a challenge. This study builds on previous work examining trends in education within resource-poor urban settings in the context of FPE. The study examines the extent to which education trends observed in Korogocho and Viwandani in Nairobi are also in other urban informal settlements in Kenya. Study findings are expected to lead to an increased understanding of what is happening in the fast growing Kenyan major urban informal settlements in terms of education.

1.2   Purpose of the Study

The purpose of the study is to examine the patterns of schooling and the quality of education received by children living in urban informal settlements in Kenya. The study findings are expected to give a more generalized picture on access to schooling and quality education among the urban poor in the context of FPE. The present study extends previous work conducted by APHRC between 2005 and 2010 in two Nairobi urban informal settlements of Korogocho and Viwandani. Notwithstanding, the present study also sought to understand the factors that contribute to low utilization of public schools by the poor slum residents whom ideally should benefit more from the FPE policy; and, challenges related to quality education through assessment of the learning outcomes and quality of teaching. In this research report, we refer to public schools as government schools, while both formal private and low-cost schools are also referred to as non-government schools. Evidence generated through this research is expected to inform improvements in the provision of education for all children living in resource-poor urban informal settlements.

The research questions guiding the study are:
1. What is the effect of FPE on schooling among poor households in urban slums in Kenya?
2. What are the qualitative and quantitative explanations of the observed effects?
3. Is there any difference in pupil achievement as assessed by performance on a standardized test on literacy and numeracy administered to pupils in government and non-government schools?
4. What are the main classroom teaching and learning process variables that determine learning outcomes?

1.3   Study Hypotheses

In this study, we hypothesize that:
1.   Poor households in the slums are shifting to private schools because of perceived better quality in non-government schools.
2.   Low-cost private schools in urban slums are more affordable to poor households than government schools under FPE.
3.   Classroom-based process variables are more important than input variables in determining learning outcomes.

1.4   Study Design and Sampling Procedures

This was a cross-sectional study involving schools and households. The study covered six purposively selected major towns (Eldoret, Kisumu, Mombasa, Nairobi, Nakuru and Nyeri) in different parts of Kenya (see Map 1) to provide case studies that could lead to a broader understanding of what is happening in urban informal settlements. The selection of a town was informed by presence of informal settlements and its administrative importance, that is, provincial headquarter or regional business hub. A three-stage cluster sampling procedure was used to select households in all towns with an exception of Nairobi. At the first stage, major informal settlement locations were identified in each of the six towns. The informal settlement sites were identified based on enumeration areas (EAs) designated as slums in the 2009 National Population and Housing Census conducted by the Kenya National Bureau of Statistics (KNBS). After identifying all slum EAs in each of the study towns, the location with the highest number of EAs designated as slum settlements was selected for the study. At the second stage of sampling, 20% of EAs within each major slum location were randomly selected. However, in Nakuru we randomly selected 67% (10) EAs while in Nyeri all available 9 EAs were included in the sample. This is because these two towns had fewer EAs and therefore the need to oversample to have a representative number of EAs. In total, 101 EAs were sampled from the major slum locations across the five towns. At the third stage, all households in the sampled EAs were listed using the 2009 census' EA maps prepared by KNBS. During the listing, 10,388 households were listed in all sampled EAs. Excluding Nairobi, 4,042 (57%) households which met the criteria of having at least one school-going individual aged 5-20 years were selected for the survey. In Nairobi, 50% of all households which had at least one school-going individual between 5 and 20 years were randomly sampled from all EAs existing in APHRC schooling data collected in 2010. A total of 3,060 households which met the criteria were selected. The need to select a large sample of households in Nairobi was to enable us link data from the current study with previous ones that covered over 6000 households in Korogocho and Viwandani. By so doing, we were able to get a representative sample of households

in Nairobi to continue observing the schooling patterns longitudinally. In all, there were 7,102 eligible households in all six towns. A total of 14,084 individuals within the target age bracket living in 5,854 (82% of all eligible households) participated in the study. The remaining 18% of eligible households were not available for the interview as most of them had either left the study areas, declined the interview, or lacked credible respondents in the household at the time of the data collection visit or call back.

For the school-based survey, schools in each town were listed and classified into three groups based on their location: **(i)** within the selected slum location; **(ii)** within the catchment area of the selected slum area - about 1 km radius from the border of the study locations; and **(iii)** away from a selected slum. In Nairobi, schools were selected from existing APHRC data. During the listing exercise, lists of schools were also obtained from Municipality/City Education Departments in selected towns. The lists were used to counter-check the information obtained during listing. All schools located within the selected slum areas and those situated within the catchment area (1 km radius from the border of the slum) were included in the sample as long as they had a grade 6 class or intended to have one in 2012. The selection of schools within an informal settlement and those located within 1 km radius was because they were more likely to be accessed by children from the target informal settlement. Two hundred and forty-five (245) schools met the selection criteria and were included in the sample. Two hundred and thirty (230) primary schools (89 government schools, 94 formal private, and 47 low-cost schools) eventually participated in the survey. A total of 7,711 grade 3, 7,319 grade 6 pupils and 671 teachers of the same grades were reached and interviewed. All 230 head teachers (or their deputies) were interviewed on school characteristics. Table 1.1 summarizes the sampling and sample size per site.

Table 1.1: Targeted and Actual Sample for the Survey per Site

Town	Slum (as defined by KNBS)	Total No. of EAs	No. of EAs selected	Number of households listed	Number and percentage of households selected to participate	Number and percentage of households covered	Number of listed schools	Number and percentage of schools selected to participate	Number and percentage of schools covered
Eldoret	Langas	145	29	3558	1289(36%)	1144(89%)	70	42(60%)	41(98%)
Kisumu	Manyatta 'A'	108	22	2331	1203(52%)	1024(85%)	32	28(88%)	27(96%)
Mombasa	Maweni	103	21	2450	670(23%)	543(81%)	57	51(89%)	46(90%)
Nairobi	Korogocho & Viwandani	136	60	**	3060	2332(76%)	**	63	60(95%)
Nakuru	Baharini	15	10	1019	461(45%)	435(94%)	66	50(76%)	46(92%)
Nyeri	Majengo	9	9z	1030	419(41%)	375(89%)	20	11(55%)	10(91%)
Total		**516**	**151**	**10388***	**7102**	**5853(82%)**	**245***	**245**	**230(94%)**

*Totals exclude households and schools for Nairobi

**There was no listing of households and schools in Nairobi. The sample was from existing

APHRC data

1.5   Survey Instruments

Five survey questionnaires were administered at household level:

(i).   An *individual* schooling history questionnaire was administered to individuals aged 5 – 20. The questionnaire was directly administered to individuals aged 12 - 20 and administered to a proxy for children younger than 12 years. Ideally, the proxy was the child's parent or guardian, or an adult familiar with the individual's schooling history and who usually resides in the same household. The questionnaire had two main sections: school participation for the current year (year of interview), and school participation for the five years preceding the year of interview (i.e. 2007 to 2011). The section on schooling participation on the current year collected information on the schooling status of the individual, the type, name and location of the school that the individual was attending, grade, and whether the individual had changed schools or dropped out of school in the current year. Respondents also provided information on the reasons for changing schools and dropping out of school, where applicable. The section on school participation for previous years also collected similar information. The questionnaire also collected information on the individual's year of birth and when they joined grade one.

(ii).   A *household* schedule questionnaire was administered to the household head or the spouse. It sought information on the members of the household, their relationship to the household head, their gender, age, education and parental survivorship.

(iii). A parental/guardian perception questionnaire was administered to the household head or the parent/guardian of the child. It collected information on the parents/guardians' perceptions on Free Primary Education since its implementation, household support to school where child(ren) attends and household schooling decision.

(iv). A parental/guardian involvement questionnaire was strictly administered to a parent or guardian who usually lives in the household and who was equipped with adequate knowledge of the individual's schooling information (i.e. credible respondent). The questionnaire was completed for each individual of the targeted age bracket (5-20 years). The information on the individual comprised questions on the gender of the individual, parental/guardian aspirations for the individual's educational attainment, and parental beliefs about the individual's ability in school and their chances of achieving the aspired level.

(v). A household amenities and livelihood questionnaire was administered to the household head or the spouse or a member of the household who could give reliable information. The questionnaire collected information on duration of stay in the area, household possessions, access to basic amenities, and shocks experienced by the household.

Seven instruments were administered at school level:

(i). A *primary school institutional questionnaire* was administered to the head teacher (or deputy). The questionnaire collected information on school infrastructure, availability of teaching resources, staffing (number, qualification, absenteeism, and recruitment), schoo charges, students' enrollment and absenteeism, school ownership and management.

(ii). A *Math/English teacher questionnaire* was administered to grades 3 and 6 Math and English teachers. The questionnaire collected data on teachers' demographic characteristics, level of education, pre- and in-service trainings, years of experience in teaching the subject, supervision by curriculum advisor/school inspector, workload, support from head teacher/deputy head teacher, interactions with parents, and availability of teaching materials and teaching practices.

(iii). A *student background characteristics questionnaire* was administered to grade 6 pupils. This tool gathered information on pupils' socio-demographic characteristics (age, sex, parents' level of education, household socio-economic status), school homework, language spoken outside school, pupil and teacher absenteeism, and schooling history.

(iv). A *classroom observation checklist* was completed during classroom observations. This checklist collected information on pre-lesson preparation by Math and English teachers; number of pupils present and absent during the date of interview; availability of visual aids, teaching materials in the classroom; and classroom environment such as sufficient writing space, light, ventilation, and students seating arrangement.

(v). A grade 3 and 6 numeracy tool was used to assess grades 3 and 6 pupils' Mathematics ability.

(vi). A grade 3 and 6 literacy tool was used to assess grades 3 and 6 pupils' literacy skills.

(vii). A Math teacher knowledge assessment tool was administered to grades 3 and 6 Math teachers to assess teachers' pedagogical knowledge in Mathematics.

Conducting FGDs

In addition to the quantitative survey, we collected qualitative data by conducting three Focus Group Discussions (FGDs) at school level in each study site. This comprised one FGD with mixed teachers drawn from government and non-government schools, and two others with grade 3 and 6 pupils' parents in both government and non-government schools separately. English and Mathematics teachers for grades 3 and 6 were invited from 10 participating schools close to each other. Thus, in total, a team of 20 teachers were invited to participate in the FGD in any given site to ensure that even if some would not turn up, we still had at least 10 teachers. To select parents to participate in the FGDs, 10 pupils from grade 3 and 6 respectively were randomly selected from the selected schools. Then, through the head teachers, invitation letters were dispatched to their parents to attend the FGDs on the agreed date. During the exercise, the Field Interviewers filled the participant description and consent forms. In addition, the entire discussion was recorded.

1.6   Recruitment, Training and Pre-testing

Recruitment of the Field Interviewers (FIs) was on competitive basis. The advertisement for the recruitment exercise was sent to various places through the offices of the area Chiefs and District Statistical Officers for the residents to apply. This ensured that the qualified local residents got the first opportunity to participate in the survey as we believe in promoting the wellbeing of the people where we do our surveys. In total, 139 FIs were recruited and trained. Field workers from Nyeri, Nairobi and Mombasa were recruited and trained in Nairobi, while those from Nakuru, Kisumu and Eldoret were recruited and trained in Nakuru.

Prior to the training workshops, researchers met and reviewed all tools in order to ensure similar understanding and minimize training bias. Field Interviewers were trained on all the questionnaires, video filming and research ethics. They were also trained on how to conduct FGDs. Team leaders and APHRC researchers were trained by literacy and numeracy experts and given opportunity to pilot test the numeracy and literacy tests in Kibera, Nairobi. Thereafter, revisions based on field experiences with the guidance of the experts were done. During the sixth day of training, fieldworkers participated in a pilot survey in conjunction with APHRC's research team. Following the training, 118 Field

Interviewers were eventually recruited (78 administering household questionnaires and 40 administering school-based tools).

1.7   Data Collection

Data collection was conducted between January and March, 2012. The FIs worked in teams led by a team leader. A team of four field workers were assigned to collect data in each school. One FI did the video filming and visited schools a day after the other team members had administered all the other tools. This ensured that no filming was done when the assessment tools were being administered. For the household surveys, a team of 3 or 4 field workers were assigned to each EA. In areas perceived to be risky for the FIs, security was provided by identified people from the community in collaboration with village elders.

During data collection, the study team maintained regular communication with the District Statistical Officer and Municipal Education Officer. This enabled the research team to quickly solve any administrative issues that arose. The field team experienced several challenges during data collection at school level. First, in some schools, pupils took the tests seated on the floor as there were no chairs and desks in the rooms. This might have had implications on their speed and overall performance. Second, crowded classes in some schools made it difficult to administer the tests. In such classes, the FIs spaced out the children as much as possible. One FI then administered the tools while another FI moved around the class assisting pupils. Third, getting administrative buy-in in some schools was difficult even though the study team had a letter of authorization from the Ministry of Education. With the assistance of Municipality Education Officials and District Statistical Officers from the Kenya National Bureau of Statistics, we managed to convince several schools to participate in the study. However, nine private schools completely declined the interview. For the household surveys, several challenges were experienced. First, some pre-sampled households could not be found. We decided to trace households that had moved within the same EA. Households which had moved outside the EA or that could not be traced were replaced. Second, getting household respondents during the day was difficult in some places. To maximize on the household response rate, the research team worked late and also on weekends in order to get those respondents who could not be found during the day.

1.8   Quality Assurance

Several measures were taken to ensure that quality data were collected during the period. First, team members in various study sites held daily meetings to discuss issues related to fieldwork. Second, team leaders went through all the questionnaires checking for errors including inconsistencies. If a team leader found inconsistent information while editing, he/she had to go back to the same household to confirm the information with the person who responded to the questionnaire. All team members edited their work daily before submitting to their respective team leaders. Third, team leaders also accompanied different teams to observe data collection. They also had sit-ins with household FIs and conducted random spot-checks in some households to ensure quality. Finally, the core research team also visited every study site and conducted random household spot checks. Following these visits, the core research team held meetings with the teams and communicated issues and challenges that they came across and brainstormed on ways to improve the quality of data collection. In general, close and intensive supervision by team leaders and researchers ensured that the survey was conducted in a professional way and that quality data was collected.

1.9   Analysis

Descriptive, bivariate and regressions analysis techniques were used to analyze quantitative data. The descriptive analysis involved calculation of means for pupil achievement and teacher pedagogy scores and their standard deviations as well as frequencies and percentages for categorical variables. The test data involved scoring individual pupils on different individual test items. Item scores were thereafter summed up and converted into percentages and standardized by calculating z-scores. Literacy and numeracy scores were based on defined scoring rubrics to ensure objectivity in scoring. Bivariate associations included cross tabulations of pupil and teacher scores with school type, study site and gender.

To assess the correlates of achievement and school choice, regressions models were fitted. A multinomial regression model was fitted using data collected at the household level, with the type of school as the outcome variable and several factors hypothesized or known to be associated with school choice included as explanatory variables (e.g. school type, use of text books, study site, teacher experience and workload, and pupil characteristics). The achievement model involved fitting a random intercept multi-level model – with pupils nested within schools. Five models were fitted (see appendices): **(1)** literacy model for grades 3 and 6 separately; **(2)** numeracy model for grades 3 and 6 separately without controlling for individual literacy score; **(3)** numeracy model for grades 3 and 6 separately controlling for individual literacy score; **(4)** schooling pattern model for

Nairobi that includes public, formal private and low-cost schools; and **(5)** schooling pattern model for other towns that includes public and formal private schools. The outcome in the first three models was the individual test z-score. In the last two models, school type is the outcome variable. In this report, statistical significance is reported at 95% ($\alpha=0.05$).

For the qualitative data analysis, we generated codes from the concepts that emerged from the research question that guided the study. Additional codes were generated after reading the first set of the transcripts. The coding process entailed identifying vital moments in the data and coding these before beginning the process of interpretation (Fereday & Cochrane, 2006). The codes were subsequently categorized into themes (Rice & Ezzy, 1999).

The classroom observation data were analyzed using a rubric developed to systematically analyze the video recordings. The rubric drew upon classroom interaction research work, notably the work of Chesterfield (undated), Sorto, Marshall, Luschei & Carnoy (2009), Ngware et al. (2010) and the classroom interaction study in South Africa (Carnoy & Chisholm, 2008). The rubric was adapted to suit the Kenyan context and piloted to improve its validity. All the video-recorded lessons were analyzed using a systematic observation and time-line analysis. According to Ackers and Hardman (2001), this kind of analysis is appropriate because one requires a way of synthesizing the entire mass of recorded lesson discourse in a systematic way in order to identify and quantify clear patterns of teacher–pupil interactions in the lesson. The video analysis techniques also allowed triangulation with the observation data to achieve greater validity and reliability in the analysis of the classroom observation data. Two teacher trainers with extensive experience and expertise on teacher training and pedagogy analyzed the 396 videos. The two internal experts who had done video coding for our previous studies first coded each video separately, and then did double coding for 11% of the videos. The internal experts' overall rating agreement was 0.90.

2.0 Household Characteristics and Schooling Patterns

This chapter describes the socio-economic characteristics of the sampled households and schooling pattern among school-age children in the study sites across the six major towns. We examine whether there are differences in primary and secondary school enrollment rates by household background characteristics such as wealth index, gender and level of education of the household head. We further present the effects of FPE on public and private schooling among children residing in urban informal settlements.

Table 2.1 presents basic characteristics of the study sites in the six major towns. There was a wide variation between the study areas in terms of population density with the highest population density observed in the Nairobi study sites of Korogocho & Viwandani, followed by Kisumu and Mombasa sites. In general, study areas in Eldoret and Nyeri are relatively sparsely populated. Population to public primary school ratio was used as a proxy measure of access to public schools in each study site. The results indicate that the ratio was very high in Nairobi and Eldoret study sites; indicating few public schools relative to the population size in those areas. On average, one public school serves a population of 9,357 in Korogocho and Viwandani, while only 534 people were served by one public school in Nakuru.

The survey collected data on the amount of school charges. The last three columns in Table 2.1 present annual average charges of grade 3 pupils and, in general, the charges by formal private schools were much higher than that of government and low-cost schools. There was also a wide difference in the amount of charges across the study sites. Government schools in Nakuru and Eldoret charged over Kshs.2,000 while in Nyeri they charged about Kshs.1,200. This is over and above the Kshs.1,020 per pupil they receive from the FPE program. With regard to formal private schools, the highest charges were observed in Nakuru followed by Nyeri and Mombasa. Low-cost schools in Nairobi charged an average of Kshs.3,245 per annum. In government schools, three quarters of the charges went to pay for school meals with about 10% each going to examinations and extra classes. The government caters for tuition in all public primary schools. In formal private schools, about three quarters of the charges go to tuition with a fifth going to school meals. In low-cost schools, about 70% was spent on tuition, 14% on school meals and about 10% on extra classes.

Table 2.1: Background Characteristics of Study Areas

Towns	Pop. density	Sex-ratio (Male to Female)	Pop- gov't primary sch. ratio	Average school Charge (KSHS.)		
				Gov't	Formal private	Low-cost
Mombasa	6627	115.1	3835	467	10,349	-
Nairobi*	**86066	124.8	9367	603	6,892	3,245
Nyeri	3848	110.5	1924	1,276	14,333	-
Nakuru	6506	95.8	534	2,931	20,900	-
Eldoret	2011	104.2	8494	2,493	7,032	-
Kisumu	20334	104.1	2400	616	8,783	-

*Computed Korogocho & Viwandani combined; ** calculated based on NUHDSS data

2.1   Household Characteristics

2.1.1   Household Size

Household size refers to the number of the usual members of a household. Information on household size was collected by asking a respondent, household head/spouse or an adult member about the number of people who are members of the household at the time of the survey. The distribution of sampled households by number of members *(Table 2.2)* shows that about two-thirds of the households had 4 - 6 members. The overall average house-hold size was estimated at 3.2 and varies by study sites, ranging from 2.8 in Nairobi to 3.8 in Kisumu. The figure is lower than the national level mean household size (4.4) estimated based on the 2009 census data.

Table 2.2: Household Size by Study Sites

Town	Household Size			Mean
	1-3	**4-6**	**7 & above**	**HH size**
Mombasa	18.5	64.3	17.3	3.3
Nairobi	20.9	59.9	19.2	2.8
Nyeri	25.0	64.2	10.8	3.1
Nakuru	31.0	54.6	14.5	3.5
Eldoret	20.4	64.1	15.5	3.3
Kisumu	17.1	64.0	18.9	3.8
Total	**20.8**	**61.7**	**17.5**	**3.2**

2.1.2   Distribution of Household Heads by Sex and Broad Age-group

This section describes the characteristics of household heads such as sex, age, and level of education. The household head could either be male or female who makes key decisions such as managing the income and expenses of the household, and is not necessarily the oldest person in the household. This section describes the characteristics of household heads such as sex, age, and level of education. The household head could either be male or female who makes key decisions such as managing the income and expenses of the household, and is not necessarily the oldest person in the household. *Table 2.3* presents the distribution of household heads by broad age-groups and proportion of female-headed households. The result indicates that overall about 30% of the households were headed by females. However, there was a wide variation across the study sites, the lowest being 20% in Mombasa and the highest 43% in Nyeri. According to the 2006 Kenya Integrated Household Budget Survey, the percentage of female-headed households in urban areas was estimated at 23% (Ministry of Planning and National Development, 2007). The majority of household heads (81%) were in the age group 25-49 years with no noticeable difference across the study sites. Higher proportion (17%) of household heads aged 50 years and above was observed in Nyeri, while relatively lower proportion (13%) in Nairobi were aged 50 and above.

Table 2.3: Distribution of Household Heads by Sex and Broad Age-groups

Town	Female Headed	Broad Age-group			
	Households (%)	< 25	25-49	>=50	Total
Mombasa	20.3	2.0	81.4	16.6	543
Nairobi	30.2	6.1	80.4	13.5	2,332
Nyeri	43.2	3.2	79.7	17.1	375
Nakuru	37.0	3.9	80.2	15.9	435
Eldoret	26.9	3.5	81.0	15.5	1,144
Kisumu	25.9	3.3	80.8	15.9	1,024
Overall	29.2	4.4	80.6	15.0	5,853

Table 2.4 presents the distribution of household heads by highest level of education attained. Overall, household heads with no formal education were about 6%, ranging from 2% in Kisumu to 9% in Mombasa. Except in Kisumu and Eldoret, more than half of the household heads have only primary level or less education. In Kisumu, the highest proportion (66%) of household heads reported to have some secondary or higher level of education, followed by about 47% in Eldoret. In contrast, about 71% of household heads in Nyeri had only elementary level or no formal education. This corresponds to the high proportion of female headship in Nyeri. Among male household heads, nearly half (49%) of them had

at least secondary education while only above 28% of female household heads had similar level of education. In general, less than 10% of household heads in each study site had education beyond secondary level; the exception was Kisumu where 16% of household heads had some education beyond secondary level.

Table 2.4: Distribution of Household Heads by Level of Education and Study Site

Town	No Education	Primary	Secondary	Higher	Unknown
Mombasa	9.0	42.4	37.0	9.2	2.4
Nairobi	7.4	51.9	35.7	2.6	2.4
Nyeri	8.0	63.2	25.3	1.6	1.9
Nakuru	6. 7	54.5	32.2	3.7	3.0
Eldoret	4. 5	46.0	40.5	6.3	2.7
Kisumu	2.3	30.2	50.1	16.4	1.0
Overall	6.1	47.0	38.4	6.4	2.2

2.1.3   Household Wealth Index

Household wealth status is correlated with a range of household durable asset ownerships such as house, car, television, refrigerator and telephone among others. Table 2.5 presents distribution of households by wealth quintiles. Household wealth index is constructed for the whole sample across the study sites using principal component analysis (PCA) based on household's durable assets ownerships.

Table 2.5: Distribution of Households by Wealth Quintiles

Town	Sample	Wealth Quintile				
		Poorest	2	3	4	Least Poor
Mombasa	522	19.9	16.5	12.1	19.2	32.4
Nairobi	2282	12.7	21.9	26.0	24.3	15.2
Nyeri	358	60. 9	17.6	10.3	4.5	6.7
Nakuru	423	19.6	16.1	27.4	24.1	12.8
Eldoret	1117	29.1	19.2	16.7	17.4	17.5
Kisumu	1008	12.7	20.3	15.1	16.9	35.0
Overall	5710*	20.1	19. 9	20.1	19. 9	20.0

* 144 households had incomplete data on asset ownership & were excluded from the wealth quintile computation

The result shows that about two-thirds (61%) of the households residing in the informal settlement of Nyeri town fall in the poorest quintile (bottom 20%) and only about 7% in the top quintile. In contrast, high proportion of households (more than 30%) in Mombasa and Kisumu fall in the top wealth quintile. This suggests that household wealth correlates with sex of household head and level of education. Results in Table 2.3 and Table 2.4 indicate that Mombasa and Kisumu had relatively higher proportions of male-headed households and tended to be more educated than household heads in other study sites.

2.2   Living Arrangements and Orphan-hood Status of Children

Table 2.6 presents living arrangement of children aged 5-17 in terms of whether they live with biological parents, at least one parent, or neither of the parents. The proportion of children living with both parents ranged from 51% in Nakuru to 70% in Mombasa. Except in the slum areas of Kisumu and Nyeri towns where about 15% live with none of their biological parents, about 90% of children live with at least one of their biological parents and below 10% live with neither of their parents.

Table 2.6: Proportion of Children Aged between 5 and 17 Years and Living Arrangement

Town	With both parents	With at least one parent	With neither parent	Sample
Mombasa	69. 9	91.8	8.2	1,199
Nairobi	65.5	90.3	9.6	4,966
Nyeri	52.3	85.9	14.1	731
Nakuru	50.7	90.1	9.9	928
Eldoret	61.9	90.4	9.6	2,528
Kisumu	61.9	84.6	15.4	2,396
Overall	62.7	89.2	10.8	12,748

Information about parental survival or orphan-hood status of children aged 5-17 years was collected by asking whether the biological father and mother were alive at the time of the survey *(Table 2.7)*. A child whose father is not alive is called a paternal orphan and one whose mother is not alive a maternal orphan; if both parents are not alive the child is called a double orphan. The findings show that about 19% of children aged 5-17 are orphaned to at least one of their parents. Across all the study sites, there are higher proportions of paternal orphans than that of maternal orphans. About 3% of children had lost both parents, except in Kisumu where about 8% are reported double orphans.

Table 2.7: Proportion of Children Aged Between 5 and 17 Years Orphaned

Town	At least one parent	Orphan-hood Status			
		Paternal	Maternal	Double	Sample
Mombasa	10.8	8.1	4.3	1.6	1,199
Nairobi	17.6	15.3	4.7	2.4	4,966
Nyeri	16.4	12.9	6.2	2.6	731
Nakuru	21.5	18.3	6.1	2.9	928
Eldoret	16.5	13.4	5.6	2.4	2,528
Kisumu	27.2	23.7	11.1	7.6	2,396
Overall	18. 8	15.9	6.2	3.4	12,748

2.3   Schooling Patterns

2.3.1   Primary and Secondary School Enrollment Rate

Table 2.8 shows gross and net enrollment rates in primary and secondary education. Gross enrollment ratio (GER) is defined as the total enrollment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age children corresponding to the same level of education in a given school year. Net primary enrollment ratio (NER) is defined as the number of official school-age children who are enrolled in a specific level of education as a percentage of the total children of the official school-age children. The former is a crude measure and most commonly used indicator, while the latter is a refined indicator of participation in a given level of education by children belonging to the official school-age group.

The overall primary and secondary school GERs were estimated at 105% and 73% respectively *(Table 2.8).* Estimates of NERs were found to be 89% for primary and 55% for secondary level education. Both primary and secondary enrollment rates vary across the study towns, the variations were more noticeable at secondary level than in primary education. The informal settlement in Mombasa had the lowest primary NER (82%), while the highest rate (94%) was observed in Nakuru. At the secondary level NER was below 50% for Mombasa and Nakuru, while it was slightly above 60% for Nyeri and Kisumu town. In general, the results suggest that while primary school enrollment is almost universal, access to secondary education remains low in urban informal settlements.

Table 2.8: Primary and Secondary Enrollment Rates (GER & NER)

Town	Primary		Secondary	
	GER	NER	GER	NER
Mombasa	95.6	81.6	69.9	43.2
Nairobi	109.2	91.5	72.6	55.6
Nyeri	103.4	88.7	77.1	60.6
Nakuru	105.1	94.4	63.4	47.1
Eldoret	107.5	89.0	74.2	56.7
Kisumu	101.8	87.2	74.8	61.0
Total	105.4	89.3	72.6	55.5

A 2010 report by the Ministry of Education on enrolment shows that at national level primary and secondary GERs were estimated at 110% and 49% respectively, and the corresponding NERs at 91% and 36% (Ministry of Education, 2012). This indicates that while the primary enrollment rate of the study sites is slightly lower than the national level estimate, enrollment rate at secondary level is higher than the national rate.

Table 2.9: Enrollment Rate of Children Aged 6-13 by Orphan Status and by Study Sites

Town	Non-orphan	Paternal Orphan	Maternal Orphan	Double Orphan
Mombasa	96.9	100.0	98.4	100.0
Nairobi	98.2	96.8	96.2	96.6
Nyeri	97.4	90.0	94.3	71.4
Nakuru	97.7	96.9	98.9	92.3
Eldoret	97.0	96.3	95.5	93.8
Kisumu	98.2	94.9	96.0	94.3
Total cases (%)	7009 (97.7)	1174 (96.0)	422 (96.3)	209 (94.3)

Table 2.9 presents school participation rates among orphan children by type of orphanhood status and study sites. The result reveals that orphan children's school participation rate was slightly lower than the participation rate by non-orphan children. School participation rate among non-orphan, single parent orphan, and double orphan children were estimated at 98%, 96% and 94% respectively. The differences among the three groups were not statistically significant. However, comparisons across the study sites reveal that the school participation rate among double orphans residing in Nyeri town was much lower than their counterparts in other towns.

2.3.2   Enrollment Pattern by School Type

Figure 2.1 presents the distribution of primary school students by type of school attended across the study sites. Overall about 47% of primary school children in the informal settlements in the six towns attend non-government schools. However, comparison between towns shows significant differences across study sites. In three of the six towns (Mombasa, Nairobi, and Eldoret) more than half of the children living in the informal settlements attended non-government primary schools. The highest proportion of children in Nairobi informal settlements (63%) attended non-government primary schools, while less than 5% of the children living in the informal settlement in Nakuru did so. This wide variation in schooling patterns across study sites in different towns may suggest differences in availability of public primary schools or public/private school choice by parents for their children.

Figure 2.1: Distributions of Primary School Students by School Type
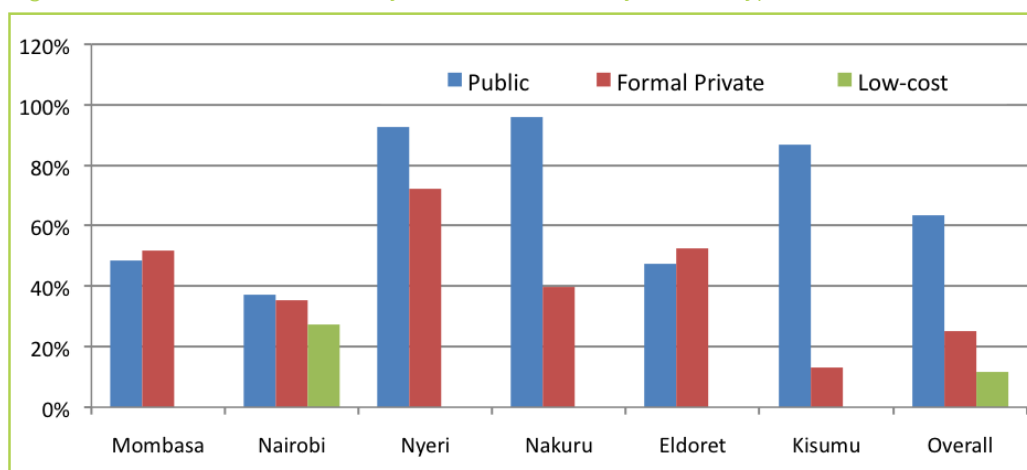
In the two study sites (Korogocho and Viwandani) in Nairobi city, non-government schools are classified as formal private or low-cost private. The results show that 36% and 27% of primary school students attended formal private and low-cost schools respectively; while the remaining 37% attended government schools.

2.3.3   School Type Attended by Background Characteristic

Bivariate association between household background characteristics and school type attended (government/public, formal private and low-cost) are presented in *Table 2.10* to examine whether choice of school type varies by household socio-economic backgrounds. There is a significant association between household size and the type of primary school a child attended. Children from larger households tend to attend government schools while those from smaller households attended non-government schools, particularly formal private schools. This result may suggest that smaller households can afford to send

their children to fee-charging private schools, while larger households cannot afford to as their income is thinly distributed across large household members. Higher proportions of children from female-headed households (72%) attended government schools compared to 60% from male-headed households. Conversely, a higher percentage of children from male-headed households enrolled in private schools and the association is statistically significant at 1% level of significant.

Household head's level of education and household wealth index are positively associated with attending non-government schools. The result shows that a higher proportion of children from households headed by a person with some secondary education enrolled in formal private schools, relative to those from less educated household heads *(Table 2.10).* For instance, about 26% of the children from households headed by a person having some secondary education attended formal private schools while 16% of children where the household heads had below secondary education enrolled in formal private schools. This may be related to the preference of formal private schools for perceived better quality of education or because better educated household heads may have more resources to pay the higher fee charged in such schools.

Similarly, the result reveals that a higher proportion of children from the better-off households than from the poorest households attended formal private primary schools. Conversely, a higher percentage of children living in relatively poorer households than from less poor households enrolled in government or low-cost private schools. For instance, only 14% of children living in households belonging to the first two wealth quintiles (bottom 40%) enrolled in formal private schools compared to 40% of children from the top 20% wealth quintile group. This study estimated the annual average charges of grade 3 students in government, formal private and low-cost schools at 1,720, 10,100, and 3,245 Kenyan Shillings respectively. This suggests that formal private schools charge more than 5 times the government schools and about 3 times the low-cost schools. However, it should be remembered that government schools receive capitation grants amounting to Kshs.1,020 for every student annually. Thus, relatively better-off households in urban informal settlements who can afford higher school fees send their children to formal private schools, while poorer households send their children either to the government or low-cost schools.

Table 2.10: Association between Background Characteristics and School Type Attended

Background	School Type			Association test (Chi-Sq)
	Public	Formal Private	Low-cost	
Sex of Child:				
Boy	62.2	22.2	15.6	7.3*
Girl	63.9	19.4	16.8	
Orphan status				
Both parents	74.6	10.4		42.7**
Single parent	71.2	14.3	14.5	
None orphan	61.3	22.2	16.5	
Sex of HH head				
Male	59.6	23.3	17.1	79.0**
Female	71.9	14.3	13.8	
HH head education				
Below secondary	64.2	16.5	19.3	108.2**
Secondary or above	61.5	26.3	12.2	
HH size				
1-3	57.4	24.6	18.0	35.0*
4-6	63.2	21.0	15.9	
7+	69.5	15.4	15.1	
HH wealth status				
Bottom 40%	70.5	14.2	15.3	246.0**
Middle 40%	57.9	21.0	21.2	
Top 20%	52.5	39.5	8.0	

The results indicate that household wealth index and level of education of household heads were the two major factors predicting private school enrollment. However, there is no significant difference between those attending public and low-cost primary schools based on household wealth and level of head's education. These bivariate associations are maintained even after controlling for individual and other household variables in a regression model (see Appendix 4a).

2.3.4   Transition to Secondary School

The transition rate to secondary school was estimated by dividing the number of new entrants to the first grade of secondary education (Form 1) in 2011 by the number of students enrolled in the last grade of primary education (Standard 8) in 2010, and the result is multiplied by 100 *(Figure 2.2).* The rates were computed based on schooling history data collected at household level for each school-age child retrospectively. The overall transition

rate across all study sites is about 75%, and there is no noticeable difference by gender except in Nakuru where the rate is substantially higher among girls than boys. The overall transition rate is slightly higher than the national level transition rate estimated at 73% in 2010 (Ministry of Education, 2012). Both sexes combined, the lowest rate of transition is observed in Mombasa (66%) while the highest is in Kisumu (83%).

Figure 2.2: Rates of Transition to Secondary School by Site and Gender
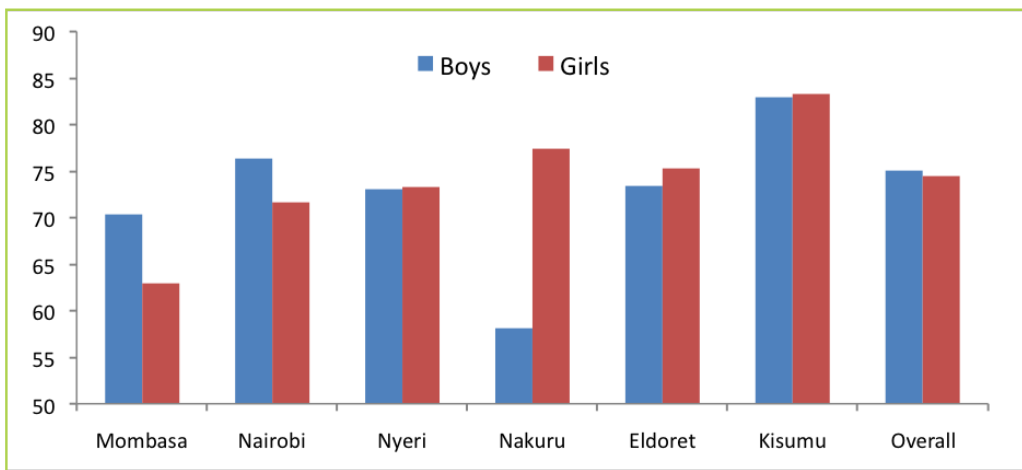
Table 2.11 presents association between socio-economic backgrounds and the probability of transition to secondary school. The result shows that the transition rate among non-orphan children was higher (76%) than children who were orphaned by one parent (71%) and double orphans (70%). The difference between orphaned and non-orphan children was statistically significant, but no difference between paternal and maternal orphans. There was no statistically significant association between sex of the household head and the probability of transition to secondary school. However, there was strong association between the household head's level of education and transition rate as well as household wealth index and probability of transition. This is consistent with finding in previous studies examining the association between household socio-economic and children's schooling outcomes (e.g. Ngware et al., 2009). One can argue that students from high socio-economic household backgrounds get academic support from educated parents and are more likely to score high in primary school leaving examination (Chaudhury et al., 2006; Torche, 2005). In addition, better-off households have more economic resources to let children continue their secondary education than children from low socio-economic backgrounds.

Table 2.11: Transition Rate to Secondary School by Socio-economic Background

Background	Transition rate	Association test (Chi²)
Sex of Child		
Boy	75.1	0.05
Girl	74.5	
Orphan-hood status		
Both parents	70.2	2.6
Single parent	70.6	
Non-orphan	76.3	
Sex of HH head		
Male	73.3	0.49
Female	75.6	
HH head education		
Below secondary	69.9	11.0**
Secondary or above	80.5	
HH size		
1-3	68.6	3.7
4-6	75.4	
7+	77.8	
HH wealth status		
Bottom 40%	70.2	11.6**
Middle 40%	74	
Top 20%	84	

2.4   Summary

This chapter presents descriptions of demographic and households' characteristics of the study population and the schooling pattern of primary and secondary school-age children in different informal settlements across six major urban towns in Kenya. The chapter addresses the following issues: **(1)** Whether urban informal settlements are similar in terms of public-private schooling patterns; **(2)** Whether school participation rates and public and private school enrollments associate with household background characteristics.

Key Findings:
- There are no noticeable differences in age and sex compositions and mean household sizes across the study sites.
- Overall, about 30% of the households were headed by females, the lowest being 20.3% in Mombasa and the highest is 43% in Nyeri.

- Household heads in the informal settlements of Kisumu town are relatively better educated with two-thirds having some secondary education, while more than 70% of households in Nyeri had only primary level or no formal education.
- More than 97% of primary school-age children (aged 6-13) were attending school at the time of the survey, compared to about 72% of secondary school-age (ages 14-17) children.
- The NER of primary and secondary schools were estimated at 89% and 55%, respectively.
- There is no noticeable difference in school participation rates among orphaned and non-orphaned primary school-age children.
- Overall, about 47% of children in the study sites attended non-government primary schools. A high proportion of children attended non-government primary schools in Nairobi (63%) followed by 52% in Mombasa and Eldoret, while only about 4% in Nakuru, 7% in Nyeri, and 13% in Kisumu.
- Children from smaller household sizes, living in households headed by male members are more likely to enroll in private schools than their counterparts from larger families and headed by female members.
- There is significant positive association between high household socio-economic status (measured by level of education and wealth index) and enrollment in private formal primary schools.
- Overall, primary to secondary transition rate are estimated at an average of 75%, ranging from 66% in Mombasa to 83% in Kisumu.
- Children from households headed by a person having secondary or more level of education and better-off households have higher probability of transition to secondary education than children from less educated and poorer households.

3.0 Students' Achievement in Numeracy and Literacy

This chapter presents achievement data collected from grades 3 and 6 pupils in 230 primary schools spread across six towns in Kenya. The selection criterion of schools was that the school should be located within the study site or in the neighborhood/catchment - very proximate to the informal settlement. The previous chapter described the household level data that was collected from informal settlements within catchment of the schools participating in the study. This chapter is motivated by previous evidence in the slums of Nairobi that demonstrated a growing utilization of low-cost non-government schools by the poor by-passing public schools (Oketch et al., 2010; Tooley & Stanfield, 2008). The main reason for utilization of these non-government schools by the poor as highlighted by informal settlement households is the perception that these schools are of better quality (Oketch et al., 2010). Despite this perception, there has not been an assessment to show that pupils in these low input schools perform better than those in the government schools. Existing evidence is limited on the summative assessment done at grade 8 that learners in the informal settlement who at any given time have attended a non-government school perform better than those in government schools. Therefore the hypothesis guiding this chapter is that non-government primary schools in urban informal settlements perform equally or better than the government primary schools despite low resources. The question to be answered is: Is there a difference in achievement measured by performance in a standardized test on literacy and numeracy administered to pupils in government, formal private and low-cost schools?

In this study, government primary schools are those that benefit from FPE capitation and most of their teachers are from the Teachers Service Commission; formal private schools are those owned by either individual(s), or non-government institution(s); while the low-cost private schools are those that consider themselves as 'non-formal' schools although they are not non-formal schools. The low-cost schools consider themselves 'non-formal' because of various reasons including: coping mechanisms, flexibility in the use of school uniform, located in the slum area, sub-standard facilities or owned by the community. Our discussions with stakeholders in the MoE indicated that some low-cost private schools consider themselves 'non-formal' to avoid MoE's scrutiny and to be allowed to "operate like self-help groups and therefore attract funding from the NGO sector".

The study used standardized assessment tools to measure literacy and numeracy competencies among grade 3 and 6 pupils in the sampled schools. The assessment tools were prepared in consultation with curriculum and assessment experts from Kenya Institute of

Education (KIE), National Assessment Centre (NAC) and practitioners (teachers). The tools were pre-tested with pupils of the same grades and from similar contexts to improve on their validity. Besides the assessments, pupils in grade 6 were interviewed about their individual characteristics and on their household background characteristics such as education level of their parents, and household possessions. This information was not collected from pupils in grade 3 because they are not old enough to provide reliable responses for the interviews.

This chapter presents the school characteristics, background information of the pupils, pupil test scores and information on teacher absenteeism as reported by grade 6 pupils. The results are presented mainly split by gender of the pupil and school type. Attempts are also made to present achievement scores for each of the different domains that were tested for each of the test tool.

3.1   Background Information

Literature on the effects of average class size (ACS) and pupil teacher ratio (PTR) on learning achievement is not conclusive. For instance, Mosteller (1995) in the STAR project in USA found that students in smaller class sizes of 13 to 17 pupils in early grades had much better test scores than the students who were in larger class sizes of 22 to 25. A study of 72 schools in Kenya showed that students in larger classes scored significantly higher than those in small classes (Ngware, et al. 2010). This was explained by the schools' good performance history that then attracted more pupils. Hanushek (1999) argued that reduction in class size does not lead to learning gains for students but instead it benefits trade unions due to the extra teachers hired. From Table 3.1, as would be expected, public schools had larger average class sizes (ACS) and higher pupil teacher ratio (PTR). However, there was no statistically significant association between these two school characteristics and student test scores. Textbooks are important teaching and learning materials. All public schools in Kenya receive financial allocations from the government to buy textbooks. The recommended textbook pupil ratio in lower primary is 1:3 while that of upper primary is 1:2, with an ultimate aim of achieving a ratio of 1:1 in all main subjects including Math and English. From *Table 3.1*, low-cost schools that receive support for textbooks from non-government education stakeholders had the best textbook pupil ratio of 1:1. However, the association between students' mean scores and textbook pupil ratio is positive and not statistically significant after controlling for school, teacher and pupil characters.

Table 3.1: Summary of School Characteristics

Variable	School Characteristics		
	Government	Formal private	Low-cost
Number of schools*	88	93	47
Average school size	965	224	243
Average class size	54.6	22.6	29.6
Gender parity index	1.04	0.97	1.02
Average number of streams (expressed per grade)	2.2	1.2	1.0
Average teaching force size	23.0	13.5	11.0
Proportion of female teachers	0.75	0.56	0.54
Proportion of Female H/T (%)	39.1	26.0	30.0
Pupil teacher Ratio	41	15	21
Textbook pupil ratio - G3 English	0.78	0.58	1.02
Textbook pupil ratio - G6 English	0.69	0.52	1.06
Textbook pupil ratio - G3 Math	0.84	0.52	1.01
Textbook pupil ratio - G6 Math	0.70	0.52	1.06
Registered by MoE	98%	70%	11%
Registered by MoGSS	0%	24%	79%
Registered by Others/Not registered	2%	6%	11%

Notes: * Two schools did not have complete school-based data and have been excluded from the reported statistics in this table.

Table 3.2 presents the distribution of the pupils who participated in at least one of the tests. Overall, the numbers of girls and boys in each of the grades is relatively the same. It is important to note that the study did not involve sampling of pupils while administering the tests, but rather all pupils in the identified grade or stream in that grade (for schools that are multi-stream) were included.

Table 3.2: Number of Pupils Assessed at School Level by Gender, Grade and Study Site

Town	Grade 3				Grade 6			
	Boys	%	Girls	%	Boys	%	Girls	%
Mombasa	687	53.7	592	46.3	640	52.4	582	47.6
Nairobi	921	51.3	876	48.8	807	48.7	851	51.3
Nyeri	186	54.7	154	45.3	173	50.8	169	49.4
Nakuru	1056	52.1	972	47.9	936	47.9	1020	52.2
Eldoret	558	51.9	517	48.1	448	50.7	436	49.3
Kisumu	585	49.1	607	50.9	586	46.6	671	53.4
Overall	3993	51.8	3718	48.2	3590	49.1	3729	51.0

Notes: Mombasa and Nyeri had slightly more boys than girls in the two grades while Kisumu and Nakuru had more girls than boys in grade 6.

Table 3.3 presents the distribution of the number of grade 3 and 6 pupils tested split by type of school– formal private, low-cost and government schools. These schools were located within the target informal settlements or within a radius of about 1km from the boundaries of target sites. This made such schools accessible to children from the study areas. Overall, the sample consisted of more pupils from the public schools than were from the non-government schools. However, the result shows a wide variation in the distribution of pupils by type of school.

Table 3.3: Number of Pupils Interviewed by Type of School and Study Site

Town	Grade 3				Grade 6			
	n	% public	% Formal Private	% Low-cost	n	% public	% Formal private	% Low-cost
Mombasa	1279	41.1	58.9	-	1222	43.8	56.2	-
Nairobi	1797	26.2	10.8	63.0	1658	27.7	11.5	60.8
Nyeri	340	80.6	19.4	-	342	77.8	22.2	-
Nakuru	2028	84.6	13.4	-	1956	86.2	11.7	-
Eldoret	1075	31.2	67.8	-	884	37.0	61.8	-
Kisumu	1192	87.8	12.3	-	1257	90.7	9.3	-
Overall	7711	56.6	28.0	-	7319	60.3	25.2	-

In Nairobi, about 60% of the pupils were from low-cost schools and a further 10% from formal private schools. Mombasa and Eldoret had a remarkably high number of pupils in formal private schools. These figures are estimated based on grade 3 and 6 pupils assessed in the sampled schools while the household survey included all school-age children. Proportions of pupils attending non-government schools are slightly different

from the estimates from the household survey and reported under chapter 2. However, the patterns of enrollment remain the same and the proportions reported in this chapter reinforce those from the household survey where Nairobi, Eldoret and Mombasa had a high proportion of their pupils enrolled in formal private and low-cost schools.

3.2   Pupil Absenteeism

Pupils in grade 6 were asked to state the number of days they were absent in the last complete school week (Table 3.4). Overall, about 19% of the pupils were absent from school for at least one day in that last one school week prior to the date of data collection. The proportion of pupils absent varied by school type and study site and within some sites by gender. For instance, Mombasa reported the highest rate of absenteeism, with nearly one quarter of the pupils being absent from school at least for one school day – for both formal private and government schools. Kisumu schools reported the lowest absenteeism. In Eldoret, more girls were absent than the boys – i.e. 20.4% and 16.7% respectively; on the contrary, in Nyeri more boys (24.3%) than girls (14.2%) were absent from school. Apart from Nyeri, when absenteeism is split by school type, the overall results show insignificant difference between government and formal private schools. In Nairobi, the government and formal private schools had equally high rates of absenteeism (25%) when compared to that of the low-cost schools of 17%.

Table 3.4: Proportion of Pupils Absent from School for at Least One Day

Town	Grade 3				Grade 6			
	n	%	%	%	n	%	%	%
		Public	Formal Private	Low-cost		Public	Formal private	Low-cost
Mombasa	582	26.1	640	25.8	1222	27.3	24.9	-
Nairobi	851	20.8	807	19.5	1658	25.0	24.5	17.1
Nyeri	169	14.2	173	24.3	342	21.1	13.2	-
Nakuru	1020	16.1	936	19.0	1956	17.9	15.8	-
Eldoret	436	20.4	448	16.7	884	15.9	20.2	-
Kisumu	671	13.0	586	11.1	1257	11.9	13.7	-
Overall	3729	18.6	3590	19.0	7319	18.3	21.3	-

Figure 3.1 shows the proportion of pupils who were absent from school in at least 1 day in the last school week preceding the interview by pupil socio-economic status. Although pupils from the 20% poorest households were 20% likely to have missed school as compared to 17% of the pupils among the least poor households, the difference is not statistically significant at 5%.

Figure 3.1: Proportion of Grade 6 Pupils Absent from School for at Least One day by Wealth Index
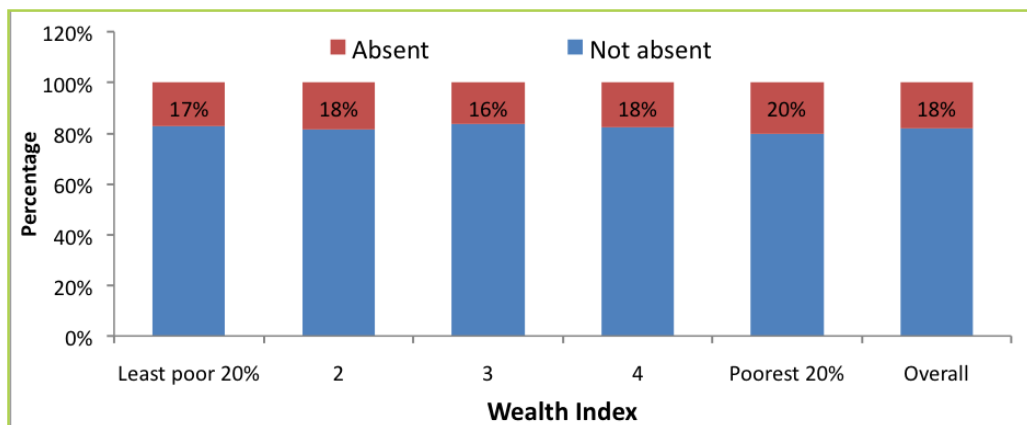
3.3   Communication in English Language at Home

In Kenya, the language of instruction and examination in upper primary schools (grades 4 to 8) is English in all subjects with an exception of Kiswahili language used to teach Kiswahili as a subject. Furthermore, English in primary school is a compulsory subject and pupils are expected to be fluent in it while in and out of school. Research shows that there is a positive correlation between the language of instruction and pupil academic achievement not only in the language of instruction as a subject but also the other subjects (Fakaye & Ogunsiji, 2009; Mukama, 2007). The grade 6 literacy test was therefore tested in English while that of (grade 3) lower primary was in Swahili. In lower primary, the language of instruction is mainly the language of catchment, with Swahili language being common in the urban places due to their cosmopolitan nature.

Figure 3.2 and *Figure 3.3* show the proportions of pupils who always speak English while at home. Nyeri and Nairobi have among the highest proportion of boys and girls who always speak English in that order while at home. Mombasa has the least. Most of the towns visited are cosmopolitan and are depicted by a mix of languages, even in towns where one language is expected to be dominant.

Figure 3.2: Proportion of Grade 6 Pupils Who Always Speak English While at Home
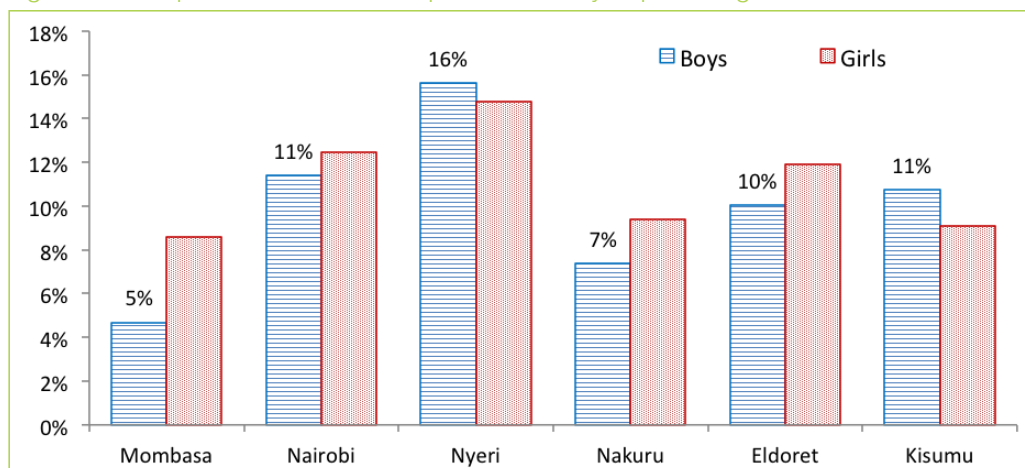
The proportion of pupils who always spoke English at home varied by the type of school attended. The variation was significant for Nairobi, Nyeri and Eldoret where a high proportion of pupils from the formal private schools reported always speaking English while at home. Moreover, in Nairobi a higher proportion of pupils in low-cost schools spoke English at home as compared to pupils in government schools in the same site.

Figure 3.3: Proportion of Pupils Who Always Speak English While at Home by School Type
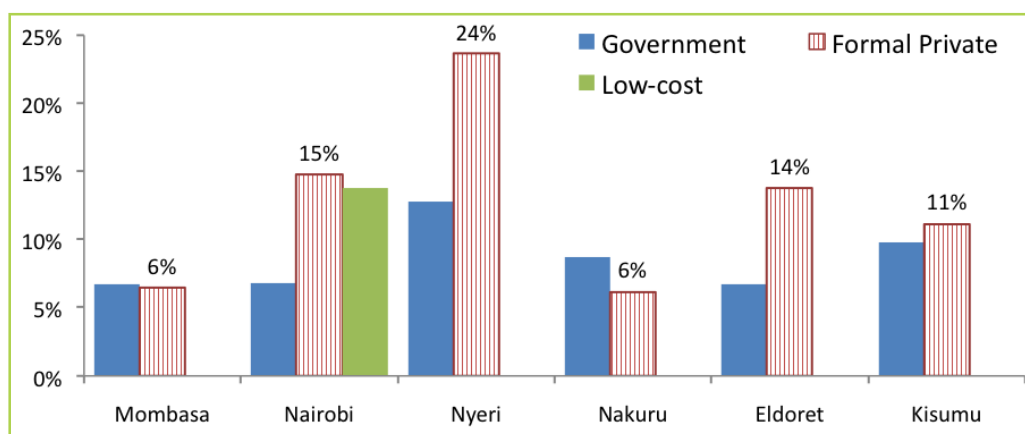
Note: There was only 1 low-cost school in each of the sites of Eldoret and Nakuru

Mombasa is marked by a low number of pupils who use the English language for communication at home. This could be possibly explained by virtue of Mombasa being in the Kenyan coast where Swahili is predominantly spoken. In Kenya, Swahili is a pre-colonial trade language and traces its roots to the coast.

3.4   Teacher Absenteeism

Teacher absenteeism was measured by asking grade 6 pupils to state how often their teachers miss or are absent from lessons. When a teacher is absent from school or even misses lessons while in school, learning is usually disrupted. The consequence of teacher absence is a loss of instruction time, which pupils are expected to be exposed to in order to learn. Frequent teacher absenteeism is known to negatively affect pupil academic achievement.

Table 3.5: Teacher Absenteeism as Reported by Pupils

Town	Government				Non-government			
	Number	Often	Sometimes	Rarely	Number	Often	Sometimes	Rarely
Mombasa	535	16.6	48.9	34.4	659	7.6	55.7	36.7
Nairobi	458	9.3	68.6	22.1	1,192	8.9	61.2	29.8
Nyeri	266	11.2	56.8	31.9	75	2.7	30.7	66.7
Nakuru	1,652	6.8	65.6	27.6	271	1.1	48.7	50.2
Eldoret	326	5.5	68.1	26.4	557	6.6	37.3	56.0
Kisumu	1,137	17.9	10.8	71.2	117	14.5	17.1	68.4
Overall	4374	11.4	49.23	39.4	2871	7.5	51.5	40.9

In general, the pupils' responses (Table 3.5) show that teachers miss or are either 'often' or 'sometimes' absent from lessons. Kisumu recorded the highest proportion of pupils reporting that their teachers are rarely absent from school – for both government and non-government schools. It is notable that in Kisumu pupils reported the lowest pupil absenteeism. This confirms the findings from other studies (Miller et. al., 2010) which report positive association between teacher and pupil absenteeism. With an exception of Kisumu, the other study towns recorded a significant difference between the government and non-government schools in teacher absenteeism and missing of lessons. That is, pupils in government schools reported more absenteeism and missing of lessons than is the case among non-government schools.

3.5   Pupil Achievement: Literacy

In this section the literacy achievement data for both grades 3 and 6 is presented. The mean scores and their standard deviations are presented as well as the minimum and maximum values. TTEST is used to test whether the difference between the means is significantly different at 5% level of significance or 95% CI. Due to the additional pupil information collected from grade 6 pupils, their achievement scores are presented disaggregated by selected background characteristics.

3.5.1 Grade 3 Literacy Scores

Table 3.6 shows the mean scores for grade 3 literacy assessment disintegrated by school type. The last column (mean diff) is calculated by subtracting the mean scores in public schools from that of formal private and low-cost schools in each study site. The mean performance is above 60% for both non-government and government schools. In general, the mean scores in the literacy test indicate that pupils attending formal private schools outperformed their counterparts in the government and low-cost schools across all study sites, and the differences are statistically significant. The magnitude of the difference in performance between formal private and government schools varied by study site; while in Nyeri, where we observed the largest proportion of students in formal private speaking English outside the school, the difference was large (17 percentage points), in Nairobi and Kisumu it was about 4 percentage points. Furthermore, there are also variations in mean scores within the study sites. The result shows that in government schools, the highest mean score was observed in Kisumu (69%) while the lowest (59%) was in Nyeri. Comparison between non-government schools shows that the mean score is high (about 75%) in Nakuru, Nyeri and Mombasa and the lowest (64%) was observed in Nairobi. In Nairobi, students in the low-cost schools performed the same as in the formal private schools and slightly better than the government schools.

Table 3.6: Grade 3 Literacy Mean Scores by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	Std. Dev	Mean (B)	Std. Dev	Mean (C)	Std. Dev	A-B	A-C	B-C
Mombasa	66.4	22.1	75.1	18.0	-	-	-8.7**	-	-
Nairobi	59.1	21.4	63.6	20.5	63.2	20.0	-4.5*	-4.1*	0.4
Nyeri	58.6	20.8	76.0	10.2	-	-	-17.4**	-	-
Nakuru	62.9	19.8	77.7	9.3	-	-	-14.8**	-	-
Eldoret	59.0	20.1	69.6	16.3	-	-	-10.6**	-	-
Kisumu	68.9	20.7	72.8	18.0	-	-	-3.8**	-	-
Overall	63.7	20.8	72.4	17.1	-	-	-8.7**	-	-

Notes: ** Significant at 1%; * Significant at 5%

Table 3.7 shows grade 3 literacy achievement results by the gender of the pupil. The difference column shows negative differences across the sites - meaning girls scored higher than boys. The differences are however not large and some are not statistically significant. Overall, boys scored 3 percentage points less than the girls. Kisumu and Nakuru had the highest differences that were statistically significant at 1% level of significance. Mombasa, Nyeri and Eldoret had comparable means for both gender that were not statistically different.

Table 3.7: Grade 3 Literacy Mean Scores by Gender

Town	Boys				Girls				Mean
	Mean (A)	Std. Dev	Min	Max	Mean (B)	Std. Dev	Min	Max	Diff=A-B
Mombasa	71.2	20.2	0	95.0	72.0	20.4	3.3	98.3	-0.8
Nairobi	60.8	21.3	0	90.0	63.6	19.6	3.3	91.7	-2.8
Nyeri	60.9	20.8	5.8	95.0	63.4	19.9	7.5	86.7	-2.5
Nakuru	62.9	20.5	0	91.7	67.4	17.8	0	93.3	-4.5**
Eldoret	65.5	18.2	5.0	96.7	67.3	18.4	7.5	94.2	-1.8
Kisumu	66.8	21.8	5.0	95.8	71.9	18.7	7.5	95.8	-5.1**
Overall	64.7	20.8	0	96.7	67.8	19.3	0	98.3	-3.1**

Notes: ** Significant at 1%; * Significant at 5%

3.5.2   Grade 3 Literacy Domains

Further analysis of grade 3 literacy was conducted using the skills and curriculum content area tested. The skills tested included listening and writing and the domains were knowledge in letter, syllable and word knowledge, handwriting, writing fluency, creative writing as well as picture recognition. In letter, syllable and word knowledge, learners were expected to write letters, syllables, and words read to them by the test administrator. In some instance, learners were expected by use of pictures to either fill missing letters in a word or write the names of given objects. Handwriting tested the pupils' ability to copy given words or short sentences correctly. Writing fluency mainly tested on the ability of the learner to write sentences in a coherent manner and this was a higher skill of writing knowledge. Creative writing was a higher skill that required learners to write a short composition either guided by a picture or using a given short topic. This skill tested coherence in writing, observation of punctuation marks and spelling. Finally, listening comprehension entailed learners listening to a short story and/or passage read out to them and answering questions that required recall and implied understanding. Most of the questions related to listening comprehension were factual (required learners to draw answers directly from the passage), with a few being inferential (required learners to understand the story and infer the answers).

Grade 3 Performance in Literacy Domain by Study Site

Figure 3.4 shows how the different study sites performed in the different skills tested for grade 3 literacy. Overall, letter knowledge, syllable and handwriting were highly performed across the different sites on one hand; listening comprehension and creative writing were the worst performed on the other hand. Though listening comprehension required mainly factual answers drawn from a phrase, it is surprising the performance was nearly equal to that of the creative writing, a high order skill. Figure 3.4 also shows a close performance in the different domains by the study sites. Mombasa, when compared to Nyeri and Nairobi, performed significantly better in sentence knowledge which required fluency in writing notwithstanding the fact that the test was in Swahili which is widely spoken in Mombasa. Moreover, Mombasa also posted statistically significant scores (about 47%) in creative writing as compared to other sites with scores of less than 35%.

Figure 3.4: Grade 3 Literacy Performance in the Different Skills Tested
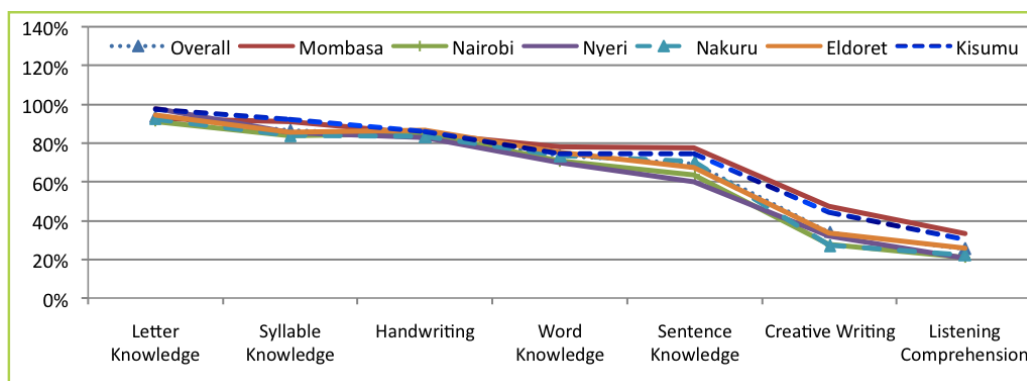
Grade 3 Performance in Literacy Domains by School Type

Performance in the grade 3 literacy skills by study sites shows the following (Figure 3.5):

1. Letter and syllable knowledge as well as handwriting to be highly performed across the school types.
2. The formal private schools performed slightly better than the government and low-cost schools in letter and syllable knowledge and in handwriting and statistically different in all the other skills.
3. Listening comprehension and creative writing were poorly performed with the formal private schools doing better though below 50%

Figure 3.5: Grade 3 Literacy Performance in the Different Skills Tested by School Type
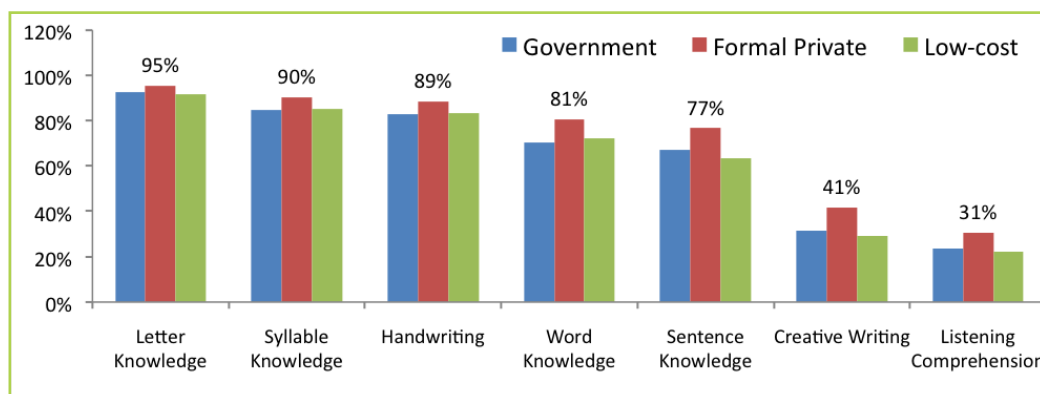
3.5.3 Grade 6 Literacy Scores

Grade 6 literacy achievement scores depict a clear difference in performance between the government and formal private schools in favor of the latter *(Table 3.8)*. The overall mean difference is 12 percentage points and ranged from 2.2% to 27.9% for the different study sites – the differences were statistically significant at 1% level of significance. In Nairobi, the low-cost schools performed better than the government and formal private schools. The mean scores in literacy tests among grade 6 pupils, in both government and non-government schools, are much lower than scores for grade 3 pupils, and it is more so in government schools. While the government schools mean score was slightly below 50%, that of the formal private schools was close to 60%.

Table 3.8: Grade 6 Literacy Mean Scores by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d.	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	45.8	19.2	60.9	17.5	-	-	-15.1**	-	-
Nairobi	47.4	19.2	49.5	15.4	52.7	17.5	-2.2	-5.3**	-3.1*
Nyeri	48.5	19.6	69.2	18.6	-	-	-20.7**	-	-
Nakuru	42.9	19.3	70.7	15.4	-	-	-27.9**	-	-
Eldoret	47.1	18.7	57.5	17.5	-	-	-10.4**	-	-
Kisumu	58.7	17.5	67.9	17.1	-	-	-9.3**	-	-
Overall	**48.4**	**19.8**	**60.7**	**18.0**	-	-	**-12.3**	-	-

Notes: ** Significant at 1%; * Significant at 5%

The standard deviations are large across the study sites and for both public and private schools, indicating a wide variation in students' performance within the same study site. On average, grade 6 pupils in non-government schools in Nakuru and Nyeri scored much higher compared to pupils in the government schools with about 28 and 21 percentage point difference respectively. The two towns posted the highest mean score of about 70% and above among the formal private schools in relation to the other towns. Kisumu had the highest mean score among the government schools; non-government schools in Kisumu also performed better than those in other sites.

The overall mean score for grade 6 literacy were 50.6% and 53.5% for boys and girls respectively *(Table 3.9)*. This however varied by study site – that is, while in Nakuru boys and girls scored about 44% and 48% respectively, Kisumu posted 59% and 60% in that order. With an exception of Nyeri, there were modest differences between boys and girls in favor of the former.

Table 3.9: Grade 6 Literacy Mean Scores by Pupil Gender

Town	Boys				Girls				Mean Diff=A-B
	Mean (A)	Std. Dev	Min	Max	Mean (B)	Std. Dev	Min	Max	
Mombasa	53.8	18.9	1.3	97.4	54.8	20.5	4.0	96.1	-0.9
Nairobi	49.2	18.0	5.3	92.1	52.4	17.7	4.1	90.8	-3.2**
Nyeri	49.0	21.8	0	96.1	57.2	19.8	7.9	93.4	-8.1**
Nakuru	43.7	21.2	0	93.4	48.4	20.1	2.6	97.4	-4.7**
Eldoret	52.4	19.1	7.9	92.1	54.6	18.2	2.6	94.7	-2.2
Kisumu	59.0	18.1	1.3	94.7	60.1	17.3	2.6	97.4	-1.1
Overall	**50.6**	**20.1**	**0**	**97.4**	**53.5**	**19.3**	**2.6**	**97.4**	**-2.9**

Notes: ** Significant at 1%; * Significant at 5%

3.5.4   Grade 6 Literacy Domains

Grade 6 literacy was split into the different domains and skills. The skills tested included listening comprehension, reading and writing; the domains were knowledge, comprehension and application. The items were not mutually exclusive and therefore could fall in more than one skill and/or domain.

Listening Comprehension

In listening comprehension, pupils were expected to listen to a conversation and to fill in missing words to complete the conversation; listen to sentences read out to them and depending on the stress on some of the words, pick the one that has the correct meaning; as well as listen to and write a paragraph with the right punctuation.

Table 3.10: Grade 6 Mean Scores: Listening Comprehension by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d.	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	48.2	22.2	65.8	19.0	-	-	-17.7**	-	-
Nairobi	51.3	20.8	50.5	16.8	56.2	19.2	0.8	-4.9**	-5.7**
Nyeri	54.5	20.7	74.5	21.1	-	-	-20.1**	-	-
Nakuru	47.8	21.7	74.0	18.1	-	-	-26.1**	-	-
Eldoret	50.7	19.7	59.2	19.1	-	-	-8.5**	-	-
Kisumu	65.9	18.1	76.2	16.2	-	-	-10.3**	-	-
Overall	**53.5**	**21.9**	**64.3**	**20.0**	**-**	**-**	**-10.8**	**-**	**-**

Notes: ** Significant at 1%; * Significant at 5%

Overall, the formal private schools were better than the government and low-cost schools in listening comprehension *(Table 3.10)*. That is, formal private schools scored on average 11 percentage points higher in the listening comprehension than the government schools. The low-cost schools in Nairobi performed better than both the government and formal private schools and the difference was statistically significant.

Reading Comprehension

In reading comprehension, pupils were required to read out a passage and answer questions related to the passage – a passage was read within specified time. Unlike in the listening comprehension, reading comprehension was poorly performed with means of 25.4%, 34.8%, and 28.8% among the government, formal private and low-cost schools *(Table 3.11)*. Despite the low performance in this skill, the standard deviations are quite large across the sites, indicating varied performance across and within the sites by the pupils. With an exception of Nairobi, performance by school type shows statistically significant differences between students in government and non-government schools and in the favor of the latter. In Nairobi, the government schools performed equal to the formal private schools though significantly lower than the low-cost schools (3% point difference).

Table 3.11: Grade 6 Mean Scores: Reading Comprehension by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d.	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	25.5	19.0	35.7	21.7	-	-	-10.2**	-	-
Nairobi	25.6	18.7	26.1	18.9	29.2	19.6	-0.5	-3.7**	-3.2*
Nyeri	27.3	21.3	44.5	23.4			-17.2**	-	-
Nakuru	20.0	15.6	39.8	19.9	-	-	-19.8**	-	-
Eldoret	24.6	19.8	32.4	20.7	-	-	-7.8**	-	-
Kisumu	32.9	21.1	38.3	20.7	-	-	-5.3**	-	-
Overall	**25.4**	**19.3**	**34.8**	**21.3**	**-**	**-**	**-9.4****	**-**	**-**

Writing Knowledge

Writing knowledge tested pupils on rearrangement of words in a particular order, completing a passage by selecting the most suitable words from a list provided for each of the questions (multiple choice questions) and filling in a form with personal information *(Table 3.12)*. The performance in this skill was high across the three school types with a statistically significant difference between the government and formal private schools of 15 percentage points.

Table 3.12: Grade 6 Mean Scores: Writing Knowledge by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d.	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	62.2	26.4	77.7	23.5	-	-	-15.5**	-	-
Nairobi	61.2	28.5	68.4	26.3	68.9	25.6	-7.2**	-7.7**	-0.5
Nyeri	60.5	27.3	83.6	21.6	-	-	-23.1**	-	-
Nakuru	57.7	28.4	90.5	18.4	-	-	-32.8**	-	-
Eldoret	62.7	27.1	75.9	24.6	-	-	-13.3**	-	-
Kisumu	72.1	24.5	81.4	22.3	-	-	-9.3**	-	-
Overall	62.9	27.6	78.38	24.1	-	-	-15.4**	-	-

Across the study sites, Nakuru recorded the highest mark of 90% among the formal schools while Kisumu performed better among the public schools. There was no difference on how pupils in the formal and low-cost private schools in Nairobi performed in writing knowledge. Despite the good performance, the spread is large indicating weak and strong students in this skill.

Writing Application

Figure 3.6: Grade 6 Mean Scores: Writing Application by School Type
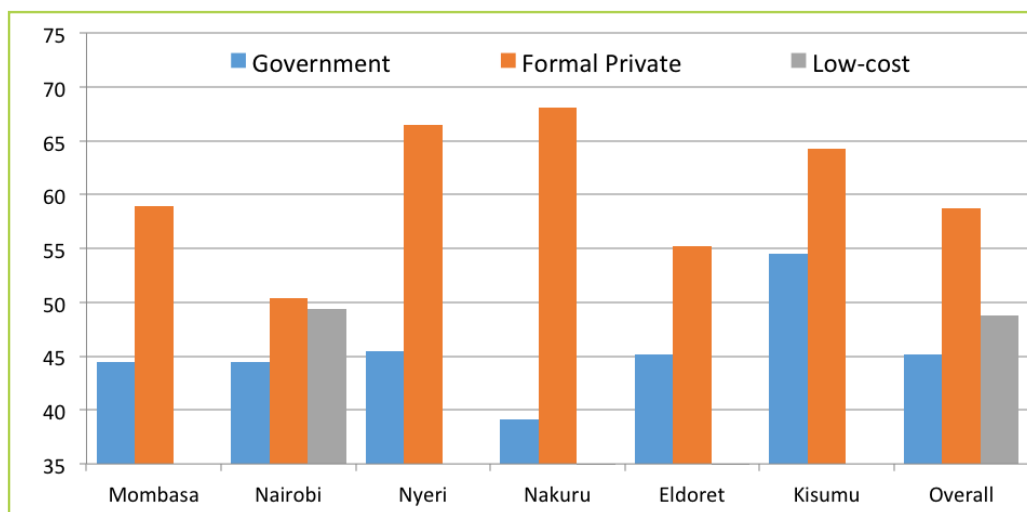
3.6   Pupil Achievement: Numeracy

The same procedure used in literacy was applied for analysis of pupil numeracy scores. Pupils in grade 3 and 6 were tested on their numeracy achievements using grade-appropriate tests. For grade 3 the numeracy test had 45 questions and although each pupil had

the test, each item was read out loudly to the pupils in the class by the test administrator. The grade 3 pupils were expected to show their workings on the pupil booklet and thereafter write the correct answer. Depending on the procedure to arrive at the final answer in an item, and the level of cognitive demand, test items attracted different marks. Procedure questions attracted a minimum of two marks while knowledge or recall-type items attracted one mark. So if a child followed the correct procedure and got the answer wrong, marks were awarded for the process. The grade 6 test consisted of 40 items that were multiple-choice. Pupils were required to do the calculations in the work book and circle the correct answer. However, it is the correct answer that attracted marks and all the items had an equal weighting. The calculated scores were converted into percentages.

3.6.1   Grade 3 Numeracy Scores

Table 3.13 shows grade 3 numeracy mean scores by type of school. Overall, the mean mark was 64%, 73% and 64% for government, formal private and low-cost schools respectively. This means that pupils from the formal private schools posted higher scores than those in the government and low-cost schools and the differences were statistically significant. Similar to the differences in literacy test scores, in all of the study sites, students in formal private schools outperformed their counterparts in the government and low-cost schools, and the differences were statistically significant.

Consistent with the literacy results, Nyeri and Nakuru posted the highest school difference between government and non-government schools of about 17% points. Schools in Nairobi posted the lowest mean marks while Kisumu and Nakuru posted the highest mark among the government and formal private schools respectively. The performance was also characterized by large standard deviations within the school types, and individual scores ranged from 2.74% to 97.26%. This indicates varied ability of students within and across the same towns.

Table 3.13: Grade 3 Numeracy Mean Scores by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean	s.d	Mean	s.d	Mean	s.d	A-B	A-C	B-C
	(A)		(B)		(C)				
Mombasa	66.9	14.5	75.8	12.1	-	-	-8.9**	-	-
Nairobi	58.9	16.3	66.1	12.2	65.4	14.7	-7.2**	-6.5**	0.7
Nyeri	59.5	15.3	77.0	9.5	-	-	-17.6**	-	-
Nakuru	62.5	16.3	80.7	10.1	-	-	-18.2**	-	-
Eldoret	60.8	13.9	69.7	14.3	-	-	-8.9**	-	-
Kisumu	69.6	13.2	74.6	13.4	-	-	-5.0**	-	-
Overall	64.0	15.6	73.4	13.4	-	-	-9.4**	-	-

Grade 3 numeracy results show an insignificant difference between boys and girls overall

and across the towns *(Table 3.14)*. Differences however existed between the different sites. For instance, while the mean mark for boys and girls in Nairobi was about 64%, that of Mombasa and Kisumu was about 72% and 70% respectively.

Table 3.14: Grade 3 Numeracy Mean Scores by Gender

Town	Boys				Girls				Mean Diff (A-B)
	Mean=A	s.d	Min	Max	Mean=B	s.d.	Min	Max	
Mombasa	71.6	14.0	20.6	95.9	72.7	13.5	23.3	94.5	-1.1
Nairobi	64.1	15.3	6.8	91.8	63.4	15.0	9.6	91.8	0.7
Nyeri	63.2	16.2	20.6	90.4	62.5	15.6	20.6	93.2	0.7
Nakuru	64.9	16.7	8.2	97.3	65.7	17.0	2.7	95.9	-0.9
Eldoret	67.2	14.6	20.6	91.8	66.6	14.8	16.4	95.9	0.6
Kisumu	69.1	14.0	13.7	95.9	71.3	12.6	24.7	97.3	-2.2
Overall	66.7	15.5	6.9	97.3	67.2	15.4	2.7	97.3	-0.5

3.6.2   Grade 3 Numeracy Domains

Items in the grade 3 numeracy were grouped into the three categories of the cognitive domain: knowledge, comprehension and application as shown in *z* Most of the grade 3 test items were on knowledge and comprehension with a few touching on application. Measurement, whole numbers and addition accounted for slightly over half of the items following the scope of content found in the grade 3 Math curriculum. Results on how pupils performed on the different domains are presented and disaggregated by school type.

Table 3.15: Distribution of Grade 3 Numeracy Test Items by Content and Skill Tested

Curriculum Content Area	Category of cognitive domain			Total Items (%)
	Knowledge	Comprehension	Application	
Pre-number activities	2	2	0	4 (08.9)
Whole Numbers	1	5	2	8 (17.8)
Fractions	1	1	0	2 (04.4)
Addition	3	2	1	6 (13.3)
Subtraction	2	3	0	5 (11.1)
Multiplication	0	2	0	2 (04.4)
Division	0	0	2	2 (04.4)
Measurement	4	3	4	11 (24.4)
Geometry: Shapes	3	1	1	5 (11.1)
Total (%)	16(35.6)	19(42.2)	10(22.2)	45

Knowledge

The performance in knowledge items was high compared to performance in comprehension and/or application related items, with overall means of about 73%, 82% and 77% among the government, formal private and low-cost schools (Table 3.16). There are statistically significant differences in achievement between government and formal private schools in favor of the latter.

Table 3.16: Grade 3 Numeracy Mean Scores on Knowledge Items by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	74.4	13.1	83.4	10.1	-	-	-9.1**	-	-
Nairobi	70.1	15.4	77.1	11.3	76.9	13.7	-7.0**	-6.9**	0.1
Nyeri	71.6	14.1	83.8	9.4	-	-	-12.2**	-	-
Nakuru	70.4	15.6	88.1	9.6	-	-	-17.7**	-	-
Eldoret	71.5	12.5	79.6	12.8	-	-	-8.2**	-	-
Kisumu	77.1	11.9	80.3	11.6	-	-	-3.2*	-	-
Overall	72.6	14.4	z81.9	11.6	-	-	-9.4	-	-

In Nairobi, the low-cost schools performed better than the government schools in the knowledge domain by 7 percentage points. Among the government schools, there was a huge variation between the study sites, while among the formal private schools the mean score ranged from 77% in Nairobi to 88% in Nakuru.

Comprehension

Performance in the items on comprehension was below that of items on knowledge and more or less the same to that of the whole test *(Table 3.17)*. The formal private schools recorded statistically significant scores than the public schools - with an overall difference of 8 percentage points. In Nairobi, the difference in performance between formal private and low-cost schools was small (1.8%) and it was not statistically significant. Among the government schools, Kisumu and Mombasa recorded the highest performance in comprehension; while among the formal private schools Nakuru had the highest score. Moreover, like in the case of knowledge items, Nakuru and Nyeri recorded the largest differences in comprehension items between government and formal private schools of 16 and 17 percentage points, while in Kisumu the difference was small.

Table 3.17: Grade 3 Numeracy Mean Scores on Comprehension Items by School Type

Town	Government Mean (A)	s.d	Formal Private Mean (B)	s.d	Low-cost Mean (C)	s.d	Mean Difference A-B	A-C	B-C
Mombasa	69.4	16.3	78.1	13.4	-	-	-8.7**	-	-
Nairobi	61.7	18.2	68.9	13.9	67.1	16.5	-7.2**	-5.3**	1.8
Nyeri	64.5	17.0	80.4	10.7	-	-	-15.9**	-	-
Nakuru	66.4	17.6	83.4	10.8	-	-	-17.0**	--	-
Eldoret	62.8	16.3	72.0	15.5	-	-	-9.2**	-	-
Kisumu	73.5	14.2	78.09	14.1	-	-	-4.6**	-	-
Overall	67.5	17.1	75.9	14.5	-	-	-8.4	-	-

Application

Unlike in the knowledge and comprehension items, performance in the application items was low *(Table 3.18)*. Despite the low performance, the mean score difference between the government and private formal schools is larger than that observed in the knowledge and comprehension items. This indicates that students in government schools performed poorly in the application items.

Table 3.18: Grade 3 Numeracy Mean Scores on Application Items by School Type

Town	Government Mean (A)	s.d	Formal Private Mean (B)	s.d	Low-cost Mean (C)	s.d	Mean Difference A-B	A-C	B-C
Mombasa	52.0	21.0	61.4	19.2	-	-	-9.3**	-	-
Nairobi	38.8	21.1	46.2	19.0	47.2	20.9	-7.4**	-8.3**	-1.0
Nyeri	33.6	20.5	61.4	15.6	-	-	-27.8**	-	-
Nakuru	44.7	23.0	65.8	17.5	-	-	-21.1**	-	-
Eldoret	43.0	19.7	52.2	21.2	-	-	-9.1**	-	-
Kisumu	52.1	21.4	60.2	22.1	-	-	-8.1**	-	-
Overall	45.9	22.46	57.4	20.6	-	-	-11.5**	-	-

In Nairobi, although the formal private and low-cost schools scored below 50%, their scores in application items were on average 7% and 8% more than that of the government schools. In Nakuru and Nyeri students in formal private schools scored 28 and 21 per-centage points more than students in government schools, respectively. The lowest score (33.6%) was recorded in Nyeri among government schools while the highest score (67.3%) was observed in Nakuru among the low-cost schools.

3.6.3   Grade 6 Numeracy Scores

Table 3.19 shows grade 6 numeracy test percentage scores by study site and school type. The overall performance of grade 6 numeracy was about 45% with a standard deviation of 9.6. In the beginning of 2009, a similar study (classroom observation study) focusing on grade 6 pupils across 6 districts in Kenya using the same assessment tool was conducted. The study found the mean pupil mark to be 46.9% with a standard deviation of 10.6% (Ngware et. al. 2010). Therefore, in spite of the timing and contextual differences, the current study validates not only the previous results but also the test tools. Overall, the formal private schools posted significantly higher mean scores across the towns than the government and low-cost schools though the magnitude of the difference varied. For instance, in Nakuru, formal private schools scored 19 percentage points more than government schools; while in Nairobi the difference was 4 percentage points, though the low-cost schools scored slightly higher than the formal private schools. Scores by pupil gender show slight differences between boys and girls *(Table 3.20)* all in the favor of the boys.

Table 3.19: Grade 6 Numeracy Mean Scores by School Type

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	41.9	14.4	52.7	15.0	-	-	-10.7**	-	-
Nairobi	39.7	13.5	43.3	12.9	44.2	13.0	-3.6*	-4.4**	-0.7
Nyeri	41.6	13.8	54.5	15.2	-	-	-13.0**	-	-
Nakuru	38.3	13.2	61.6	14.6	-	-	-23.3**	-	-
Eldoret	39.4	13.2	49.2	14.0	-	-	-9.8**	-	-
Kisumu	51.3	14.7	61.6	15.5	-	-	-10.3**	-	-
Overall	**42.5**	**14.7**	**52.4**	**15.4**	**-**	**-**	**-10.0****	**-**	**-**

Unlike in grade 3, the standard deviations for grade 6 numeracy test are small in all the study sites. This means the ability of the pupils did not vary considerably *(Figure 3.7 and Figure 3.8).* The score for numeracy in grade 6 were normally distributed while those of the literacy test were negatively skewed (right skew) and more spread. When the two scores were correlated, the correlation coefficient was 0.7 - indicating a strong linear association between numeracy and literacy. That is, pupils who scored highly in literacy also had high scores in numeracy.

Table 3.20: Mean Grade 6 Numeracy Score by Gender

Town	Boys (A)				Girls (B)				Mean
	Mean	s.d.	Min	Max	Mean	Std. Dev	Min	Max	Diff (A-B)
Mombasa	49.4	15.4	12.5	92.5	464	15.8	10.0	87.5	3.0
Nairobi	44.1	13.6	2.5	90.0	41.6	12.7	10.0	90.0	2.5
Nyeri	43.7	16.3	0.0	90.0	45.2	13.8	5.0	80.0	-1.6
Nakuru	41.8	15.6	2.5	95.0	40.2	14.9	7.5	90.0	1.6
Eldoret	46.5	14.8	10.0	87.5	44.4	14.1	17.5	87.5	2.1
Kisumu	54.3	15.4	12.5	97.5	50.3	14.3	10.0	90.0	3.9
Overall	46.4	15.7	0.0	97.5	44.0	14.8	5.00	90.0	2.3

Figure 3.7: Distribution of Grade 6 Numeracy Scores
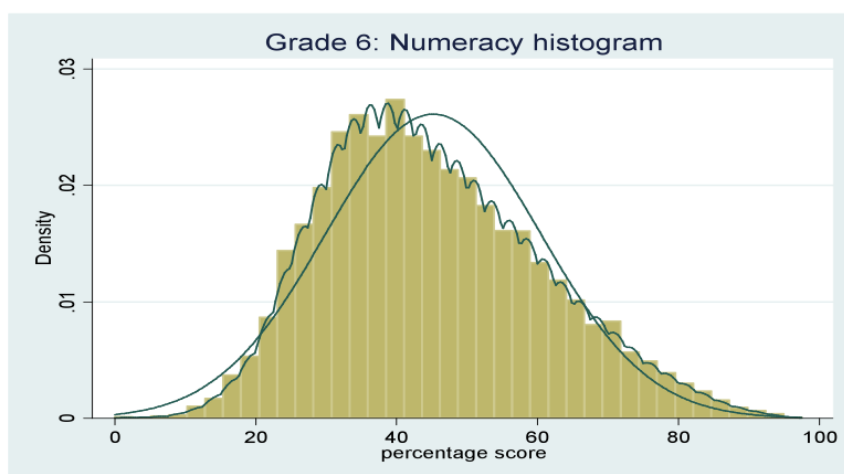
Figure 3.8: Distribution of Grade 6 Literacy Scores
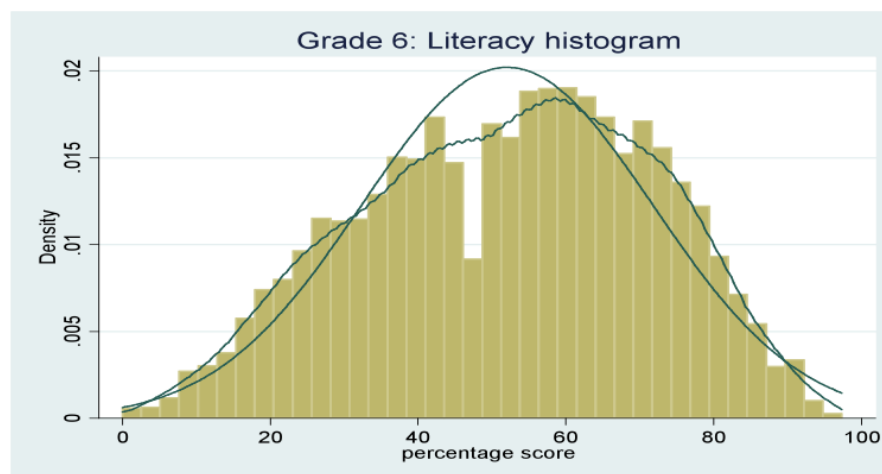
3.6.4 Grade 6 Numeracy Domains

Grade 6 numeracy test was spread across different levels of cognitive demand of the item as well as curriculum outcome as shown in *Table 3.21*. Majority of the questions were from number concepts and operations in the curriculum content area, and were mainly on the third level of cognitive demand (procedures with connection). Analysis was done using the curriculum content area and the results are presented in *Table 3.22 to Table 3.26*.

Table 3.21: Distribution of Grade 6 Numeracy Test Items by Curriculum Outcome Area

Curriculum content Area (CA)	Number of items under each level of cognitive demand				
	Memorization	Procedures without connection	Procedures with connection	Doing Mathematics	Total Items
Number concepts and operations	2	6	11	2	21 (52.5%)
Patterns and Algebra	0	0	2	2	4 (10.0%)
Geometry	4	0	1	0	5 (12.5%)
Measurement	2	1	4	0	7 (17.5%)
Basic statistics	0	1	1	1	3 (07.5%)
Total items (%)	8 (20.0%)	8 (20.0%)	19 (47.5%)	5 (12.5%)	40

Number Concepts and Operations

The following were observed in the number concepts and operations:
- The performance was higher than in the overall test scores.
- Formal private schools performed better than the government schools. The overall difference between the two was 11% points and was statistically significant.
- In Nairobi, the low-cost schools performed better in number concepts and operations than the government schools, though slightly lower than the formal private schools.
- Nairobi recorded the lowest score in this outcome area across the school types while Kisumu recorded the highest scores.

Table 3.22: Grade 6 Numeracy Mean Scores: Number Concepts and Operations

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	51.9	16.6	63.4	16.6	-	-	-11.6	-	-
Nairobi	48.5	15.8	54.2	15.6	54.3	15.0	-5.7	5.8	0.1
Nyeri	52.8	15.7	63.3	16.2	-	-	-10.5	-	-
Nakuru	46.3	16.0	72.9	15.7	-	-	-26.5	-	-
Eldoret	48.8	15.3	59.4	15.8	-	-	-10.6	-	-
Kisumu	61.7	17.0	72.4	16.4	-	-	-10.7	-	-
Overall	**51.8**	**17.4**	**63.0**	**17.0**	-	-	**-11.2**	-	-

Patterns and Algebra

The following are observed in number patterns and algebra:

- The performance was below that of the overall test and number concepts and operations and the means were below 40%.
- In spite of the low performance, the formal private schools scored on average 6% points more than the government schools.
- In Nairobi, the low-cost schools performed equally as the government schools.
- High standard deviation, indicating that the pupils score in this outcome area was spread. This was not the case in the number concepts and operations, which had smaller standard deviations.

Table 3.23: Grade 6 Numeracy Mean Scores: Patterns and Algebra

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	36.7	22.9	47.5	21.2			-10.8**	-	-
Nairobi	36.6	22.5	36.2	19.9	38.9	22.2	0.4	-2.3*	-2.7
Nyeri	36.4	23.3	50.5	20.5			-14.1**	-	-
Nakuru	35.2	21.4	52.2	20.0	30.2	18.7	-17.0**	5.0	22.0
Eldoret	31.5	20.9	43.2	21.0	49.1	20.7	-11.7**	-17.6	-5.9
Kisumu	47.6	21.6	56.9	22.2			-9.3**	-	-
Overall	**38.5**	**22.5**	**46.4**	**21.5**	**38.6**	**22.1**	**-7.8**	**-0.1**	**7.8**

Geometry

- The performance was below that of the overall test and number concepts and operations and the means were below 40% for government and low-cost schools.
- In spite of the low performance, the formal private schools scored on average 8% points more than the government schools and low-cost schools.
- In Nairobi, the low-cost performed equally as the government school and formal private schools.
- High standard deviation, indicating that the pupils' score in this outcome area was spread.

Table 3.24: Grade 6 Numeracy Mean Scores: Geometry

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	36.7	22.9	47.5	21.2	-	-	-10.8**	-	-
Nairobi	36.6	22.5	36.2	19.9	38.9	-	0.4	-2.3*	-2.7
Nyeri	36.4	23.3	50.5	20.5	-	-	-14.1**	-	-
Nakuru	35.2	21.4	52.2	20.0	-	-	-17.0**	-	-
Eldoret	31.5	20.9	43.2	21.0	-	-	-11.7**	-	-
Kisumu	47.6	21.6	56.9	22.2	-	-	-9.3**	-	-
Overall	38.5	22.5	46.4	21.5	-	-	-7.8**	-	-

Measurement

The following were observed in measurement outcome area:
- Measurement recorded the lowest performance and that the mean scores were about 30%, 40% and 31% for government, formal private and low-cost schools respectively
- In spite of the low performance, the formal private schools scored on average 10% points more than the government schools and low-cost schools.
- In Nairobi, the low-cost performed equally as the government school and slightly better than the formal private schools.
- High standard deviation, indicating that the pupils' score in this outcome area was spread.

Table 3.25: Grade 6 Numeracy Mean Scores: Measurement

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	27.5	19.5	38.9	21.5	-	-	-11.4**	-	-
Nairobi	28.2	20.4	30.5	19.3	31.2	19.7	-2.4*	-3.0**	-0.7
Nyeri	26.1	21.9	44.2	23.1	-	-	-18.0**	-	-
Nakuru	27.3	19.4	49.6	20.1	-	-	-22.3**	-	-
Eldoret	26.7	19.6	37.5	21.3	-	-	-10.8**	-	-
Kisumu	36.3	21.4	47.1	21.3	-	-	-10.8**	-	-
Overall	**29.6**	**20.6**	**39.7**	**21.7**	**-**	**-**	**-10.1****	**-**	**-**

Basic Statistics

Table 3.26: Grade 6 Numeracy Mean Scores: Basic Statistics

Town	Government		Formal Private		Low-cost		Mean Difference		
	Mean (A)	s.d	Mean (B)	s.d	Mean (C)	s.d	A-B	A-C	B-C
Mombasa	26.6	24.8	40.8	27.6	-	-	-14.2**	-	-
Nairobi	27.2	25.0	28.1	25.3	29.7	25.8	-0.9	-2.5*	-1.7
Nyeri	27.8	26.0	40.8	27.0	-	-	-13.0**	-	-
Nakuru	24.6	24.5	47.8	27.3	-	-	-23.2**	-	-
Eldoret	27.2	24.8	36.4	26.2	-	-	-9.3**	-	-
Kisumu	38.2	26.7	47.9	28.2	-	-	-9.6**	-	-
Overall	**29.0**	**25.9**	**39.5**	**27.5**	**-**	**-**	**-10.5****	**-**	**-**

The following were observed in basic statistics:
- The performance was below that of the overall test and number concepts and operations and that the overall means were below 40% in all schools.
- In spite of the low performance, the formal private schools scored on average 11% points more than the government schools.
- In Nairobi, the low-cost schools performed equally as the government schools and private formal schools.
- High standard deviation, indicating that the pupils' score in this outcome

3.7   Pupil Wealth Index

Table 3.27: Grade 6 Numeracy Mean Scores by Pupil Wealth Index

Town	Least Poor		Middle Poor		Poorest	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Mombasa	49.5	16.2	48.1	14.8	45.6	15.8
Nairobi	44.5	13.3	43.6	12.9	41.6	13.3
Nyeri	48.5	16.3	45.1	14.0	38.2	11.9
Nakuru	44.4	16.6	40.1	13.9	35.4	12.3
Eldoret	46.6	15.2	46.6	15.1	43.9	13.4
Kisumu	56.2	15.6	52.9	14.3	48.3	14.0
Overall	47.8	16.4	45.3	14.6	42.7	14.2

Table 3.27 and Table 3.28 show grade 6 numeracy and literacy scores by pupil wealth index respectively. The mean scores in both literacy and numeracy were higher among the pupils from the households in the highest wealth index/quintile than the pupils from the lowest wealth quintile across the study sites.

Table 3.28: Grade 6 Literacy Mean Scores by Pupil Wealth Index

Town	Least Poor		Middle Poor		Poorest	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Mombasa	57.6	19.1	54.0	18.9	49.6	20.6
Nairobi	55.6	17.6	51.6	17.0	48.5	18.3
Nyeri	59.6	22.0	54.2	18.8	42.6	18.4
Nakuru	51.7	21.1	45.2	19.1	35.8	18.4
Eldoret	57.5	17.6	55.9	18.0	49.1	19.1
Kisumu	65.2	16.6	61.1	16.9	53.8	17.3
Overall	56.5	19.9	52.4	18.8	47.5	19.4

Further analysis *(see Appendix 2 & 3)* using multilevel random intercept model showed the association of the effect of pupil wealth index with literacy but not with numeracy scores after controlling for school, pupil and teacher characteristics. That is, pupils from households ranked in the last 2 poorest quintiles scored lower by approximately 10% of a standard deviation compared to those in the wealthiest quintile. To have a measure of school poverty, the pupil wealth quintile was aggregated at school level by calculating the proportion of pupils in the school ranked in the poorest 40% within the study site. The results show that a 1% increment of the proportion of pupils ranked as poor in a school to significantly reduce individual score by 1% - for both literacy and numeracy in both grades.

3.8   Summary

Teacher and Pupil Absenteeism
- Overall, 19% of the pupils had missed school in the last one school week preceding the date of interview. Nyeri recorded the highest proportion of pupils reporting absenteeism at about 24%.
- Formal private schools recorded the highest proportion of pupils absenteeism at 21% compared to the low-cost private schools at 17%.
- Teacher absenteeism as reported by pupils was higher among government schools than it was among the formal private and low-cost schools at 11.4% and 7.5% respectively.

Literacy: Grade 6
- In Nairobi, the low-cost private schools performed better than the government and formal private schools. Formal private schools did better as compared to government schools by about 10% point difference.
- Formal private schools performed better in all the competency domains. Though the difference was small, the low-cost schools performed better than the government schools. Reading comprehension was poorly performed across the study sites and school types.

Numeracy: Grade 3
- Pupils from the formal private schools posted higher scores than the government and low-cost schools and the difference was statistically significant.
- In this test, there was no significant difference between boys and girls.
- Domains – knowledge and comprehension related test items were performed well (above 60%) while the application questions were poorly performed. Across all domains, students in formal private performed better than those in low-cost and government schools. Other than the knowledge questions the students in low-cost performed as well as those in government schools in the two other domains.

Numeracy: Grade 6
- The formal private schools posted significantly higher mean scores across the towns than the government schools though the magnitude of the difference varied. The low-cost schools in Nairobi scored more or less the same as the government schools.
- Scores by pupil gender show slight differences between boys and girls and in favor of the boys.

- Across the domains, number concepts and operations were somehow performed better (above 50%), while patterns and algebra together with measurement were poorly performed (below 40%) across the school types and sites.
- The formal private schools performed better than both government and low-cost schools in all the domains.
- Small differences between government and low-cost schools in favor of the latter were noted in Nairobi, though the difference was not statistically significant.

Wealth Index
- The mean scores in both literacy and numeracy were high among pupils from households in the highest wealth index/quintile than those of pupils from the lowest wealth quintile across the study sites.

4.0 Teacher Characteristics, Knowledge and Teaching Styles

Teacher quality is considered essential to improving learning outcomes. However, research findings are mixed with respect to which teacher characteristics influence learning outcomes. Several studies conducted in the west have found a weak association between observable teacher characteristics such as years of experience, education and qualifications and student achievement at primary school level (see for example Rivkin, Hanushek & Kain, 2002; Jepsen & Rivkin, 2002; Clotfelter, Ladd & Vigdor, 2003). Rivkin et al. argue that although teacher quality is an important factor in student achievement, it is not well captured by teacher characteristics such as experience, education and training. This argument is supported by Jepsen (2004) who contends that isolating individual teacher characteristics that improve student achievement is a difficult task. On the other hand, in a study conducted in the US, Clotfelter et al. (2003) found a positive association between student achievement and teacher experience as well as teacher test scores. Other studies that find statistically significant effects of teacher characteristics (for instance level of education and training, experience, gender, age, teaching styles and knowledge) on learning achievements include those of Rockoff (2004). In addition, earlier studies such as those of Hanushek (1971), Murnane (1975), and Armor, Conroy-Oseguera, Cox et al. (1976) find statistically significant impacts of classroom fixed effects – a combination of teacher characteristics and peer influence. A study in Kenya (Ngware et al., 2010) did not find an association between teacher test scores in Math (testing knowledge) and student achievement in high performing primary schools. However, in low performing primary schools, there was a positive association between teachers' test scores and student achievement.

In this chapter, we explore teacher characteristics and how they are related to each other and to student achievement across different types of primary schools in the urban informal settlements. In addition to teacher characteristics, we examine the associations between classroom teaching behavior, teacher knowledge and student achievement.

4.1 Teacher Characteristics

4.1.1 Gender and Age

Table 4.1 shows the distribution of teachers who were interviewed by site, gender and school type. Except Nairobi, the other sites had no or very few low-cost schools and therefore we shall focus on low-cost schools in Nairobi. Overall, 57% of the teachers interviewed were female. However, there were differences in the distribution of teachers by gender based on type of school and by geographical region. There were more female

teachers than male teachers in urban government schools. One explanation of this pattern could be the widespread practice in the public service in Kenya where female employees follow their spouses to the location where the spouse duty station is found.

Table 4.1: Teachers Interviewed by Gender and School Type

Town	Government			Formal private			Low-cost		
	Number	% F	% M	Number	% F	% M	Number	% F	% M
Mombasa	33	90.9	9.1	101	43.6	56.4	-	-	-
Nairobi	23	69.6	30.4	22	50.0	50.0	125	36.0	64.0
Nyeri	22	81.8	18.2	9	55.6	44.4	-	-	-
Nakuru	101	79.2	20.8	31	51.6	48.4	-	-	-
Eldoret	21	61.9	38.1	99	52.5	47.5	-	-	-
Kisumu	60	63.3	36.7	21	57.1	42.9	-	-	-
Total	**260**	**75.0**	**25.0**	**283**	**49.5**	**50.5**	**-**	**-**	**-**

Note: Total schools with complete data were 228. On average, 3 teachers were interviewed in every school, 1 in grade 3 and 2 in grade 6.

Formal private schools had a balance of male and female teachers, while low-cost schools were dominated by male teachers. Mombasa had the highest proportion (91%) of female teachers in government schools, while Nairobi had the highest proportion (64%) of male teachers in low-cost schools. The gap between the proportions of male and female teachers in the sampled schools is much wider (50%) in government schools than in the low-cost schools (26%).

Table 4.2 presents the mean age of teachers by school type. On average, teachers in government schools are older by about 14 years. An aging teaching force in government schools can be explained by the freeze in teacher recruitment that took place in 1998 and the low rate of employment into the public school system in the subsequent years. The low recruitment rate may also be due to budgetary constraints. As expected, teachers' age was highly and positively correlated with years of teaching experience. A comparison of teachers' gender and age showed that in government schools, female teachers were older than male teachers and the difference in age was statistically significant ($\alpha=0.05$).

Table 4.2: Mean Age of Teachers by School Type

Town	Government			Formal private			Low-cost		
	Number	Mean	Std	Number	Mean	std	Number	Mean	std
Mombasa	33	42.2	7.7	101	27.5	5.8	-	-	-
Nairobi	23	42.0	8.6	22	29.3	6.0	125	26.9	6.5
Nyeri	22	43.5	7.6	9	30.6	3.4	-	-	-
Nakuru	101	43.6	9.4	31	31.3	6.2	-	-	-
Eldoret	21	45.0	8.8	99	27.3	7.4	-	-	-
Kisumu	60	37.0	10.5	21	24.9	3.1	-	-	-
Total	260	41.8	9.6	283	27.9	6.4	-	-	-

In formal private and low-cost schools, teachers' gender was not associated with pupils' mean scores in Math achievement, even after controlling for grade. However, in government schools, grade 6 pupils taught by a male teacher scored 4 percentage points higher than those taught by a female teacher. The difference in mean scores for grade 3 students was only marginally significant but classes taught by male teachers scored 14 percentage points less - perhaps an indication that male teachers in government schools may not be well prepared to teach early grades. With respect to literacy test mean scores, teacher gender was associated with grade 6 pupils' achievement. Classes taught literacy by female teachers scored 8 percentage points more than those taught by male teachers. Grade 3 literacy classes taught by female teachers scored 5 percentage points more than those taught by male teachers. However, the difference was only marginally significant. In government and formal private schools, teacher's gender was not associated with literacy mean scores. After controlling for household, school and individual pupil characteristics, teachers' age did not have any statistically significant effect on student achievement (see Appendix 2 and 3). However, teachers' gender had a statistically significant effect on grade 6 Math test scores; being taught Math by a male teacher increases pupil's Math test scores by about 11%. This may be explained by stereotyping where the society considers males to be better than females in Math and sciences.

4.1.2   Teachers' academic and professional qualifications

Table 4.3 presents teachers' academic qualifications by school type. In all the schools, majority of the teachers had secondary education (O-level or Form 4). In government primary schools, a considerable proportion (22%) of teachers had at least a first degree.

Table 4.3: Highest Level of Academic Qualifications

Education level	Government		Formal private		Low-cost	
	n	%	n	%	n	%
Primary education	1	0.4	2	0.7	1	0.8
Junior secondary education	1	0.4	0	-	1	0.8
Secondary education (O-Level)	155	59.6	239	84.5	100	78.1
Secondary education (A-Level)	45	17.3	27	9.5	23	18.0
Bachelors degree or higher	58	22.3	15	5.3	3	2.3
Total	260	100.0	283	100.0	128	100.0

Table 4.4 and *Figure 4.1* show teachers' highest level of professional qualifications and proportion of untrained teachers. Compared to government schools where only 5% of teachers are untrained, 30% of teachers in formal private schools and 59% of teachers in low-cost schools are untrained. The proportion of untrained teachers in formal private and low-cost schools is huge and it will be interesting to see if there is an association between the level of professional training and students' mean scores in literacy and Math. From *Figure 4.1*, Nairobi has the highest (46%) proportion of untrained primary school teachers among all the seven study sites – mainly in the low-cost schools. Overall, slightly over a quarter (26%) of all the teachers surveyed were untrained.

Table 4.4: Highest Level of Professional Training

Education level	Government		Formal private		Low-cost	
	n	%	n	%	n	%
Not trained	14	5.4	85	30.0	75	58.6
Certificate	168	64.6	160	56.5	48	37.5
Diploma	37	14.2	30	10.6	4	3.1
Degree	41	15.8	8	2.8	1	0.78
Total	260	100.0	283	100.0	128	100.0

Figure 4.1: Comparing Proportion of Untrained Teachers Across Study Sites
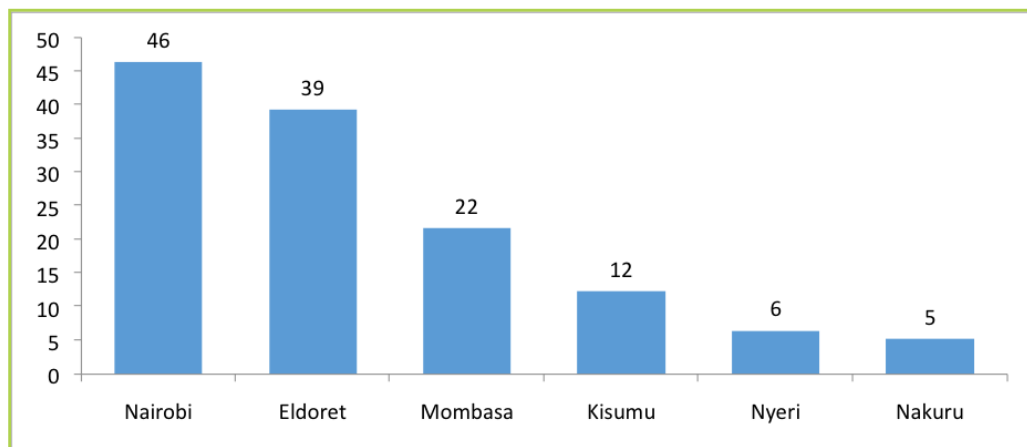
In both government and formal private schools, teachers' academic qualifications was not associated with pupils' mean scores even after controlling for grade and subject. In low-cost schools, there was an association between teacher academic qualifications and grade 3 literacy scores. Students taught literacy by a teacher who was a degree holder scored 15 percentage points less compared to students taught by a teacher whose highest academic qualification is secondary O-level. Though these are descriptive statistics and therefore not conclusive, it would appear that higher teacher academic qualifications do not necessarily lead to higher student learning achievement in the early grades. Grade 6 students in formal private schools scored 6 percentage points more when taught Math by a certificate (P1 or P2) trained teacher compared to those taught by an untrained teacher; while in literacy they scored 7 percentage points more if the teacher had certificate level training. Students taught literacy by a teacher with degree level training scored 16 percentage points more than those taught by an untrained teacher. These significant effects could be explained by the improved teacher pedagogical knowledge skills acquired through teacher training. Results from regression analysis (Appendix 2 and 3) show that teachers' level of training was associated with grade 6 literacy test scores when controlling for other variables.

4.2   Teacher Experience

Table 4.5 presents teachers' years of teaching experience. Overall, a third of teachers in formal private schools had less than 5 years teaching experience. The proportion was similar for low-cost schools (65%). This may be an indication of high teacher turnover. In government schools, 45% of teachers had taught in primary school for at least 20 years. The associations between student mean scores and teacher years of teaching experience were mixed. For instance, in formal private schools, we found a weak but positive association between Math teacher years of teaching experience and student Math mean

scores. After disaggregating data at grade level in public schools, we found a negative and moderate (-0.4) association between years of teaching experience and grade 6 student Math mean scores *(see Appendix 5)*; while in grade 3 in formal private schools we found a positive and weak (0.2) association. From these findings, it would appear that in formal private schools, more years of teaching add value to students' performance perhaps due to continuous improvement, teacher supervision and support. In government schools, more years of teaching do not necessary lead to better student scores perhaps due to the 'business as usual' way of doing things – which may be as a result of inadequate on-the-job teacher support mechanism. For instance, in public schools, almost half of the Math teachers interviewed indicated that in the last 12 months, the head teacher 'rarely or never' observed them while teaching compared to about one-third in private and/or low-cost schools. After controlling for household, school and individual pupil characteristics, years of teaching experience was not associated with student achievement *(see Appendix 2 and 3).*

Table 4.5: Teachers' Years of Teaching Experience

Experience	Government		Formal private		Low-cost	
	Number	%	Number	%	Number	%
Less than 5 years	32	12.3	186	65.7	83	64.8
Between 5 and 9 years	36	13.9	80	28.3	31	24.2
Between 10 and 14 years	27	10.4	8	2.8	9	7.0
Between 15 and 19 years	48	18.5	5	1.8	5	3.9
20 yrs & above	117	45.0	4	1.4	0	-

4.3   Teacher Workload

According to the Task Force on the Re-alignment of the Education Sector to the Constitution of Kenya 2010, for efficient utilization of teachers, the average teaching load in a week should be between 20 and 24 hours. Available literature on teaching load show that on average, in Kenya and Uganda, teachers teach between 480 and 500 hours annually compared to between 700 and 1000 hours in other countries (UNESCO, 2011). In this study most teachers taught for less than 20 hours in a week *(Table 4.6).* The average teaching load per week was 17 and 16 hours in government and in the two types of non-government schools, respectively. This translates to between 255 and 275 hours in a year, much less than what is reported in literature. With a daily average number of teachers absence of 13% in urban government schools in our study, the number of hours taught in a year is less than the 255. After presenting the results of absenteeism, we shall revisit this issue due to its importance in providing learning opportunities to pupils. In formal private

schools, most teachers in Nyeri and Nakuru taught for 16-20 hours in a week. In low-cost schools, majority (54%) of teachers taught for less than 16 hours in a week. Overall, less than 12% of teachers interviewed in all schools taught for at least 21 hours in a week.

To assess whether teacher workload is correlated with student achievement, we compared students' mean scores by teacher workload across the three school types. In government schools, teacher workload was negatively associated with grade 6 students mean scores in literacy. However, in grade 3, teachers' workload was not associated with student mean scores in Math or literacy. After controlling for household, school and individual pupil characteristics, teachers' workload was negatively associated with student achievement in grade 6 Math (see Appendix 3).

Table 4.6: Teacher Workload/Hours Taught Per Week

Town	Government (%)			Formal Private (%)			Low-cost (%)		
	<16 hrs	16-20hrs	>20 hrs	<16 hrs	16-20hrs	>20 hrs	<16 hrs	16-20hrs	>20 hrs
Mombasa	54.5	39.4	6.1	51.5	35.6	12.9	-	-	-
Nairobi	21.7	60.9	17.4	68.2	31.8	0.0	53.7	30.1	16.3
Nyeri	27.3	63.6	9.1	33.3	55.6	11.1	-	-	-
Nakuru	14.9	67.3	17.8	41.9	54.8	3.2	-	-	-
Eldoret	38.1	61.9	0.0	53.5	32.3	14.1	-	-	-
Kisumu	43.3	55.0	1.7	71.4	23.8	4.8	-	-	-
Overall	**30.0**	**59.6**	**10.4**	**53.4**	**36.0**	**10.6**	-	-	-

4.4   Teacher Absenteeism

Teacher absenteeism was a common phenomenon among the study sites, and in particular among teachers in public schools. From our study, about 35% of the teachers indicated that they are never away from their work station. Teachers' reasons for being away from school included domestic responsibilities (17%), attending training or professional development (16%), attending departmental committee meetings (9%), consultation with other teachers (6%), and attending union meetings (4%).

Figure 4.2 shows the proportion of teachers self-reporting absenteeism by school type and region. Teachers interviewed were asked the number of school days they were absent from school in the week preceding the survey. From Figure 4.2 the highest proportion of teachers who missed at least one school day was among government school teachers in Nyeri town (26%). However, it is notable that Nyeri had the lowest (31) number of teachers in our sample. The lowest reported absenteeism in government primary schools surveyed

was in Kisumu town. In all regions, less than 7% of teachers in formal private schools reported being absent for at least a day within one week. In low-cost schools of Nairobi, about 7% of teachers were absent for at least one school day in a week. Overall, about 13%, 4% and 7% of teachers in government, formal private and low-cost, respectively, reported being absent from school for at least one school day in the week preceding data collection. Teacher absenteeism was negatively associated with literacy scores for grade 6 pupils in low-cost schools – an increase in absenteeism by one day decreased literacy mean scores by about 4 percentage points. Schools where student absenteeism was low also reported lower teacher absenteeism.

Overall, these findings suggest a huge loss of learning time. For instance, in the case of the 89 government schools that participated in the study, the proportion of 13% of teachers who reported being absent for a day translates to a loss of at least 54 cumulated teaching hours every week assuming 4.7 teaching hours in a school day in upper primary. In one school year, this translates to more than 2,100 teaching hours lost. For the 94 formal private schools participating in this study, the number of grade 6 teaching hours lost in a year is at least 648; while in the 47 low-cost schools in Nairobi, the lost teaching time is 1,134 hours. To put this into perspective and assuming that this situation persists in schools in urban informal settlements, for every 100 government primary schools with at least five teachers to teach in upper primary (grades 4-8), pupils lose over 11,800 hours; for low-cost schools and formal private schools, this translates to over 6,300 and 3,600 hours, respectively. This represents a huge loss to students in urban informal settlements in terms of learning opportunities missed.

Figure 4.2: Proportion of Surveyed Teachers who were Absent from School for at Least one Day
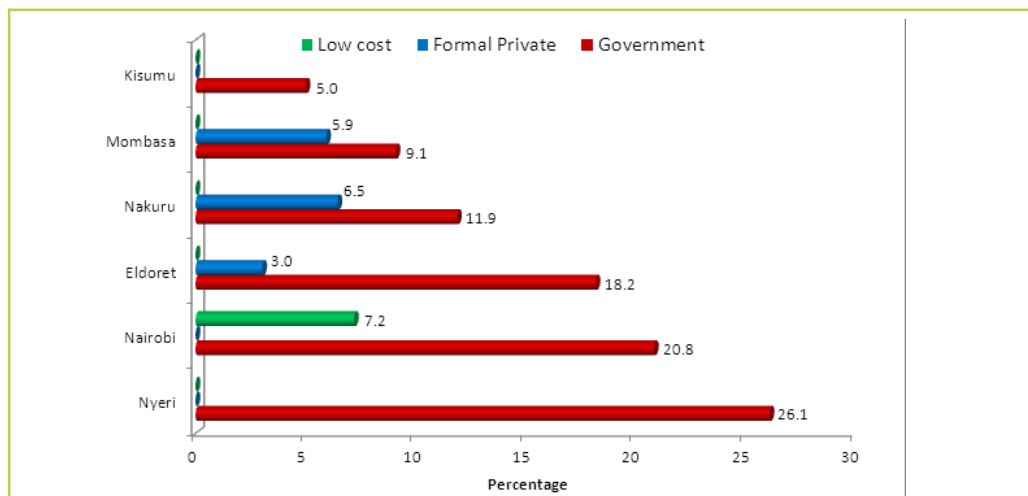
4.5   Teacher Math Test Mean Scores

The teacher Math test assessed teacher knowledge in three domains – Math content, pedagogy and pedagogical content knowledge. *Figure 4.3* presents teacher mean scores by school type and study site. Overall, teachers in formal private schools scored (52%) almost the same as their counterparts in government and low-cost schools (50%). In Kisumu and Nakuru, the differences in Math mean scores between teachers in government and formal private schools were substantial; 8 and 13 percentage points respectively with teachers in formal private schools outperforming their counterparts in government schools. No other statistically significant differences in teacher mean scores were observed within sites and across school types. Teachers in formal private schools in Eldoret had the lowest (47%) Math means score while formal private school teachers in Nakuru had the highest (63%) scores. The lowest individual teacher score of 7.5% was observed from a teacher in a government primary school in Nakuru, while the highest (93%) was recorded in a formal private school in the same town. During data collection, 3 Math teachers abandoned the test on claims that it was too difficult for them.

Figure 4.3: Teacher Mean Scores (%) on the Math Test by School Type and Study Site
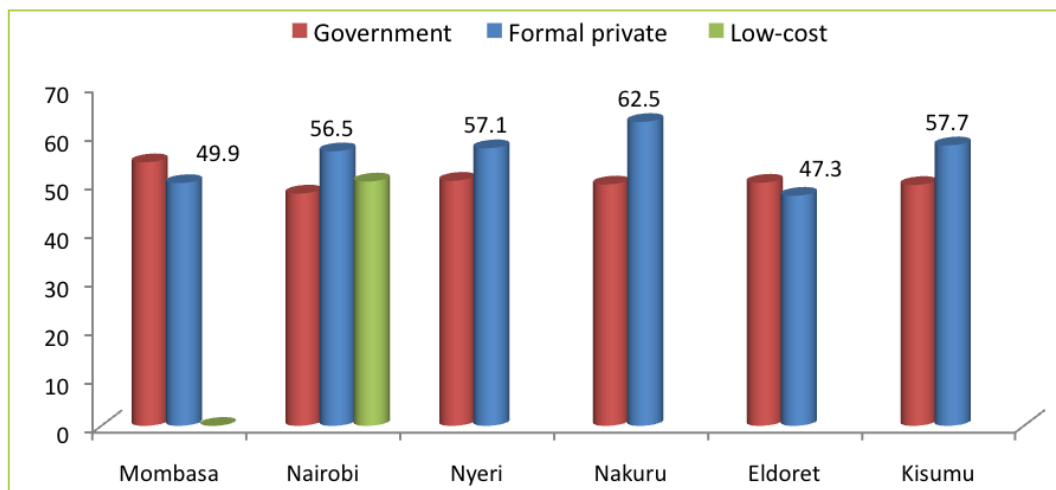
Although the contents of the test were not grade-specific and tested knowledge in Mathematics that a teacher teaching Math in a primary school should possess, in all study sites and school types, grade 6 Math teachers outperformed (55.8%) grade 3 teachers (45.6%). Grade 6 teachers scored about 10 percentage points higher than their colleagues in grade 3. The lower performance of grade 3 teachers may be an indication that school management assigns low performing teachers to early grades or the content they teach on a daily basis is not challenging enough to make them think about higher level cognitive tasks that are required of them. Available literature on early grades learning outcomes show that at this early stage of learning skills, quality teachers are necessary if students are to

achieve the basic learning competencies that will make them progress through the school system with little learning difficulties (Croninger, Rice, Rathbun & Nishio, 2003). Low Math performing teachers assigned to lower or early grades would therefore mean that students progress within the school system with Math learning difficulties.

Figure 4.4 and *Figure 4.5* present comparisons of teacher mean scores across study sites and school types for grades 3 and 6 respectively. From *Figure 4.4*, with an exception of Mombasa, grade 3 teachers in formal private schools scored slightly higher than their counterparts in government schools. Overall, this difference was not statistically significant, however teachers in Nakuru's formal private schools scored statistically significantly higher (15 percentage points) than their counterparts in government schools.

Figure 4.4: Grade 3 Teachers Math Mean Scores by Sites and School Type
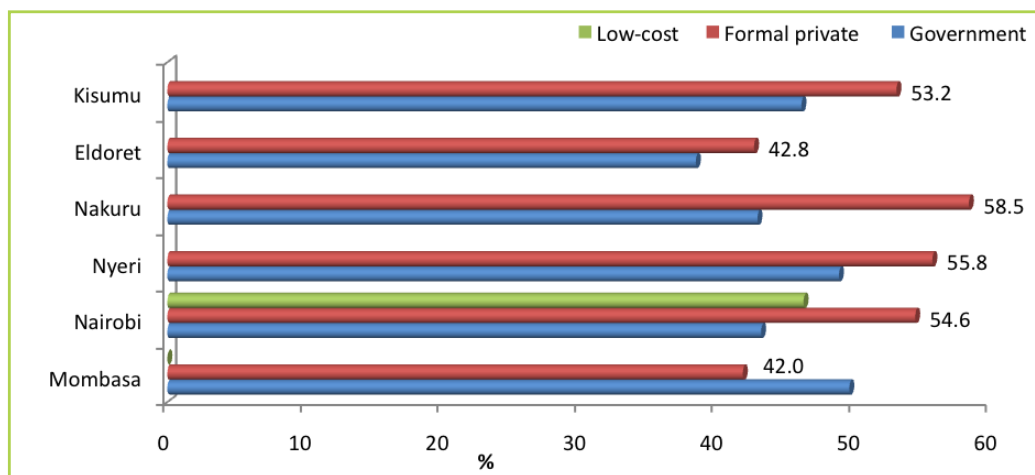
From *Figure 4.5,* almost a similar pattern to the one reported in *Figure 4.4* is observed. With an exception of Mombasa and Eldoret, grade 6 teachers in formal private schools scored slightly higher than their counterparts in government schools. Overall, this difference was not statistically significant, but within site teachers in Nakuru's formal private schools scored significantly higher (10 percentage points) than their counterparts in government schools.

Figure 4.5: Grade 6 Teachers Math Mean Scores by Site and School Type
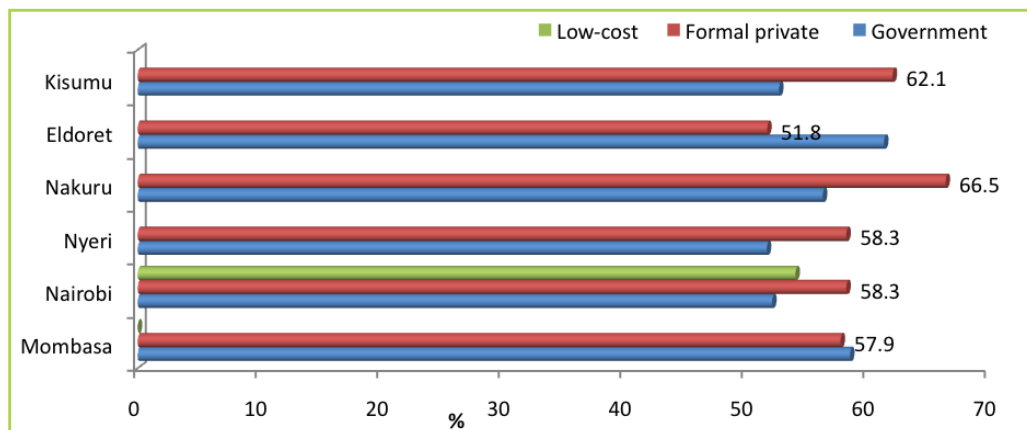
Table 4.7 presents teacher Math test mean scores on Math knowledge domains assessed during the study. Following Shulman's (1987) model that emphasizes the interrelationship between content knowledge and pedagogy, the study assessed three domains of teacher knowledge: content knowledge, pedagogical knowledge, and pedagogical content knowledge (see for example Hlas & Hilderbrandt, 2010; Ngware et al. 2010). Content knowledge refers to the subject matter knowledge and/or what is taught. Ball (2000) describes pedagogical knowledge as the "how" of teaching. Pedagogical knowledge can be acquired through training and classroom experience. According to Shulman, pedagogical content knowledge is the hands-on knowledge used by instructors to guide their decisions in highly contextualized classroom settings. For example, in teaching Math, pedagogical content knowledge would mean awareness of how to organize Math subject content for direct instruction to pupils; knowledge of the common Math constructions, misconstructions, and challenges that learners face when learning particular Math content, and knowledge of the specific teaching strategies that can be used to mitigate students' learning difficulties in particular classroom settings (Rowan, Schilling, Ball & Miller, 2001; Shulman, 1987).

Table 4.7: Teacher Math Knowledge and Teaching Style

Town	Government			Formal private			Low-cost		
	Mean			Mean			Mean		
	CK	PK	PCK	CK	PK	PCK	CK	PK	PCK
Mombasa	59.1	46.0	55.2	52.9	43.0	51.4	-	-	-
Nairobi	46.5	46.9	48.9	53.8	53.7	59.2	54.7	44.2	50.5
Nyeri	53.2	36.4	55.1	48.5	38.9	70.0	-	-	-
Nakuru	51.5	47.9	49.4	57.7	61.1	65.8	-	-	-
Eldoret	53.2	48.4	48.9	47.0	44.1	49.0	-	-	-
Kisumu	51.7	40.3	52.5	53.9	56.3	60.4	-	-	-
Overall	**52.2**	**45.0**	**51.2**	**51.3**	**46.9**	**53.8**	**-**	**-**	**-**

Notes: CK=Content knowledge; PK=Pedagogical knowledge; PCK=Pedagogical content knowledge.

From *Table 4.7*, the mean score in content knowledge ranged from 51% to 55% across the three school types. Teachers in low-cost schools scored slightly higher than their counterparts in government and formal private schools, although the difference was not statistically significant. The Math content assessment examined content knowledge of what primary school pupils would be expected to understand. Given that teachers are expected to teach Math in any of the primary grades, it is expected that their content knowledge should be higher than this if they are to have a better command of the teaching of Math. A major finding in qualitative studies on Math instruction is that the range of teaching strategies, alternative Mathematical representations and explanations at the disposal of a teacher during instruction are largely dependent on the mastery of the subject (Baumert, Kunter & Blum et al., 2010).

The lowest scores in the three Math knowledge domains were in pedagogical knowledge. The mean score in this domain ranged from 43% in low-cost schools to 47% in formal private schools (this difference is not statistically significant). The low scores on the pedagogical knowledge domain suggest that teachers are not adequately prepared during pre-service training and/or have little access to in-service training. The latter point is underscored by our finding that in the 18 months preceding the survey, fewer than 40% of Math teachers had participated in in-service training or been visited by a quality officer. The situation may also have been aggravated by changes in the education curriculum that have taken place without the commensurate teacher professional development to facilitate the implementation of the changes. During one of our interactions with stakeholders in the education sector, it emerged that in-service training programs are mainly sensitization sessions with no practical relevance of classroom situation. For low-cost schools, low pedagogical knowledge may partially be explained by the higher (58.6%) proportion of untrained teachers in this school category.

Performance in the pedagogical content knowledge domain was higher. The mean score for teachers in public schools and those in low-cost schools was 51% while in formal private schools it was 54%. This difference is statistically significant at 5%. Among grade 3 teachers, there was no difference in pedagogical content knowledge by school type. However, among grade 6 Math teachers, public school teachers scored 5 percentage points higher than their counterparts in low-cost schools. Grade 6 Math teachers in formal private schools scored 6 percentage points higher than their counterparts in low-cost schools. Again, these differences may partially be explained by the high proportion of un-trained Math teachers in low-cost schools. According to Rowan et al. (2001), pedagogical content knowledge requires a teacher to be savvy in content knowledge, understand how pupils think, and be aware of alternative pedagogical strategies. Skills in the latter areas are mainly acquired through training.

Associations of mean scores between the Math knowledge domains show a positive cor-relation even after disaggregating by grade and school type. In Table 4.8, we present teacher test scores disaggregated by Math knowledge domain and grade. Math teachers in grade three scored statistically significantly less than their counterparts in grade 6, in all the domains tested. Anecdotal information suggests that lower grade (1-3) teachers perform poorly compared to those who teach upper grades (4-8). As noted above, the lowest scores were on the pedagogical knowledge domain. However, grade 6 teach-ers performed significantly better than grade 3 teachers. Among grade 3 teachers, the highest scores were in pedagogical content knowledge; while for grade 6 teachers, the highest scores were in content knowledge. However, among teachers in the same grade but teaching in different schools, the differences in mean scores across the three Math knowledge domains are not statistically significant.

Table 4.8: Teacher Math Test Mean Scores (%) by Math Knowledge Domain and Grade

Town	Grade 3			Grade 6		
	Mean			Mean		
	CK	PK	PCK	CK	PK	PCK
Mombasa	42.89	40.10	46.09	65.81	47.34	58.59
Nairobi	46.69	43.48	48.34	60.11	47.77	54.01
Nyeri	53.63	37.62	55.70	50.00	36.67	63.50
Nakuru	46.24	46.72	46.48	59.51	54.08	59.71
Eldoret	42.79	41.15	41.88	53.86	48.06	55.75
Kisumu	46.46	43.97	50.81	58.09	44.99	58.23
Overall	45.41	42.84	46.97	59.36	48.16	57.31

Following the work of Ball (2000), we examined whether mean scores in the three Math domains were associated with pre-service training and teaching experience. Results showed that pedagogical content knowledge was positively associated with pre-service. Scores in the other Math knowledge domains were not associated with pre-service training even after disaggregation by highest level of training. The association between scores on the Math knowledge domains and years of teaching experience was weak and negative. Again, the association was only statistically significant for pedagogical content knowledge. The negative relationship implies that less experienced teachers scored higher or were more knowledgeable than experienced teachers. On disaggregating data by teachers' gender and school type, the negative and statistically significant association holds for female teachers and for teachers in government schools. We also examined the association between the Math knowledge domains and teacher academic (general education) qualifications. Academic qualifications ranged from primary education (coded as 1) to first degree or higher (coded as 5). Descriptive results show that none of the Math knowledge domains had a statistically significant association with teacher's level of academic education. On disaggregating the data by gender and school type, a positive association was observed between education qualifications and pedagogical knowledge for females and teachers in government schools. A positive association was also observed between pedagogical content knowledge and education qualification of teachers in formal private schools. The lack of association between content knowledge and teachers' academic qualifications may partially be explained by the fact that almost three quarters of the teachers have secondary O-level as their highest academic qualifications hence providing less variation. Overall, our data only provides weak support for the argument posed by Ball (2000).

4.6 Relationship Between Teacher Test scores and Teacher Characteristics

From *Table 4.9,* results of the association between teacher characteristics and their Math mean scores are mixed. Academic qualifications was a categorical variable with 1=primary level of education, 2=junior secondary, (up to S2), 3=secondary level, (O-level), 4=secondary level (A-level), 5=first degree or above. Teacher training or professional qualifications was a categorical variable with 1=no training or untrained teacher, 2=certificate level training, 3=diploma level training, and 4=degree level training or post-graduate diploma in education. Looking at the results of all schools and grades combined, male teachers did better in Math than female teachers; younger teachers had higher scores; higher levels of training was associated with higher teacher scores; and, more years of teaching was associated with lower scores. Years of teaching experience was strongly and positively correlated with age. Their negative association with teacher Math score may be explained by lack of continuous improvement on Math knowledge and may have forgotten the Math knowledge they acquired when in school or training college. The difference in scores across gender

can be explained by stereotyping – that male teachers are better Math teachers, and this may lead to low confidence among female Math teachers. Teacher training programs are aimed at improving pedagogical knowledge and it would appear that higher levels of training provide teachers with better pedagogical knowledge.

Table 4.9: The Association Between Teacher Characteristics and their Math Mean Score

Teacher characteristics	Teacher Math Score											
	All schools			Public			Formal Private			Low-cost		
	G3 & 6	G3	G6	G3 & 6	G3	G6	G3 & 6	G3	G6	G3& 6	G3	G6
Gender (f-m) (t-test)	-5.5***	-0.4	0	-6.4**	-9.4	1.5	-8.1***	-0.3	-0.5	1.3	4.6	9.2
Age (Pearson r)	-0.2***	-0.2***	-0.01	-0.3***	-0.2**	-0.2	-0.1	-0.1	-0.1	-0.3***	-0.3**	-0.1
Academic qualifications (ANOVA) F	0.75	1.02	0.46	1.15	0.64	0.43	1.28	1.37	1.03	0.43	0.26	0.02
Training (ANOVA, F)	3.46**	2.71**	1.23	0.75	1.09	0.11	4.99***	3.78**	2.09	0.73	0.16	1.18
Years of teaching exp. (Pearson r)	-0.2**	-0.2**	0.0	-0.2**	-0.2**	0.0	-0.1	-0.1	0.1	-0.3**	-0.3**	0.0

There was no association between teacher academic qualifications and their Math scores, and this lack of a statistically significant association may be due to the measure used. Academic qualification was measured using teacher highest level of education attained. Perhaps using their Math score or grade in that highest level attained may have yielded different results.

4.7   Teacher Math Knowledge and Teaching Style

During the study, 395 grade 3 and 6 Math lessons were observed. Using a time analysis video rubric that enabled us to examine classroom interactions in 5-minute intervals, classroom instructional Math tasks were analyzed and grouped into 3 major activities namely individual seat work, recitation, and teacher class activity based on the amount of time that activity was utilized during instruction. Individual seat work was the most dominant approach across all schools (53% in government schools, 55% in low-cost schools and 60% in formal private schools). Under the individual seat work, the teacher and pupils were involved in the following classroom-based tasks: copying instructions/ notes, solving problems individually as the teacher circulates in class or the teacher is on another task unrelated to what the pupil is doing, teacher checking individual work as

pupils solve the problem, and teacher checking individual work after pupils have stopped solving the problem. From these tasks, there is limited interaction between teacher and pupil though the teacher keeps the pupil busy with seat work (solving Math tasks while seated alone at his/her usual desk or seat). In lessons that are characterized by this activity, the teacher walks into the classroom, instructs the pupils on the day's content - mainly an introduction followed by a Math task in the form of an example or two, then pupils are asked to complete a similar task (Ngware et al., 2010). Thereafter, an exercise may be given either on the chalkboard or from a recommended text book.

Recitation involves 'question and answer' with cued elicitation (Ngware et al., 2010; Ngware, Mutisya & Oketch, 2012; Carnoy, Chisholm et al., 2008; Sorto et al., 2009; Hardman, Abd-Kadir & Agg et al., 2009; Ackers & Hardman, 2001). It is a teacher-led activity that consists of three moves - an 'initiation', usually in the form of a teacher question, a 'response' in which a pupil attempts to respond to the question, and a 'follow-up' action, in which the teacher provides feedback to the pupil's response in the form of praise or affirmation (Smith, Hardman & Tooley, 2005). Most of the interactions involve closed teacher questions, brief pupil responses, and, often, minimal diagnostic feedback. Though it is directed instruction, compared to the other dominant activities, recitation involves pupils more during the lesson.

Activities involved in recitation lessons include a teacher asking an individual pupil a question and the pupil giving a verbal or non-verbal answer; individual pupils asking a question with the teacher and/or another pupil responding, occasional whole class chorus and group reporting, individuals reading orally, the whole class reading orally, pupils solving problem on the chalkboard, pupils giving instructions, and individuals demonstrating both verbally or non-verbally. Such lessons are highly interactive and stimulating, and pupils learn from the teacher and their peers.

The other dominant teaching practice approach was the 'teacher only' activity. It involves the teacher dominating most of the tasks or heavily teacher-centered and/or lecture type of a lesson (see for example Carnoy et al., 2008). Lessons dominated by teacher only activities are characterized by the following tasks: teacher giving the entire class task instructions, teacher carrying out a demonstration, whole class lecture, teacher giving a review or recap of a lesson, and teacher evaluating the lesson objectives. Whole class chorus is a common feature in classroom interaction dominated by 'teacher only' activities as evidenced by other studies, for instance Moloi, Morobe and Urwick (2008) in Lesotho; Hardman, Abd-Kadir and Smith (2008) in Nigeria; Ackers and Hardman (2001), Pontefract and Hardman (2005), Ngware et al. (2010) and Hardman et. al. (2009) in Kenya.

Table 4.10 shows the proportion of Math lessons and the respective dominant teaching activity in each of the study sites. Across all the study sites and school types, more than

half of the Math lessons in grade 3 and 6 utilized individual seat work as the dominant activity. In formal private and low-cost schools, 'teacher only' activity was the next frequently utilized mode of interaction during Math lessons. These findings are consistent with an earlier study in Kenya that found Math lessons to be dominated by individual seat work – teacher walks in to the class, introduces the lessons, provides one or two examples on the chalk board, asks individual pupils to solve another one or two examples on the chalkboard as the rest of the pupils watch, asks pupils to solve some tasks/problems individually in their notebooks, and then the teacher walks around the classroom checking and/or correcting pupil's work.

Table 4.10: Dominant Teaching Activities

Town	Individual Work		Recitation		Teacher Class Activity		Total
	n	%	n	%	n	%	n
Mombasa	53	58.9	15	16.7	22	24.4	90
Nairobi	46	52.3	19	21.6	23	26.1	88
Nyeri	9	56.3	4	25.0	3	18.8	16
Nakuru	44	53.7	20	24.4	18	22.0	82
Eldoret	42	61.8	13	19.1	13	19.1	68
Kisumu	29	56.9	17	33.3	5	9.8	51
Total	223	56.5	88	22.3	84	21.3	395

Table 4.11 shows the teacher's Math test mean scores against the dominant activity. The emerging pattern shows that teachers who utilized individual seat work scored the least while those whose lessons were highly teacher-centered scored the most. From this observation, we can argue that teachers who mostly used individual seat work have low Math knowledge and during instruction they minimize verbal interactions with their pupils as their knowledge of Math is limited. Baumert et al. (2010) contends that explanations at the disposal of the teacher during instruction are largely dependent on the mastery of the subject. In the case of the teachers who mostly use teacher-centered approach, they seem to have more knowledge than their pupils (which is a good thing) but end up passing most of it to the pupils thus reducing the pupil to a passive participant. Recitation provides pupils with an opportunity to participate in the lesson through question and answer sessions, though the questions involved are simple, factual and repetitive. Recitation was more common among teachers teaching grade 3 while individual seat work and the teacher-centered were more common in grade 6.

Table 4.11: Teacher Mean Score and Dominant Teaching Activity

Town	Individual Work		Recitation		Teacher Class Activity	
	Mean%	s.d	Mean%	s.d	Mean%	s.d
Mombasa	50.1	15.8	53.2	15.6	51.6	11.8
Nairobi	52.7	15.6	49.6	13.6	52.6	12.3
Nyeri	52.3	14.6	36.9	11.3	64.2	6.3
Nakuru	48.7	17.3	54.5	17.3	54.5	15.1
Eldoret	47.3	15.1	44.8	13.2	51.7	18.0
Kisumu	50.3	13.5	51.2	12.6	61.5	9.5
Overall	**49.9**	**15.6**	**50.4**	**14.8**	**53.6**	**13.6**

Dominant teaching activities were also examined in relation to the student mean scores in Math. It emerged that in government and formal private schools, students in Math lessons dominated by individual seat work scored higher than their colleagues in 'teacher only' dominated instruction. Further, in government schools, students in Math lessons dominated by individual seat work scored 7 percentage points more than those in lessons dominated by recitation. Study findings suggest that individual seat work in Math yields relatively better results than the other instructional styles. This may be explained by the 'opportunity to practice' by completing Math tasks independently. In our observations although recitation enhances teacher-pupil interaction, the quality of interaction was poor as the initiation, response and follow-ups were routine, factual and dominated by cued elicitation.

4.8   Use of Non-basic Teaching Materials

Non-basic teaching and learning materials include items such as charts, visual aids and manipulables. These items may be made by the teacher and/or the pupils and displayed on the classroom walls. In other instances they are stored in the book corner and/or school library for those schools with a library. The study by Ngware et al. (2010) found that non-basic teaching materials partly explained the performance in high performing primary schools. In this study, 49% of government schools and about 35% of formal private schools had non-basic teaching materials. In low-cost schools, about a quarter of the lessons had these materials *(Table 4.12)*. Generally, the proportion of lessons with non-basic teaching materials was low in all school types. The very low proportion of lessons in low-cost schools with non-basic teaching materials may be explained by both inadequate resources and lack of teacher training that would have built their capacity on the development and use of non-basic materials – about 59% of teachers interviewed in the low-cost schools were untrained.

Teachers who utilized non-basic teaching materials such as visual teaching aids scored 10 percentage points higher in the teacher Math test than those teachers who did not. In government and formal private schools, use of non-basic teaching materials was associated with higher student mean scores. Development and use of non-basic teaching materials are part of the skills taught in teacher development programs. A considerable proportion of teachers in low-cost schools have not gone through training and may therefore lack the skills to develop and use non-basic teaching materials, which may partially explain the low use of these materials in low-cost schools.

Table 4.12: Proportion of Lessons with Non-basic Teaching Materials

Town	Government		Formal Private		Low-cost	
	Number of Lessons	% with NBTLM	Number of Lessons	% with NBTLM	Number of Lessons	% with NBTLM
Mombasa	22	45.4	67	26.9	-	-
Nairobi	12	41.7	11	54.6	67	25.4
Nyeri	12	58.3	4	75.0	-	-
Nakuru	64	53.1	18	27.8	-	-
Eldoret	6	66.7	48	41.7	-	-
Kisumu	37	40.5	14	28.6	-	-
Overall	153	49	162	34.6	-	-

Notes: Non-basic materials include visual aids, visual teaching aids, pupil-made materials, and teacher-made materials.

4.9   Summary

- In urban informal settlement primary schools, formal private schools have a balance of relatively young male and female teachers, while low-cost schools are dominated by male teachers. Public schools are dominated by a female teaching force which is relatively older. Majority (80%) of teachers who teach lower grades are females.
- In government schools, pupils in grade 6 taught by a male teacher scored 4 percentage points higher than those taught by a female teacher. The difference in mean scores for grade 3 students was marginally significant but classes taught by male teachers scored 14 percentage points less. Perhaps an indication that male teachers in public schools may not be well prepared to teach early grades.
- Classes taught literacy by female teachers scored 8 percentage points more than those taught by male teachers. Grade 3 literacy classes taught by female teachers scored 5 percentage points. In the other school types (government and formal private), there was no statistically significant difference in literacy mean scores by teacher's gender.

- On the association between teacher training and student achievement, we found that grade 6 students in formal private schools score 6 percentage points more when taught Math by a certificate (P1 or P2) trained teacher compared to those who are taught by an untrained teacher; while in literacy they score 7 percentage points more if the teacher has certificate level training. If the students were taught literacy by a teacher with degree level training, they scored 16 percentage points more than when taught by an untrained teacher. These significant effects could be explained by the improved teacher pedagogical knowledge skills acquired through teacher training.

- Overall, almost two-thirds of teachers in formal private and low-cost schools have taught for less than 5 years; while in public schools 45% of the teachers interviewed had taught in primary school for at least 20 years. This implies high teacher turn-over in non-government schools and an ageing teaching force in State schools.

- Study findings suggests that in situations where there are opportunities for continuous improvement and where teacher supervision and support occurs, more years of teaching add value to students' performance.

- Overall, teachers in all types of schools scored almost the same in the three Math knowledge domains assessed – content knowledge, pedagogical knowledge and pedagogical content knowledge.

- Overall, grade 6 Math teachers outperformed their counter parts in grade 3 though the contents of the test were not grade-specific. Our teacher knowledge findings did not confirm the perception among parents that teachers in non-government schools are of 'better quality' – perhaps another measure of teacher quality is needed to qualify this perception. The slightly lower mean score among teachers in low-cost schools is explained by the higher proportion of untrained teachers in this school category.

- Our results also show that pedagogical content knowledge is positively associated with pre-service training. This is because teacher trainees cover the primary school subject syllabus as part of their training program.

- The descriptive results show that none of the Math teacher knowledge domains had a statistically significant association with teacher's level of academic education – perhaps an indication that researchers need to measure the quality of teachers embedded in academic qualification in a different way, for instance, the grade or Math score achieved in their highest academic qualification level.

- From the results of all schools and grades combined, male teachers did better than female teachers in Math; younger teachers had higher scores; higher levels of training was associated with higher teacher scores; and, more years of teaching was associated with lower scores.

- Across all the study sites and school types, more than half of the Math lessons in grade 3 and 6 utilized individual seatwork as the dominant activity. This was characterized by: teacher walks in to the class, introduces the lessons, provides 1 to 2 examples on the chalk board, asks individual pupils to solve another 1 to 2 examples on the

chalkboard as the rest of the pupils watch, asks pupils to solve some tasks/problems individually in their notebooks, then s/he walks around the classroom checking and/ or correcting student's work.

- Teachers who utilized individual seat work scored the least while those whose lessons were highly teacher-centered score the most. From this observation, we can argue that teachers who use individual seat work have low Math knowledge and during instruction they minimize verbal interactions with their pupils as their knowledge of Math is limited. However their pupils have more time during the lesson to do more Math practice; in the case of the teacher who mostly uses teacher-centered approach, they seem to have more knowledge than their pupils (which is a good thing) but end up passing most of it to the pupils thus reducing the pupils to passive participants.

5.0 Parental Experiences with FPE

This chapter highlights parental experiences with the Free Primary Education (FPE) in Kenya. Its purpose is twofold: to examine the perceptions of parents towards FPE; and to explore why parents choose to send their children to private schools when education is free in the public schools. Perceptions of parents were sought at the household level using a Parental Guardian Perception (PGP) tool. In addition, parental perceptions were sought through focus group discussions (FGDs) which targeted parents of children who attended either private or public schools in both grades 3 and 6. Therefore, this chapter presents data from the quantitative survey and from the FGDs and is organized as follows: First, survey responses of parents on their perceptions on quality of education are discussed. Secondly, the household perceptions on quality of education by school type are discussed. Thirdly, the chapter highlights why individual households send their children to particular schools and lastly, qualitative explanations for sending children to particular schools.

5.1   Perceptions on Quality of Learning in Schools

With the successful implementation of Free Primary Education (FPE) introduced in Kenya in 2003, about 1 million children gained access into school (Government of Kenya, 2005). This growth in enrollment brought to the fore the on-going debate on the quality of education. Recently, scholars have identified that some of the concerns that arose regarding FPE included having very large classes, some as high as 100 pupils due to the upsurge in enrollment (Ngware, Oketch & Ezeh, 2011). FPE reignited the quality debate in the FPE era. In the past, quality of education has been defined and assessed in terms of inputs, outputs and process. Inputs include textbooks, desks, blackboards as well as teachers and students. According to Sifuna (2007), education experts measure the quality of education through characteristics such as teacher qualifications and relevance of textbooks used in class. Outputs include achievement measured by promotion to the next grade, completion rates and measures of actual achievement like quantity of facts and skills learned. Moreover, process measurements of quality include the proper organization of lessons; use of texts correctly; and homework, use and encouragement of child-centered learning and time on task (Heneveld, 1994; Abagi & Odipo, 1997).

In the household survey, parents from six sites were asked to state their perceptions related to the quality of education their children were receiving. The statements about their perceptions were related to: the quality of learning by pupils in government schools; the performance of teachers in government schools; the state of buildings (structures) in government schools; and the number of textbooks in government schools. *Table 5.1* shows proportion of respondents who think quality of learning in government schools has

improved since 2003. Only 25% of respondents perceive education provided in government schools to be of good quality, while 75% of the respondents perceive education provided in government schools to be of poor quality. In addition, 23% of respondents perceive that the quality of education has improved based on teachers' performance. The rest, 77%, perceive that the quality of education has not improved based on teachers' performance On average the perceptions of quality of learning and teachers' performance is almost similar across all the sites.

From the parents' narratives, it is evident that they equated the quality of education to the teachers' classroom performance, which includes "good" teachers and teachers being able to teach well. This is similar to what scholars have found in various studies that relate to teaching and quality of education. For instance, scholars have advocated for the balance between access to education and meaningful learning (Alexander, 2007; Ngware et al., 2010). These scholars see the mechanism to meaningful learning experience as teachers' classroom performance. In addition, other scholars have attributed the effect of teachers on students to the following attributes: the environment created by the respective teachers in the classroom; the responsiveness and teacher warmth towards the students; and the instruction type and amount (Morrison, Bachman, & Connor, 2005). Therefore, parents across the sites equate the quality of education to teacher performance; it is highly probable that they may be speaking of the nature of classroom interaction with the students.

Perceptions of parents on input measures of quality, such as buildings and number of textbooks, show differences across the six sites. For example, the proportions of parents who think the quality of education in government schools has improved based on the type of building in the schools is lowest in Nakuru and highest in Kisumu with proportions of 28% and 84% respectively. Moreover, the proportions of parents who think the quality of education in government schools has improved based on the number of textbooks in the respective sites is lowest in Nakuru, and highest in Mombasa with proportions of 36% and 72% respectively. The observations across sites suggest that generally, the parental perceptions of quality are related to the inputs - textbooks and the type of infrastructure that is in a school *(see Table 5.1).*

Table 5.1: Proportion of Respondents who Think Quality of Learning in Government Schools has Improved Since 2003

Town	Quality of Learning		Teachers' Performance		Buildings		No. of Textbooks	
	n	%	n	%	n	%	n	%
Mombasa	129	24.7	129	24.7	383	73.2	379	72.5
Nairobi	447	20.0	446	20.0	1,435	64.0	1,385	62
Nyeri	134	37.1	119	33.0	195	54.0	185	51.3
Nakuru	51	12.0	45	10.6	121	28.4	155	36
Eldoret	210	19.0	205	18.5	726	65.6	665	60.1
Kisumu	383	38.5	369	37.1	834	83.8	565	56.8
Total	1354	24.0	1313	23.3	3694	65.4	3334	59.1

5.2 Household Perceptions on Quality of Education by School Type

Number of Household Linking with School Data

The results presented in this section are based on households' data that were merged with school data. Schools are categorized as public, formal private and low-cost based on self-reporting by the head teacher. *Table 5.2* represents the number of households that sent their children to either government, formal private and low-cost schools. In Nairobi the number of households sending their children to public schools was 555, compared to 178 households sending their children to formal private schools, and 516 households sending their children to low-cost schools.

Table 5.2: Number of Household Linking with School Data

Town	Government	Formal Private	Low-cost	Total
Nairobi	555	178	516	1,249
Mombasa	162	121	-	283
Nyeri	253	2	-	255
Nakuru	309	4	-	313
Eldoret	308	306	-	614
Kisumu	674	25	-	699
Total	2261	636	516	3413

Disaggregating results by government, private formal and low-cost schools show interesting results mainly for Nairobi. Only Nairobi has a clear distinction of respondents identifying the indicators of quality across the three categories of schools. This is because the other sites had very few or no low-cost schools. *Table 5.3* presents the percentages of respondents who perceive that the quality of education has improved since 2003, by the indicator,

quality of learning and the performance of teachers. Overall, the proportion of parents with children in the public schools who think that the quality of learning has improved is 34% compared to 14% of parents with children in the formal private schools, and 12% of parents with children in low-cost schools. Overall, there are no major differences between the parental perception and quality of learning in government schools in the original sample and in this subsample that links the household and the school data. In Nairobi, 33% of parents who sent their children to public schools thought that the quality of learning had improved in the government schools since 2003. On the other hand, 15% and 12% of parents whose children attended formal private and low-cost thought that the quality of learning had improved in government schools respectively.

Table 5.3: Why Households Send Children to Particular Schools

Town	Quality of Learning			Performance by Teachers		
	Government	Formal private	Low-cost	Government	Formal private	Low-cost
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Nairobi	183 (33.0)	26 (14.6)	62 (12.0)	167 (30.1)	32 (18.0)	69 (13.4)
Mombasa	66 (40.7)	19 (15.7)	-	69 (42.6)	14 (11.6)	-
Nyeri	96 (37.9)	1 (50)	-	83 (32.8)	1 (50)	-
Nakuru	36 (11.7)	0 (0)	-	32 (10.4)	1 (25)	-
Eldoret	96 (31.2)	38 (12.4)	-	94 (30.)	37 (12.1)	-
Kisumu	285 (42.3)	5 (20)	-	267 (39.6)	5 (20)	-
Total	**762 (33.7)**	**89 (14.0)**	**-**	**712 (31.5)**	**90 (14.2)**	**-**

Using the performance of teachers as an indicator of quality, parents whose children attend public schools generally perceived that public schools provided better quality education than the private schools. For the parents whose children attended private schools, 14% of parents with children in the formal private schools were of the opinion that the learning in government schools had improved as a result of the teachers, compared to 13% of parents whose children attended low-cost private schools. In Nairobi, 30%, 18% and 13% of parents whose children attended public, formal private and low-cost private schools respectively thought that the quality of learning had improved in the government schools because of the teachers' performance.

Table 5.4: Proportion of Respondents who Think Quality of Learning in Government Schools has Improved since 2003

Town	State of buildings			Text books		
	Government	Formal	Low-cost	Government	Formal	Low-cost
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Nairobi	393 (70.8)	127 (71.4)	315 (61.1)	371 (66.9)	106 (59.6)	315 (61.1)
Mombasa	126 (77.8)	86 (71.1)	-	127 (78.4)	81 (66.94)	-
Nyeri	146 (57.71)	1 (50)	-	126 (49.8)	1 (50)	-
Nakuru	80 (25.89)	2 (50)	-	110 (35.6)	2 (50)	-
Eldoret	231 (75)	181 (59.2	-	205 (66.6)	179 (58.5)	-
Kisumu	571 (84.7)	19 (76)	-	383 (56.8)	17 (68)	-
Total	**1547 (68.4)**	**416 (65.4)**	**-**	**1322 (58.5)**	**386 (60.7)**	**-**

Using the state of buildings in a school as a measure of quality, higher proportions of parents whose children attended formal private schools were of the opinion that the quality of learning had improved. 65% of parents whose children attend formal private schools thought that the quality of education had improved, compared to 61% of parents whose children attend low-cost schools (see Table 5.4). In Nairobi, 71% and 61% of parents whose children attended public or formal private schools and low-cost schools respectively thought that the quality of learning had improved in the government schools because of the state of buildings. Research in the context of the USA has shown that there is an association between school facilities and children achievement (Schneider, 2002a). Scholars who engaged in these studies have a consensus that new and improved buildings contribute to improved test scores on standardized tests (Earthman & Lemasters, 1998; Schneider, 2002a; Schneider, 2002b).

Generally, there was no big discrepancy between the perceptions of parents with children in different school types regarding the adequacy of textbooks. A considerable proportion of parents whose children attend government schools (59%), formal private (61%) and low-cost (61%) thought that books were adequate in the government schools. Parents whose children attend government, formal private and low-cost schools seem to perceive that textbooks are adequately provided in the government schools and it is a measure of quality. In Nairobi, 67%, 60% and 61% of parents whose children attended government, formal private and low-cost schools respectively thought that the quality of learning had improved in the government schools due to the provision of textbooks *(see Table 5.4).*

5.3   Why Households Send Children to Particular Schools

Table 5.5 below shows the reasons why parents send their children to a particular school disaggregated by public, private formal and low-cost. Even after disaggregating by private school type, the main reasons for parents sending their children to a particular school type included cost of schooling as reflected in responses such as "school is cheaper", "provides free primary education" or "got bursary/scholarship"; perceived high quality of learning in a school as reflected in responses such as "teachers/school perform better"; and distance to school and child safety concerns as captured in responses such as "school is near" or "easily accessible" or "safe to travel to school". When the results are disaggregated by private formal and low-cost schools, 7%, 56%, and 18% proportion of parents from formal private schools take their children to these schools because of cost of schooling, perceived quality of learning, and, distance to school and child safety respectively. For the low-cost schools, 17%, 53%, and 21% proportion of parents take their children to these schools because of cost of schooling, perceived high quality of learning, and, distance to school and child safety concerns respectively.

Table 5.5: Reasons for Sending a Child to a Particular Type of School

Reason	Government		Formal Private		Low-cost	
	n	%	n	%	n	%
School cheaper, provides free primary education, got bursary/ scholarship	3350	69.0	82	6.9	152	16.6
Teachers/school perform better	728	15.0	669	56.3	490	53.4
There is discipline	35	0.7	20	1.7	12	1.3
Less crowded	8	0.2	84	7.1	18	2.0
School buildings/facilities are of good quality	10	0.2	4	0.3	3	0.3
There is security in the school	5	0.1	0	-	4	0.4
School is near or easily accessible, safe to travel to school	458	9.4	219	18.4	198	21.5
School did not have level/grade child for which child was due	22	0.5	1	0.1	6	0.7
Physically or mentally disabled and preferred the appropriate	15	0.3	1	0.1	0	-
Expelled from previous school	2	-	1	0.1	0	-
Friends/neighborhood/peer influence	55	1.1	12	1.0	5	0.5
Relocation of family	17	0.4	2	0.2	1	0.1
Not given/stated	38	0.8	13	1.1	4	0.4
Other	115	2.4	81	6.8	25	2.7

Table 5.6 shows the distribution of the proportion of parents who send their children to either public or private schools by different sites because the school is cheaper or low-cost. Disaggregating the results by public, formal private and low-cost schools we can meaningfully interpret the results for Nairobi only. In Nairobi a higher proportion of parents (83%) still send their children to public schools because of low-costs. For non-government schools, 4% and 13% of parents sent their children to formal private and low-cost respectively because of cost *(see Table 5.6)*. We can deduce that a section of the low-cost schools are cost effective for parents for their children to be able to attend.

Table 5.6: Proportion of Households who sent a Child to a Particular School Type Due to Cost Related Reasons

Town	Government		Formal Private		Low-cost	
	n	%	n	%	n	%
Nairobi	945	83.1	40	3.5	152	13.4
Mombasa	288	98.0	6	2.0	-	-
Nyeri	277	100.0	1	0.4	-	-
Nakuru	268	100.0	0	-	-	-
Eldoret	702	96.0	30	4.1	-	-
Kisumu	**867**	**99.4**	**5**	**0.6**	**-**	**-**

Table 5.7 shows that a higher proportion of parents in Nairobi send their children to low-cost schools because they perceive that high quality of learning in a school as reflected in responses such as "teachers/school performs better". For non-government schools in Nairobi, 22% and 59% of parents sent their children to formal private and low-cost respectively because of the perceived high quality of learning.

Table 5.7: Proportion of Households who sent a Child to a Particular School Type due to School-quality Related Reasons

Town	Government		Formal private		Low-cost	
	n	%	n	%	n	%
Nairobi	160	19.3	179	21.6	490	59.1
Mombasa	34	22.1	120	77.9	-	-
Nyeri	92	96.8	3	3.2	-	-
Nakuru	155	95.1	8	4.9	-	-
Eldoret	46	12.4	325	87.6	-	-
Kisumu	241	87.6	34	12.4	-	-

Table 5.8 shows that a higher proportion of parents in Nairobi send their children to formal private schools because of distance to school and child safety concerns as captured in responses such as "school is near" or "easily accessible" or "safe to travel to school". For non-government schools, 31% and 10% of parents sent their children to formal private and low-cost private schools respectively because of safety concerns for the children. These results show that in Nairobi, parents prefer the formal private schools when it comes to their children's safety.

Table 5.8: Proportion of Households who sent a Child to a Particular School Type due to Accessibility and Safety Considerations

Town	Government		Formal private		Low-cost	
	n	%	n	%	n	%
Nairobi	112	58.9	59	31.1	19	10.0
Mombasa	24	58.5	17	41.5	-	-
Nyeri	29	100.0	0	-	-	-
Nakuru	62	100.0	0	-	-	-
Eldoret	43	24.2	135	75.8	-	-
Kisumu	188	95.9	8	4.1	-	-

5.4 Qualitative Explanations for Sending Children to Particular Schools

Focus group discussions (FGDs) were conducted with parents and teachers. Parents whose children attended public or private schools were invited to attend the FGDs. Twenty one FGDs were conducted with 141[1] parents and 78 teachers. *Table 5.9* below shows the distribution of parents who participated in the focus group discussions per site. The highest proportion of parents who participated was from Nairobi[2], while the least proportion of participants was from Eldoret[3].

Table 5.9: Number of FGD participants

Town	n=130	
	n	%
Nairobi	55	42.3
Mombasa	16	12.3
Nyeri	17	13.1
Nakuru	19	14.6
Kisumu	16	12.3
Eldoret	7	5.4

[1] 141 parents in total participated in the FGD, however, the generation of the tables is based on 130 because eleven FGD participants from Eldoret have missing background information. [2] Nairobi had two sites, namely Korogocho and Viwandani. [3] In Eldoret the details of parents in the private schools are missing, for this reason the eleven parents cannot be included in the total (n=130).

Age and Sex

Table 5.10 shows the distribution of parents who participated in the FGDs by age. The table shows that a majority of these participants were aged between 26 and 35 years, followed by parents who were aged between 36 and 45 years. Most of the parents who participated in the FGDs were those in the reproductive age. Across the age groups, Nairobi had higher proportions except for the age group 16-25 years

Table 5.10: Distribution of FGD Participants by Age (years)

Age	Town					
	Nairobi	Mombasa	Nyeri	Nakuru	Kisumu	Eldoret
16-25	2(3.6)	4(25.0)	1(5.9)	2(10.5)	1(6.3)	0(0.0)
26-35	28(50.9)	6(37.5)	7(41.2)	6(31.6)	7(43.8)	2(28.6)
36-45	17(30.9)	4(25.0)	7(41.2)	10(52.6)	6(37.5)	3(42.9)
46-55	6(10.9)	1(6.3)	1(5.9)	1(5.3)	2(12.5)	2(28.6)
Above 55 years	2(3.6)	1(6.3)	1(5.9)	0(0.0)	0(0.0)	0(0.0)

For instance, Nairobi had the highest turnout of parents aged 26-35 years, with approximately 51% of parents participating. Therefore, in Nairobi, a higher proportion of parents were youthful. In Nakuru, parents aged 36-45 years had the largest turn out with 53%. Unlike the case in Nairobi, Nakuru had higher proportions of middle-aged parents who turned up for the FGD. Overall, there were more female parents attending the FGDs with a proportion of 55% compared to males with a proportion of 45% *(see Table 5.11). Table 5.11* also shows that there were higher proportions of female parents attending the FGDs in Nairobi, Mombasa and Nyeri, with 55%, 94% and 65% respectively. In Nakuru and Eldoret, a higher proportion of males participated in the FGDs with 58% and 100% respectively.

Table 5.11: Proportion of FGD Participants by Site and Gender

Town	Gender			
	Male	%	Female	%
Nairobi	25	45.5	30	54.6
Mombasa	1	6.3	15	93.8
Nyeri	6	35.3	11	64.7
Nakuru	11	57.9	8	42.1
Kisumu	8	50.0	8	50.0
Eldoret	7	100.0	0	0
Total	**58**	**44.7**	**72**	**55.4**

School Type and Community

Focus group discussion participants also stated the respective schools that their children attended. *Table 5.12* shows that a higher proportion of participants stated that their children attend public schools. However, an equally bigger proportion of parents stated that their children attend private schools. Few parents stated that their children attended both public and private schools[4].

Table 5.12: Type of School the Respondents' Children Attend by Site

Town	Type of School					
	Government	%	Non-government	%	Both gov't & non-gov't	%
Nairobi	28	51.9	19	35.2	7	13.0
Mombasa	9	56.3	7	43.8	0	0.0
Nyeri	10	58.8	5	29.4	2	11.8
Nakuru	7	36.8	10	52.6	2	10.5
Kisumu	8	50.0	4	25.0	3	18.6
Eldoret	6	85.7	0	0.0	1	14.3

In particular, Nairobi, Mombasa, Nyeri and Kisumu had a higher proportion of parents stating that their children attend public schools with 52%, 56%, 59% and 50% respectively. However, it should be noted that the FGD participants are representative of the parents of the selected school.

Education Level of Participants

Table 5.13 shows that across sites there were a relatively comparable number of participants with primary and secondary level education. Looking at specific sites, Nairobi had a higher proportion (55%) of participants with secondary education compared to 40% for the participants with primary education. Similarly in Nakuru (42%) and Kisumu (63%) there were higher proportionsof participants with secondary education. However, in Mombasa (75%) and Nyeri (53%) there were higher proportions of participants with primary education.

[4]For the FGD participants the type of school attended was not disaggregated in the participant description forms. Therefore, we cannot show the type of school by private formal and low-cost.

Table 5.13: Level of Education of FGD Participants

Education Level	Town					
	Nairobi	Mombasa	Nyeri	Nakuru	Kisumu	Eldoret
Primary	22(40.00)	12(75.00)	9(52.94)	5(26.32)	4(25.00)	4(57.14)
Secondary	30(54.55)	1(6.25)	6(35.29)	8(42.11)	10(62.50)	1(14.29)
Above secondary	3(5.45)	0(0.00)	2(11.76)	6(31.58)	2(12.50)	2(28.57)
Other	0(0.00)	3(18.75)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

From the survey responses, parents sent their children to the particular schools for three main reasons: **(i)** school is cheaper or low-cost; **(ii)** quality of learning; and **(iii)** distance to school and safety concerns. In this subsection, we highlight the responses of a select group of parents who participated in the focus group discussions (FGDs).

The parents in the FGDs were selected to represent both public and private schools in the respective sites that data was collected. One of the reasons why parents send their children to a particular school is the cost of schooling. The qualitative data from the FGD suggests that parents recognized there is free primary education in the public schools. However, the provision of the free education did not necessarily result in the education of their children being cheaper in the public schools. A female respondent in an FGD from a public school observed:

> *R5: I brought him here thinking that education here is free. He is class one but I pay Ksh.200 per month and yet I used to pay Ksh.150 per month in a private school and he used to be there up to 4 p.m. Here we pay Ksh.200 per month and we are told that goes towards tuition but that tuition is not there because they don't learn, and yet in the private school he used to leave at 4 p.m. What I don't have is the money because I thought here it was free.*

> *(Female Parent, Public School, Nairobi, 25022012)*

Seemingly, the education in the public schools was considered free and some parents took the initiative to send their children to public schools; in actual sense these parents found that the education in public schools was not totally free. For instance, a survey shows that on average, public schools charge Ksh.1,720 and Ksh.1,860 per annum for a pupil in grade 3 and 6 respectively. Therefore, the illusion that parents had that public education is free seems far from real. Indeed, some of the parents thought that education in the public schools may be more expensive than in private schools. Take for instance, the reason,

…he is class one but I pay Ksh.200 per month and yet I used to pay Ksh.150 per month in a private school and he used to be there up to 4 p.m."

The same sentiment was echoed by yet another respondent in an FGD in Nairobi, who saw very little difference in terms of the money paid for tuition in the public and private schools. She intimates that at close scrutiny there is basically no difference between the two sets of the schools in terms of the monies paid for their children's education. She explained:

Another thing is that when I do my Mathematics well, that money I pay for tuition in the public school and it is free education, is the same as when you take a child to a private school. For example my two children, I have one in a public school and another one in private school and when I add up my Math, I am spending almost the same amount of money on both children.

(Female Parent, Public School, Nairobi, 25022012)

In Nairobi, the parents painted a picture that shows that despite free education, parents still pay levies/monies to the schools for their children to learn. Therefore, the government declaration and subsequent provision of free education has not eliminated parents' struggles to ensure that their children attend school. The narratives of these parents show that levies are still being charged in school, similar to what Abuya et al. (2012) found in the dropout study in the context of the slums in Nairobi. For private schools, this is embedded in the element of the schools being "private" but for the public schools the levies are additional charges beyond what the government provides as capitation. Similar to what other authors have found, free education has not entirely solved the problems of schooling for the poor (Oketch, Mutisya, Ngware & Ezeh, 2010).

A higher proportion of respondents indicated that they send their children to private school because of better school and teacher performance. This was evident in three sites of Nairobi, Mombasa and Eldoret – the larger slums in our sample sites. The qualitative data confirms to a certain extent the survey findings in regard to the reasons why parents send their children to private schools. FGD data from parents whose children attended private schools suggest that parents sent their children to private schools because of good performance and the quality of learning in these schools was better. For instance, in both numeracy and literacy the pupil mean scores are higher in the private formal schools compared to the public schools. In Grade 3 literacy and numeracy the average pupil scores 72% and 57% compared to 64% and 46% for the private formal schools and public schools respectively. In addition, in Grade 6 literacy and numeracy the average pupil scores 61% and 52% compared to 44% and 43% for the private formal schools and public schools respectively.

Moreover, the teachers in the private schools were better teachers. This is seen in the teachers' scores for private formal—teachers scored an average of 52%, compared to the public school teachers who had a score of 50%. In Eldoret, female respondents from a female dominant FGD representing a private school had this to say:

> R9: Performance in private schools is very good… R1: I was saying that you may find that in private schools students are few and so the teacher is able to understand clearly the child's weaknesses. But in public, pupils are so many in the classes such that some could be playing at the back but the teacher can't see… R10: Reluctance of the teachers in public schools and poor performance in schools leads to poor learning

(Female Parent, Female FGD, Private School, Eldoret)

In the context of Nakuru, while reaffirming the quality of education is better in the private schools, parents in an FGD were convinced that the only sure way to a better education for their children was through the attending private schools. The parents' perception was that good education was being delivered through the private schools. In this regard, one of the male respondents in an FGD in Nakuru said:

> …I have realized that the only way you can get your child a better education is through private school.

(Male Respondent, Male FGD, Private School, Nakuru, 19022012)

To show that the quality of education was good in the private school, an outcome of the school and teachers' performance, parents in an FGD discussed the differences that exist in the competencies in the Math between a child in a higher grade 8 in the public school and lower grade (5) in a private school. Parents were of the opinion that a child in a private school in a lower grade would be more competent in Math than a child in the higher grade in a public school. A respondent in a male FGD explained the following:

> R3: You may find a child is in class eight in public, and one in private but in class five. When you compare them on how they do Math, the one in class eight in public can't do Math that the one in class five in private can do. So, you feel it is better for him to school in a private school.

(Male Respondent, Male FGD, Private School, Nakuru, 19022012)

For some of the parents, their choice of the school was due to their inherent perception that private schools were better than public schools. For them, they started with their children in private schools, and they will continue to send their children to private schools

because of this belief. This belief is also engrained in the children such that even at the end of grade 8, such children do not want to learn in public schools. A parent in an FGD in one of Nairobi's private schools explained:

> *R14: To add on that, I started here with my first two children from nursery school and completed their standard eight. For example the one who did his class eight I took him to continue his education through public school and he refused… I told them it might be better upcountry than here but they refused public school and I had to bring them back here to a private school. Three others are still here in the private school and therefore I can say that private school is much better than public school. When the children look at the public schools within, they insist that they would prefer to go to a private school. And they are able to read…*

> *(Female Respondent, Female FGD, Private, Nairobi, 26022012)*

Similarly in Mombasa parents took their children to school because of the perception that in private schools, children generally perform well, and teachers are more concerned about the pupils' performance. On the contrary, the experiences of parents with public schools is that teachers are not concerned about how the children perform, whether the children have completed their homework, and whether the child has come to school or not. For this reason, parents perceived government schools and by extension public education to be problematic. A respondent from one of the FGD in Mombasa had this to say:

> *R6: When I took him to government school, he started dropping academically and when I went to collect the report form, he was number 24. And when you go to the school, some pupils are seated on desks while others are seated on the floor. ..And the teacher does not want to know whether the child has done his work or not, whether he has marked their book… whether the child has come to school or not; he doesn't want to know. You see? I felt there was a problem…I transferred him from there and took him to another school in town…*

> *(Female Respondent, Female FGD, Private, Mombasa, 25022012)*

The survey responses indicated that parents chose a particular school for their child if the school was near or easily accessible and safe to travel to. For instance, higher proportions of parents in the private schools in Mombasa (78%), Nairobi (57%), and Eldoret (83%) subscribed to this reason in their survey responses. The qualitative data suggests that some of the parents' choice of school because of this particular reason was dictated by the age of the child. In this case, the child may have been attending an early childhood education center. Due to their young age, such children were taken to schools nearer home. A male parent in a male FGD said, R2: Now the first thing that made me bring him here was that the school is near home… at his age this was good for me… (Male Respondent, Male

FGD, Private School, Nairobi, 23022012). Parents attending an FGD from Eldoret shared similar sentiments that at a relatively younger age it is prudent for a parent to take a child to a school that is relatively closer home, where the teacher can be in a position to monitor the child on his way home.

> *R3:...at a young age a child may just have to go to a school near home…So you are forced to take him even if it is to a small kiosk where it seems like there is an academy…and learning can go on [group giggles] where he can show his teacher where home is and the teacher can look after him, and make sure he goes home.*
>
> *(Male Respondent, Male FGD, Public, Eldoret)*

However, some of the parents representing public schools added their voice to this debate. They felt that the reason why some of the parents choose to take their children to the private schools is the presence of the ECD sections in such schools. They were of the opinion that public schools do not have ECD centers where the younger children can begin to acclimatize to school. This is what one of the Male Respondents in Eldoret had to say:

> *R3: Just to add on what he has said, it is also because of the weak government policy on the ECD. The government has never emphasized much on early childhood education in public schools…*
>
> *(Male Respondent, Race Course, Public School, Eldoret)*

This statement from the parents suggests that their choice of private schools may be driven by the unavailability of a complete learning cycle in the public schools from the early childhood education to grade 8. Whereas there is the existence of the ECD policy framework in Kenya, the data from Eldoret sheds some light on particular areas where the MoE should put some emphasis as relates to ECD.

Congestion was also cited by parents as being important in influencing their choice of a school for their children. In the survey responses, about 4% of parents with children in the private schools mentioned overcrowding as a consideration for choosing a particular school. Even though congestion and/or overcrowding ranked a distant fourth among reasons for parental school choice, the focus group discussions exhibited a rich diversity of opinions among the parents in regard to congestion in schools as a reason for school choice.

For instance, parents representing private schools with children in private schools explained the challenges that a large class size has on the quality of education the children get, especially when the ability of the teacher to be effective is compromised. These par-

ents felt that it is not that teachers in public school do not teach, rather it is that their capabilities are stretched to the limit due to the large class sizes and high pupil teacher ratio. A parent participating in an FGD in Nakuru explained:

> R8: Since the introduction of free primary education, I think there was an upsurge of enrollment in primary schools and I think it increased the ratio of students to teachers in a class. So, to get a teacher to attend to around 80 students in a class becomes very difficult. So, however much they try, of course sometimes as a human being there is a... there is that point of saturation, and so, I think the quality of education sometimes is uh... however I won't say that in public schools there is no quality of education; there is. My argument is that their teacher and pupil ratio is big...
>
> (Male Respondent, Male FGD, Private School, Nakuru, 19022012)

To lend credence to the insights of parents in Nakuru, parents attending an FGD in one of the sites in Nairobi felt that private schools tend to have fewer pupils in a given class. Our supposition is that in the private schools quality instruction would be an outcome of few numbers of children in class that increases the classroom interaction between teachers and students. A parent in an FGD in Nairobi categorically stated:

> R1: In my own opinion, you may find in private schools that a teacher has about 20 pupils in one class...this may make things better in private schools...
>
> (Male Respondent, Male FGD, Private, Nairobi, 23022012)

The concern with large class size was echoed by parents who participated in an FGD representing the public schools. These were parents who had their children attending public schools. They too were of the perception that large class sizes were a deterrent to teachers' effective classroom management and effective teaching. A parent whose child attends a public school while representing his views on public schools explained:

> R3: Sometimes you find that in one class in these public schools, there are so many pupils. So many, for example 60 or even 70. Now, the teacher has a hard time. This is unlike when we used to go to school. Nowadays they are so many. Even if there used to be children, they were not as many as there are nowadays. There are 3 or 4 classes; there is 4a, 4b and 4c. It is not that the teachers do not teach; they do teach but they tire a lot.
>
> (Male Respondent, Male FGD, Public, Nairobi, 04022012)

The narratives of parents are confirmed by the survey results that relate to pupil teacher ratio (PTR) in the public, private formal and private low-cost. For instance, the mean aver-

age number of pupils to a teacher is highest in public schools, at 41, compared to 15 pupils per teacher in the private formal schools and 21 pupils to a teacher in the low-cost private schools. Therefore the parental concerns echoed in the FGD that larger numbers of pupils in the public schools could be a deterrent to effective learning has grounding.

For parents representing public schools in Eldoret but who had some of their children attending private school, their opinion was that the two types of school complement each other. For instance, the private schools exist alongside public schools in order to give access to those children who are not able to be accommodated in the public schools. For them the private schools have become "like reducing agencies". Parents in a Male FGD had this to say:

> *Now with that population, if there were no academies that take children, [all respondents at the same time] there would be no space for children to learn in Langas. So these academies have become like reducing agencies...*
>
> *(Male Respondents, Male FGD, Public, Eldoret, 07032012)*

The statements by the parents reflect the dilemma of success to school in an FPE era. Most importantly, this reflects the supply constraints that face parents in respective slums where the number of public schools do not match the number of children aged 6-14 who should be in school. For example, APHRC data shows that in the context of Nairobi, Korogocho and Viwandani have 2 public schools each, while they have 4,292 and 3,600 pupils respectively. The demand for school outstrips the supply of public schools; hence the academies become very important in filling in the gaps in enrollment occasioned by the increased enrollment as a result of FPE.

5.5   Summary

With the introduction of FPE, the Ministry of Education (MoE) succeeded in ensuring that children were enrolled in primary schools across the country. This did not necessarily mean that children in the classrooms were getting quality education. With the steady enrollment of the children into the "private schools for the poor" (Tooley & Stanfield, 2008), it implied that the MoE will not achieve its objective of providing FPE to all children under the current policy framework. This chapter explored the questions: what drives parental school choice, whether private or public; and what is the parental perception of quality?

Key Findings

- Quality of education continues to be important in parental choice of schools that their children attend. On average the perceptions of quality of learning and teachers' performance was almost similar across all the sites. This may be an indication that quality of education is related to the teachers' classroom performance. We found that a higher proportion of respondents perceived the quality of learning and teachers' performance higher in private schools than government schools. This is confirmed by our quantitative findings with teachers in private schools scoring higher than those in public in the PK and PCK knowledge domains. Teachers in the private schools scored a mean of 46%, 1 percentage point higher than teachers in public schools in pedagogical knowledge domain. In pedagogical content knowledge, teachers in private schools are still better by 3 percentage points above their public school counterparts who are at 51%.
- Parents who sent their children to public schools had a positive perception of school quality in public schools. There was generally a negative perception on school quality among parents who sent their children to private schools.
- Generally across the urban towns parental perceptions of quality were related to the inputs into the education process. In this regard public schools had better quality buildings and more textbooks. Moreover, relatively higher proportions of respondents perceived that government schools showed improvement in terms of school building conditions and availability of textbooks, than of private schools.

Reasons for Sending Children to the Type of School

- Higher proportions with children in public schools took their children to these schools because of low-cost. This scenario is also depicted in Nairobi.
- There are three main considerations that parents make for the particular school choice irrespective of the school type: low-cost; quality of learning; and distance travelled to school and safety. This finding remains consistent across several studies.
- In particular, parents sent their children to private (formal and low-cost) because of quality of learning as compared to public schools.

- The tendency was that parents in the bigger slums (Nairobi, Mombasa, and Eldoret) preferred to send their children to private schools, while the smaller slums (Nyeri, Nakuru and Kisumu) preferred the public schools when it comes to issues of school quality.

- In the bigger slums parents preferred to send their children to private schools when considering the distance to schools and safety concerns. In this regard, Nairobi parents had a preference for formal private schools.

- The smaller slums parents preferred to send their children to public schools when considering the distance to schools and safety concerns.

- The focus group discussions with selected parents confirm that primary education is not yet fully free in public schools. In this regard, we can conclude that similar to what scholars have found (Oketch et al., 2010), levies that continue to be charged in schools pose a significant hindrance to schooling. In as much as a relatively higher proportion of parents within public schools take their children to school (68.95%) because these schools are cheaper and provide free primary education, levies that are charged by schools could be posing hindrances to parents in public schools.

- Focus groups with parents emphasized that their choice of schools was influenced by the absence of ECD centers in public schools where the younger children can begin to acclimatize to school.

6.0 Conclusions and Way Forward

In chapter 2 we examined whether the schooling pattern observed in 2010 in two informal settlements in Nairobi city where 60% of children attend non-government primary schools also prevail in informal settlements of other major towns. In addition, this chapter examined whether there is an association between household socio-economic characteristics and type of primary schools attended by children. The findings show that similar patterns of schooling are observed in Mombasa and Eldoret in which over 50% of children residing in informal settlements attended formal private schools, while over 85% of children in other study towns attend government schools. These different patterns of schooling across the informal settlements in different towns may be attributed to variations in availability and quality of government schools. This study shows that there are few government schools in the informal settlements in the three biggest towns (Nairobi, Mombasa and Eldoret), whereas there are more government schools in the study sites in Nyeri, Nakuru and Kisumu. This suggests that shortage of government school places could be one of the major reasons for higher proportion of children attending non-government schools in the former while the reverse is true in the latter. In addition to availability of government schools, observed variation in schooling patterns may also be attributable to differences in parents' perceptions on the quality of education in government schools in different informal settlements.

The results also indicate that household characteristics such as sex of household head, household size, household head's level of education and wealth index are significantly associated with type of school attended by children. Particularly household socio-economic status (wealth index, and head's education) are positively and significantly associated with attending non-government schools. This suggests that the better-off households are able to pay high school charges by non-government schools, especially by formal private schools. In addition, irrespective of household wealth status, parents having some secondary education are more likely to respond to perceived lower quality of education in government schools by enrolling their children in non-government schools than less educated parents. Assessment of Math and English performance revealed that, on average, students attending formal private schools scored higher in Math and English tests than their counterparts in government schools. For Nairobi city where low-cost schools exists, analysis of schooling pattern indicates no variation in household socio-economic status among those attending government and low-cost schools.

The results call for policy interventions in addressing inequality of access to quality primary education in urban informal settlements. Shortage of government primary schools in urban informal settlements denies the poor access to free primary education who instead

enroll their children in fee-charging formal private and low-cost primary schools. First, this implies that the government needs to expand availability of free public primary schools in underserved urban poor communities. Second, given the massive increase in enrollment in response to free primary education, resources have been constrained in many government schools. The result (Appendix 4a and 4b) shows that children from better socio-economic backgrounds are served by higher preforming formal private schools, while children from poorer households attend low performing government or low-cost schools. This implies that children with higher SES backgrounds access better quality education than children with lower SES backgrounds and intergenerational transfer of inequality. In addition to expanding access to free education for urban poor, it is also important to improve quality of education in government schools. The government needs to prioritize support and monitoring of low-cost schools to help them improve education quality.

In chapter 3, we dealt with grade 3 and 6 pupil achievement in both literacy and numeracy across the study sites as well as some background characteristics of the pupils. Studies on education and schooling outcomes in the urban context have demonstrated a growing utilization of low-cost non-government schools by the poor by-passing government schools (Oketch et al., 2010; Tooley & Stanfield, 2008). The main reason for utilization of these private schools for the poor as highlighted in the FGDs was the perception that these non-government schools were of better quality. Our assessments show that pupils in these low input schools perform almost as well as those in government schools and better in some instances. The low-cost schools are characterized by better input measures than government schools. That is, they have smaller class sizes and better textbook-pupil ratio. The formal private schools attract a considerable large number of pupils within the study sites, though they charged a fee that was on average twice that of the low-cost and three times that in government schools. The numeracy and literacy results for grade 3 and 6 consistently demonstrate that students in low-cost schools perform significantly higher than their counterparts in public schools. With the exception of grade 6 numeracy, the low-cost schools in Nairobi performed significantly better than the government schools. There was no statistically significant difference in performance between the formal private and low-cost schools. The performance varied by the study sites as well as grades. While grade 3 was marked by higher scores in both literacy and numeracy, grades 6 scores in numeracy were on average below the pass mark of 50%.

Pupil performance across the different skills and curriculum outcome areas demonstrated mastery in some skills while other skills were poorly performed. For instance, in grade 3, while knowledge related questions were highly performed across the school types and study site, scores of above 80%, listening comprehension and creative writing were poorly performed - with averages of 40% and below. Similarly, grade 6 pupils performed well in listening and writing comprehension, but poorly in comprehension and writing application

- with average scores of less 30% and below. This pattern was also replicated in the grade 6 numeracy tests where pupils performed well on the number concepts and operations and poorly on geometry and measurement curriculum outcome areas.

Further analysis to understand the factors associated with achievement in the study context was performed by fitting a random intercept multi-level model. The results for grade 6 show that the type of school is significantly associated with individual scores controlling for other school, teacher and pupil characteristics. Pupils in the formal and low-cost schools performed significantly better than those in public schools in both literacy and numeracy. Further, schools with a high proportion of pupils ranked in the 40% poorest quintile; their scores reduced statistically by 1.2% and 1% of a standard deviation for a 1% increment in the school poverty. Moreover, the mean scores in both literacy and numeracy are higher among pupils from households in the highest wealth index/quintile than those of pupils from the lowest wealth quintile across the study sites. Similarly, grades 3 pupils from private schools and schools with lower poverty levels performed better.

In chapter 4, we examine what is happening in the classroom. In Kenya, there are more than 250,000 primary school teachers in the government and non-government school system including teachers paid by government, private entities and communities. In the government schools, majority of the teachers are above 40 years of age and in urban government schools more than three-quarters of teachers are female. Math is a compulsory subject in the school system and therefore majority of these teachers teach Math among other subjects. Many qualified teachers do not teach the subject in which they have competency, and there are large numbers teaching Math who are not competent to do so. The reasons for this range from inadequate policy guidelines on teaching subject assignment to low Math performance in pre-training education.

Majority (over 98%) of teachers in urban primary schools have attained at least 4 years of secondary education though the proportions of those who are professionally trained vary by school type with government schools having only 5% of untrained teachers compared to low-cost schools with 59% of teachers being untrained. To implement the school curriculum, the society expects teachers to draw on both academic and professional knowledge in teaching their students. However, from our study, teachers on average scored just slightly over 50% of the total scores in a Math knowledge test that assessed their content knowledge, pedagogical knowledge and pedagogical content knowledge. For teachers to implement the curriculum effectively, they need more academic and professional knowledge than the one they exhibited in the assessment. An unacceptably high proportion (more than one-fifth) of teachers still use teacher-centered teaching methods. Most of these teachers are in low-cost schools. Even with those who use the more interactive approaches such as recitation, students are engaged in simple and repetitive recall-type

questions and cued responses that do not promote critical thinking. In learning Math, students who are given more opportunities to practice Math tasks do better and there was a positive association between student Math scores and teaching style with students exposed to individual seat work as the dominant classroom activity scoring significantly better.

Teacher characteristics varied by school type. Our research suggests that there was an effect of these unequal teacher characteristics in terms of the quality of education and student outcomes in urban schools in Kenya. In particular, teacher gender seems to be an important consideration when allocating teachers to grades and subjects. From this study, students taught literacy by female teachers performed better in literacy scores; while students in lower grades taught by female teachers also scored higher. It may be the case that female teachers are more caring to younger children and this creates an environment conducive to learning that makes the learners perform better. With all the inadequate training of teachers in low-cost schools, you would expect the worst outcomes for the students. The fact that the students' outcomes are similar or better in low-cost school says either that there is not such a strong correlation between teachers' training and students' outcome, or that teacher training may not be a good measure of the quality of a teacher.

Our analytical model also links student scores to teacher training and knowledge, which in turn affects the quality of teaching in the classroom. Controlling for differences among schools and classrooms and the social economic background of the students, the quality of teaching is hypothesized to have a positive impact on student learning achievement. In our study, majority of the teachers have at least 4 years of secondary education. Girls outperform boys in language subjects in the Kenya Certificate of Secondary Education exams done at the end of secondary four. It is therefore possible that the higher scores observed among students taught by female teachers could be the effect of content knowledge acquired when the teacher was in school and/or the PCK acquired during training. Trained teachers are better teachers as indicated by the higher test scores of students taught by trained teachers. The effect of training on learning achievement is mediated by effective classroom teaching and pedagogical knowledge. Our analysis shows that PCK is positively and significantly associated with student achievement. This confirms the empirical findings by Shulman (1987) that PCK is critical in improving pupil achievement, and that this is mediated by improved teaching of the content by a subject specialist. From our findings, we also conclude that the longer teachers stay in their profession the poorer the student scores; in other words, older teachers are associated with lower student scores. This may be explained by inadequate continuous professional and academic development among teachers. This result has negative implications to students in the public schools where the teaching force is aging. However, the negative effects of years of teaching experience on learning achievement can be reversed if teachers practice continuous improvement.

In chapter 5 we qualitatively investigate parental perceptions on FPE and the reasons behind the utilization of non-government schools. Parents realize the interconnectedness between quality of learning, teacher performance and the performance of children in any given school. We conclude that the quality of teaching in a classroom by the teacher is vital to the overall performance of pupils in school. If teachers in non-government schools teach effectively, parents will continue to send their children to these non-government schools and bypass the government schools where education is "free". Parental narratives during FGDs underscore the importance of Early Childhood Education as a motivator for parental school choice. The absence of established ECD centers in government schools is a major setback to the government schools. We expect that the implementation of the new Education Bill will establish and entrench pre-primary as an important component of basic education.

Way Forward

Low-cost Non-government Schools

The results suggest policy implications in addressing inequality of access to quality primary education in urban informal settlements. Shortage of government primary schools in urban informal settlements and the high number (over 80%) of low-cost schools not registered with MoE, denies a significant proportion of the poor access to free primary education. First, this highlights the need for the government to expand availability of tuition-free public schooling in underserved urban poor communities. To enable the MoE to achieve this, all the low-cost private schools should register with the MoE so that they can benefit from the FPE capitation as well as technical support. Such registration should not be construed to mean that they will lose their autonomy and/or funding from alternative sources. Second, given the massive increase in enrollment in response to free primary education, the quality of education has declined in many government schools. The result shows that children from better socio-economic backgrounds are served by better quality private formal schools, while children from poorer households attend poor quality government or low-cost private schools. It is therefore important that particular attention be focused on the improvement of the quality of education in government schools. There is also the need for government to support and monitor low-cost schools to help them improve education quality. This becomes necessary in view of our evidence showing that majority of Kenyan children in major urban informal settlements, for instance Nairobi, attend these schools and if FPE will achieve its stated goals then all these schools need to be brought into the FPE program so that the most disadvantaged children can benefit from capitation grants. As for the schools, they have to improve on accountability mechanisms including accepting to be evaluated by the government.

Teacher Support Systems

Our study shows that in government schools, the more the years of teaching experience, the lower the student scores. Furthermore, almost a third of children in urban informal settlements are taught Math by teachers who can score less than 40% in a teacher Math knowledge assessment. In addition, classroom teachers' pedagogical skills are more inclined to reproductive styles that teach learners how to reproduce what they are taught instead of promoting comprehension and application of what they have learnt. Teacher support mechanisms outlined below are therefore necessary to address these challenges. It is important to note that these measures cannot effectively function in isolation and they need to be implemented as a package. For example, a well-trained teacher may not teach effectively if his/her work is not assessed or measured and constructive feedback

Teacher Professional Development

Continuous professional and academic development among teachers needs to be prioritized in view of the curriculum changes that have taken place in Kenya as well as the low pedagogical skills reported in our findings. Such professional development should be systematic, regular and geared towards improving the delivery of instructions at the level the teacher is teaching and/or expected to teach. For this to be achieved, schools will have to facilitate teachers' learning by giving them access to computers with internet resources. Teachers and particularly early grades' teachers require monthly professional in-class coaching and feedback sessions by Teacher Advisory Center tutors or head teachers or other senior teachers targeted at improved learning outcomes. All these efforts should go beyond the usual sensitization and focus more on change in practice.

Untrained Teachers in Low-cost Schools

Low-cost schools have unacceptably high levels (59%) of untrained teachers. These schools provide education services to a considerable proportion of children from disadvantaged urban populations who for whatever reason find themselves left out from the government schools. Low-cost schools prefer such teachers because they are cheaper. In order to improve the quality of teaching and student scores, education policy makers may need to prioritize teacher professional development among schools serving children from poor backgrounds with a view to improving access to quality teaching in the classrooms. This may include short on-the-job trainings on pedagogy that have a heavy component of effective and practical teaching practices, and go beyond mere sensitization.

Teacher Knowledge

Teacher competency assessment needs to be part of the envisaged education reforms. This calls on education stakeholders and policy makers including Teacher Service Commission, Kenya National Union of Teachers, Ministry of Education, Kenya Institute of Education, Kenya Institute of Education Management, researchers, head teachers associa-

tions and teacher training institutions to develop acceptable levels of competencies both in pedagogy and subject content that can be periodically assessed.

Annual Teaching and Learning Goals

Monitoring learning outcomes is a critical activity in the government's efforts to improve the quality of education. Teachers will continue to play a big role in these efforts. However, our findings show that the more the years of teaching experience, the lower the student scores. To address this undesirable outcome, teachers and school committees should develop annual teaching and learning goals that can be evaluated at the end of the year. Such goals should be specific, measurable, achievable and relevant, and agreed upon by all parties involved. Learning outcomes should be used as the main indicator of how well the goals have been achieved, and teacher promotions should give more weight to student learning outcomes.

Teacher Work Assignments

The study shows that some teachers who have been assigned to teach Math in primary schools scored very low (below 20%) on a teacher knowledge test. One way of addressing this concern is to require a minimum acceptable grade (preferably a minimum of grade C plus) in a relevant subject in KCSE exam for one to be allowed to teach that subject. Such a move has implications on teacher recruitments and deployment and it may need to be implemented gradually.

Early Childhood Development

Inadequate linkage of early childhood development centers to primary schools was widely cited by parents as a hindrance to accessing government schools. The County Directors of Education in each of the forty-seven counties in Kenya will need to put early childhood development at the top of their County agenda for education, and spearhead the establishment and entrenchment of pre-primary sections as an important component of basic education as provided for in the constitution of Kenya. One way of achieving this is to certify ECD feeder schools linked to the nearest FPE primary schools with a view to the schools receiving the FPE funding in line with the new education bill of 2012.

Further Areas of Research

Finally, policy analysis and research evidence is critical in informing education reforms and in particular what is happening in the classroom. In order to improve our understanding of classroom dynamics, more research work on the most effective ways of measuring teaching quality, conducting classroom observations and instructional delivery need to be implemented. Examining the various methodologies of analyzing classroom observation data would be a good starting point. Capacity building on classroom observations and analysis that would enable more stakeholders including head teachers and researchers to

get involved in classroom observation and feedback may need to be considered as an important component of the process. If head teachers practice classroom observations and provide feedback to the observed teacher, they would help improve the quality of teaching and potential learning achievement. In addition, quantity and quality of school inputs is important for the success of teaching and learning. A study on the cost-effectiveness of the FPE capitation (Ksh.1,020) should be conducted to improve the policy makers' understanding of this level of funding.

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Appendices

Appendix 1a: Multinomial logistic odds-ratios of enrollment by school type

Variables	Private formal vs government		Private low-cost vs government	
HH wealth (bottom 40%)				
Middle 40%	2.1**	1.8**	1.03	1.1
Top 20%	5.4**	4.5**	0.84	1.2
Logschcost	9.8**	9.7**	3.3**	3.2**
Male		1.3		0.9
Male headed HH		1.2		1.6**
Secondary or above		1.8**		1. 1
HH size (1-3 member)				
HH member 4-6		0.53**		0.63**
HH member 7+		0.36**		0.37**
Constant	0.14**	0.14**	0.83	0.93
Log likelihood			2121.3	2073.4
Sample size			2166	2162

HH =Household; Logschcost= Log of school charge; * significant at 5%; ** significant at 1%"

Appendix 1b: Binomial logistic odds-ratios of enrollment in private school

Variables	Private vs government	
HH wealth (bottom 40%)		
Middle 40%	1.30**	1.13
Top 20%	2.49**	2.06**
logschcost	3.5**	3.5**
Male		1.16*
Male headed HH		1.83**
HH head edun. (<second)		
Secondary or above		1.22**
HH size (1-3 member)		
HH member 4-6		0.69**
HH member 7+		0.50**
Constant	0.19**	0.16**
Log likelihood	-2084.8	-2019.2
Sample size	3951	3951

Appendix 2: Grade 3 pupil achievement model on Literacy and Numeracy

Variable	Variable code	Grade 3 - Literacy		Grade 3 - Numeracy[1]		Grade 3 -Numeracy[2]	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Fixe ad part							
	Constant	-0.189	[-0.59; 0.211]	0.044	[-0.462 ; 0.55]	0.169	[-0.211 ; 0.55]
Literacy score						0.566	[0.549 ; 0.583]
School Type	Private Formal	0.563	[0.314 ; 0.811]	0.475	[0.18 ; 0.769]	0.155	[-0.067 ;0.376]
	Private low-cost	0.488	[0.178 ; 0.799]	0.416	[0.05 ; 0.782]	0.146	[-0.128 ; 0.421]
Study Site	Nairobi	0.179	[-0.071 ; 0.43]	0.259	[-0.044 ; 0.561]	0.146	[-0.081 ; 0.373]
	Nyeri	0.274	[-0.007 ; 0.555]	0.328	[-0.002 ; 0.657]	0.167	[-0.081 ; 0.414]
	Nakuru	0.158	[-0.031 ; 0.347]	0.303	[0.086 ; 0.521]	0.219	[0.056 ; 0.382]
	Eldoret	0.110	[-0.072 ; 0.292]	0.114	[-0.097 ; 0.326]	0.068	[-0.091 ; 0.227]
	Kisumu	0.223	[0.012 ; 0.434]	0.264	[0.017 ; 0.512]	0.161	[-0.025 ; 0.347]
School Poverty - ranked poorest 40%		-0.007	[-0.01 ; -0.004]	-0.009	[-0.012 ; -0.006]	-0.005	[-0.007 ; -0.003]
TR		0.003	[-0.004 ; 0.01]	-0.004	[-0.013 ; 0.004]	-0.006	[-0.012 ; 0.000]
G6 class size		0.001	[-0.001 ; 0.002]	0.001	[-0.001 ; 0.003]	0.001	[0.000 ; 0.002]
Text book	Pupil take home	-0.144	[-0.355 ; 0.067]	-0.328	[-0.572 ; -0.084]	-0.223	[-0.406 ; -0.039]
	Pupil don't take home	-0.157	[-0.333 ; 0.018]	-0.198	[-0.401 ; 0.005]	-0.104	[-0.257 ; 0.049]
Teacher pedagogy knowledge				0.003	[-0.001 ; 0.008]	0.003	[0 ; 0.006]
Teaching style	Recitation			-0.067	[-0.237 ; 0.103]	-0.050	[-0.178 ; 0.078]
	Teacher class activity			-0.117	[-0.308 ; 0.074]	-0.046	[-0.189 ; 0.098]
	Missing			-0.036	[-0.239 ; 0.168]	-0.017	[-0.17 ;0.136]

Cont. Appendix 2: Grade 3 pupil achievement model on Literacy and Numeracy

Variable	Variable code	Grade 3 - Literacy		Grade 3 - Numeracy[1]		Grade 3 -Numeracy[2]	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Tchr gender	Male	-0.059	[-0.213 ; 0.096]	0.071	[-0.096 ; 0.239]	0.110	[-0.016 ; 0.236]
Tchr Training	Certificate	0.014	[-0.123 ; 0.152]	0.059	[-0.099 ; 0.217]	0.028	[-0.091 ; 0.147]
	Diploma	0.157	[-0.035 ; 0.349]	0.149	[-0.068 ; 0.365]	0.006	[-0.156 ; 0.169]
Tchr gender	Male	-0.059	[-0.213 ; 0.096]	0.071	[-0.096 ; 0.239]	0.110	[-0.016 ; 0.236]
Tchr Training	Certificate	0.014	[-0.123 ; 0.152]	0.059	[-0.099 ; 0.217]	0.028	[-0.091 ; 0.147]
	Diploma	0.157	[-0.035 ; 0.349]	0.149	[-0.068 ; 0.365]	0.006	[-0.156 ; 0.169]
	Degree	0.077	[-0.204 ; 0.359]	0.177	[-0.159 ; 0.512]	0.169	[-0.083 ; 0.42]
Tchr experience	10 - 19 years	0.068	[-0.103 ; 0.238]	-0.019	[-0.222 ; 0.184]	-0.006	[-0.159 ; 0.146]
	20 or more years	0.045	[-0.135 ; 0.226]	-0.096	[-0.313 ; 0.12]	-0.105	[-0.267 ; 0.057]
Tchr Workload	16 to 20 hrs/week	-0.067	[-0.195 ; 0.061]	-0.071		-0.063	[-0.179 ; 0.052]
	21 or more hrs/week	-0.187	[-0.405 ; 0.031]	-0.215		-0.142	[-0.334 ; 0.05]
Pupil Gender	Girl	0.150	[0.109 ; 0.192]	0.037		-0.053	[-0.084 ; -0.023]
Random Part							
	Level 2 variance	0.118	[0.094 ; 0.149]	0.171		0.095	[0.076 ; 0.118]
	Level 1 Variance	0.792	[0.767 ; 0.818]	0.690		0.434	[0.42 ; 0.449]
	Intra Class Correlation (ICC)	12.98%		19.87%		17.88%	
significant at 1%				significant at 5%			

Appendix 3: Grade 6 pupil achievement model on Literacy and Numeracy

Variable	Variable code	Grade 6 - Literacy		Grade 6 - Numeracy [1]		Grade 6 - Numeracy [2]	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Fixed part							
Constant		0.834	[0.361 ; 1.306]	-0.933	[-1.512 ; -0.354]	-0.441	[-0.825 ; -0.057]
Literacy score						0.584	[0.564 ; 0.604]
School Type	Private Formal	0.635	[0.379 ; 0.891]	0.570	[0.306 ; 0.833]	0.225	[0.052 ; 0.398]
	Low-cost	0.565	[0.235 ; 0.895]	0.398	[0.05 ; 0.745]	0.082	[-0.144 ; 0.308]
Study Site	Nairobi	0.354	[0.078 ; 0.629]	0.304	[0.029 ; 0.58]	0.138	[-0.041 ; 0.317]
	Nyeri	0.170	[-0.134 ; 0.474]	0.315	[0.017 ; 0.612]	0.180	[-0.013 ; 0.374]
	Nakuru	0.197	[-0.008 ; 0.402]	0.290	[0.092 ; 0.487]	0.181	[0.051 ; 0.31]
	Eldoret	0.077	[-0.124 ; 0.277]	0.128	[-0.069 ; 0.326]	0.049	[-0.083 ; 0.18]
	Kisumu	0.183	[-0.039 ; 0.406]	0.234	[0.008 ; 0.46]	0.154	[0.006 ; 0.302]
School Poverty - ranked poorest 40%		-0.012	[-0.015 ; -0.009]	-0.010	[-0.013 ; -0.007]	-0.002	[-0.005 ; 0]
PTR		0.000	[-0.008 ; 0.007]	0.001	[-0.006 ; 0.008]	0.002	[-0.003 ; 0.006]
G6 class size		0.002	[0.000 ; 0.003]	0.001	[-0.001 ; 0.002]	0.000	[-0.001 ; 0.001]
Text book	Pupil take home	-0.154	[-0.389 ; 0.081]	-0.181	[-0.408 ; 0.045]	-0.066	[-0.219 ; 0.086]
	Pupil don't take home	-0.077	[-0.267 ; 0.114]	-0.134	[-0.323 ; 0.054]	-0.098	[-0.224 ; 0.029]
Teacher pedagogy knowledge				0.007	[0.003 ; 0.012]	0.004	[0.001 ; 0.007]
Teaching style	Recitation			0.048	[-0.102 ; 0.198]	-0.016	[-0.114 ; 0.082]
	Teacher class activity			0.006	[-0.146 ; 0.158]	-0.001	[-0.101 ; 0.099]

Notes: Numeracy model 1 – does not control for individual literacy score unlike numeracy model 2

Cont. Appendix 3: Grade 6 pupil achievement model on Literacy and Numeracy

Variable	Variable code	Grade 6 - Literacy		Grade 6 - Numeracy [1]		Grade 6 - Numeracy [2]	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
	Missing			0.152	[-0.032 ; 0.337]	0.058	[-0.063 ; 0.179]
Tchr gender	Male	0.015	[-0.114 ; 0.144]	0.194	[0.061 ; 0.328]	0.105	[0.017 ; 0.193]
Tchr Training	Certificate	0.150	[-0.014 ; 0.313]	0.069	[-0.096 ; 0.234]	0.000	[-0.109 ; 0.109]
	Diploma	0.373	[0.135 ; 0.612]	0.104	[-0.141 ; 0.348]	0.066	[-0.094 ; 0.225]
	Degree	0.274	[0.017 ; 0.531]	-0.075	[-0.358 ; 0.208]	-0.059	[-0.241 ; 0.124]
Tchr experience	10 - 19 years	-0.090	[-0.307 ; 0.126]	-0.019	[-0.213 ; 0.174]	-0.012	[-0.137 ; 0.112]
	20 or more years	-0.079	[-0.28 ; 0.122]	-0.245	[-0.53 ; 0.04]	-0.141	[-0.326 ; 0.044]
Tchr Workload	16 to 20 hrs/week	-0.069	[-0.196 ; 0.058]	-0.130	[-0.256 ; -0.005]	-0.093	[-0.175 ; -0.011]
	21 or more hrs/week	-0.066	[-0.245 ; 0.114]	-0.162	[-0.331 ; 0.008]	-0.131	[-0.243 ; -0.02]
Pupil Wealth	2	-0.014	[-0.073 ; 0.045]	0.011	[-0.052 ; 0.073]	0.020	[-0.032 ; 0.073]
	3	-0.008	[-0.068 ; 0.053]	0.041	[-0.023 ; 0.105]	0.040	[-0.014 ; 0.094]
	4	-0.087	[-0.149 ; -0.026]	-0.017	[-0.082 ; 0.049]	0.032	[-0.023 ; 0.086]
	Poorest 20 %	-0.092	[-0.156 ; -0.028]	-0.012	[-0.08 ; 0.056]	0.052	[-0.005 ; 0.109]
Grade six repetition: Repeated		-0.329	[-0.406 ; -0.252]	-0.177	[-0.258 ; -0.095]	0.031	[-0.038 ; 0.100]
Subject extra tuition: Yes		-0.135	[-0.18 ; -0.09]	-0.086	[-0.134 ; -0.038]	-0.012	[-0.052 ; 0.028]
Pupil age	age	-0.092	[-0.107 ; -0.077]	0.005	[-0.005 ; 0.015]	0.003	[-0.004 ; 0.01]
Subject Homework: Yes		0.142	[0.093 ; 0.191]	0.198	[0.143 ; 0.253]	0.084	[0.039 ; 0.13]
Always Speak English at home: Yes		0.254	[0.196 ; 0.312]	0.187	[0.125 ; 0.248]	0.031	[-0.021 ; 0.083]
Random Part							
Level 2 variance		0.146	[0.117 ; 0.183]	0.132	[0.105 ; 0.167]	0.049	[0.038 ; 0.064]
Level 1 Variance		0.592	[0.573 ; 0.612]	0.673	[0.651 ; 0.696]	0.476	[0.46 ; 0.492]
Intra class correlation		19.80%		16.44%		9.40%	

## Appendix 4a: Multinomial logistic odds-ratios of enrollment by school type: Korogocho & Viwandani, Nairobi

Variables	Private formal vs government		Low-cost vs government	
HH wealth (bottom 40%)				
Middle 40%	2.1**	1.8**	1.03	1.1
Top 20%	5.4**	4.5**	0.84	1.2
Logschcost	9.8**	9.7**	3.3**	3.2**
Male		1.3		0.9
Male headed HH		1.2		1.6**
HH head edun(< second)				
Secondary or above		1.8**		1. 1
HH size (1-3 member)				
HH member 4-6		0.53**		0.63**
HH member 7+		0.36**		0.37**
Constant	0.14**	0.14**	0.83	0.93
Log likelihood			2121.3	2073.4
Sample size			2166	2162

HH =Household; Logschcost= Log of school charge

Appendix 4b: Binomial logistic odds-ratios of enrollment in private formal school: Other towns

Variables	Private formal vs government	
HH wealth (bottom 40%)		
Middle 40%	1.30**	1.13
Top 20%	2.49**	2.06**
Logschcost	3.5**	3.5**
Male		1.16*
Male headed HH		1.83**
HH head edun. (<second)		
Secondary or above		1.22**
HH size (1-3 member)		
HH member 4-6		0.69**
HH member 7+		0.50**
Constant	0.19**	0.16**
Log likelihood	-2084.8	-2019.2
Sample size	3951	3951

Appendix 5: Relationship between length of teaching and student Math scores across school types
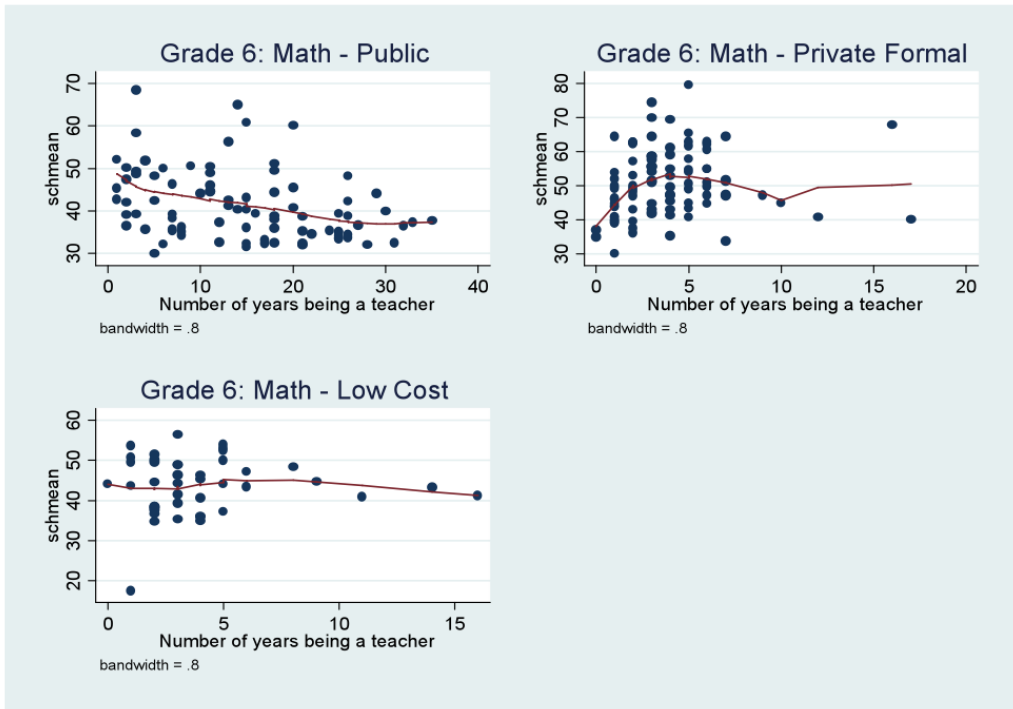
Quality and Access to Education in Urban Informal Settlements in Kenya

Access and quality of education have been part of the key challenges of Kenya's education system. To achieve the objective of increased accessibility to schooling and education, the Kenyan government introduced the Free Primary Education (FPE) policy in 2003. The implementation of FPE led to increased enrolment of children in schools from 5.9 million in 2002 to 9.9 million in 2011

However, existing studies show that the implementation of the FPE policy has been marred by questions about the quality of education; and in spite of the pro-poor focus of the FPE programme, children from disadvantaged urban population continue to enroll in low cost non-government schools.

This study investigates patterns of enrolment and quality of education in urban slums to provide a more generalized conclusion on access to schooling and quality of primary education in urban Kenya.

Data collection for this study was carried out between January and March in 2012 in the seven slum settlements with the highest number of enumeration areas categorized as slums in the 2009 national housing and population census in six towns in Kenya: Eldoret, Kisumu, Mombasa, Nairobi, Nakuru and Nyeri. Households which met the criteria of having at least one school-going individual aged 5-20 years were selected for the survey. There were 7,102 eligible households in all six towns. A total of 14,084 individuals within the target age bracket living in 5854 households participated in the study.

Two hundred and thirty (230) primary schools (89 government schools, 94 formal private, and 47 low cost schools) participated in the survey. A total of 7,711 grade three, 7,319 grade six pupils and 671 teachers of the same grades were reached and interviewed. All the 230 head teachers (or their deputies) were interviewed on school characteristics.

Evidence generated through this research is expected to inform improvements in the provision of education for all children including those living in resource-poor urban settlements. Recommendations for policy and practice include:

- Government should explore public-private partnerships in education service delivery to ensure access to quality education for all with particular focus on disadvantaged groups;

- Continuous classroom based support for teachers and setting of measurable annual teaching and learning goals should be entrenched in primary schools; and

- The central and county governments should consider prioritizing the creation of early childhood development centers that are linked to or feed primary schools and spearhead the establishment and entrenchment of pre-primary sections as an important component of public basic education.