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## **Evolutional of Educational Outcomes in Kenya**

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# Evolutional of Educational Outcomes in Kenya

Moses Oketch with Maurice Mutisya

## Abstract

This paper uses four different datasets to describe the relationship between growth in enrolment and achievement as reflected by the number of pupils completing 8 years of primary cycle in Kenya who sit for primary exit examination known as Kenya Certificate of Primary Education (KCPE) and their performance in that exam measured in mean scores and z-scores. This growth in enrolment is associated with the introduction of Free Primary Education (FPE) policy in Kenya in 2003 as part of the movement towards realising universal primary education. It also analyses using regression method, the relationship between the performance in KCPE over time and growth in the number of pupils sitting for KCPE, *after controlling for county factors such as level of poverty*. Kenya has 47 counties which are its devolved administrative units. These were formally known as Districts. Further analysis is undertaken using UWEZO dataset mainly to establish the relationship between individual characteristics and learning outcomes (*and to explore the potential of making comparisons with the South Asia equivalent surveys*). Analysis is finally undertaken using APHRC and KCPE data sets which are merged meticulously to examine slum poverty, school type, and performance in KCPE, and to compare this with non-slum schools performance in KCPE.

Based on the analysis using all these datasets, the paper concludes as follows: i) The overall mean scores trend is almost flat over the years while the number of pupils taking KCPE examination has risen each year with those who sat for the exam in 2011 44% higher than those who sat for the examination in 2002, the year before the FPE was introduced.. This implies that increased number of those taking KCPE, presumed to be associated with FPE policy has not adversely affected the KCPE performance. However, overall the KCPE mean score is just below the pass rate of 250 marks out of possible 500, meaning that majority of learners are under-performing in the KCPE; ii) Using the z-scores, we find that over time, increase in the number of those taking KCPE has led to steady increase in the mean score of each year considered against the overall mean score of all the years taken together. 2009 marks a turning point in positive gain in the examination scores, although this took time (over 4 years between 2005 and 2009). This might imply that there were some learning gains that were associated with FPE over the years, but it also needs to be noted that only a small number of pupils are retained and make

progression to grade 8. This is therefore a self-selecting group and the analysis here while shedding light on KCPE performance trend vs. the number of those taking the examination, it is not adequate to draw broad conclusions about enrolment gains to primary 8 and learning outcomes in Kenya. What is robust from the analysis, nonetheless, is that increased number of KCPE takers does not appear to have negatively affected the performance in KCPE over the years. In fact, there is slight improvement in several years.

## **Introduction**

This paper presents an analysis and discussion on Kenya's educational enrolment expansion following the implementation of universal primary education under the Free Primary Education Policy (FPE) introduced in 2003, and corresponding learning outcomes, measured by pupil performance in primary 8 exit standardized national examination, known as Kenya Certificate of Primary Education (KCPE). Other non-national datasets, collected at household level by African Population and Health Research Center (APHRC), and data by UWEZO, an East African based NGO that pays attention to learning by conducting household based learning test are used to complement the KCPE data and analysis. In the paper, the interest is therefore not merely on enrolment expansion, for which there has been much attention (Oketch & Somerset, 2010; Somerset, 2010), but in answering the following questions: Is there a relationship between performances in KCPE and change in enrolment rates of those sitting for the examination? Is there a relationship between the performances in KCPE and change in the number of pupils taking the examination, *after controlling for county factors such as poverty*? Other analysis based on APHRC and KCPE data set look into performance in the slum context and assesses poverty and achievement in KCPE, and by gender. The rest of the paper is organised as follows. First, we present the key reforms aimed at improving education quality in Kenya. This is followed by descriptive analysis at the national level on enrolment and KCPE performance. Analytical regression focussing on performance change over time controlling for several factors at the county level is then presented. Presentation of enrolment and KCPE achievement using APHRC and KCPE data follows. Teacher characteristics and pupil achievement follows. The last section concludes the paper by highlighting the key findings drawn from the descriptive and regression analysis.

## **Key Reforms to Improve Education Quality**

Kenya's education reforms have been guided by several educational commissions set up between 1964 and 1994. The majority of these Commissions have dealt with access explicitly and quality only implicitly. Part of the challenge has been the difficulty to measure quality, but policies have been around improved teacher training, improved pupils-teacher ratio, and supply of text books in schools. The most comprehensive quality oriented commissions was the Koech led Commission of 1999 (GoK, 2000). It nonetheless was considered radical by the then government of the day such that its implementation was piecemeal.

Historically, Kenya's education system was founded, from colonial time, on meritocratic selection criteria (Oketch & Rolleston, 2007). This was itself a false start to equality of educational opportunity because the system also had other barriers such as fees. Lack of enough educational places to meet demand was and remains another barrier. But it aimed to ensure that for those who entered the system, there was a strong learning outcome, guaranteed by a system that highly selected and weeded out those unable to meet the set standards through repetition and other bottlenecks to progression. Emphasis was placed, in the early period, to passing grade 4 examination, in order to progress to what was known as intermediate grade 5. The colonial system did not see it in its interest to advance greater participation in education by the Africans, and the existing subsistence economy did not require high levels of education. Examination system at grade 4 was thus used as a means to control access to the various levels. Very few managed to make this transition. Access to education by the Africans was a strong platform for fighting for independence and once independence was attained, it is not surprising that one of the immediate education reforms undertaken in East Africa which included Kenya was to scrap the grade 4 examination and to consolidate the education system to 7 years of primary education with examination taken at grade 7. For critics, this was the beginning of the erosion of meritocracy and quality but to others, and indeed, as presented by the evidence, this single decision to scrap grade 4 examination and consolidate the system to 7 years of primary cycle with single examination expanded education significantly for Africans who had been excluded (Oketch & Rolleston, 2007).

Research has shown that 'a high- quality preparatory schooling, better training in the home, or other advantages may enable a disproportionate number of children from families of high socio-economic status to satisfy meritocratic selection criteria' (Knight & Sabot, 1990). The downside of this as Knight and Sabot further noted is that '...in that case, unequal access to education will persist, and those best able to meet the cost of their children's schooling will benefit disproportionately from the subsidies'. (p. 7). This is what needs to be addressed under universal primary access system such as Kenya's Free Primary Education (FPE) policy. The key question is whether FPE has improved the performance of pupils from disadvantaged socio-economic backgrounds. As noted by Knight and Sabot (1990) in this classic natural experiment study of the 1980s with much relevance today, expansion of public places can increase access for the poor and 'yet it may do little to increase intergenerational mobility, measured in relative sense' (p. 7). The

authors go on to say that 'children from privileged backgrounds can protect their status by taking their education a stage further (p. 7). Therefore a good education system should not only expand access and be inclusive, but must also ensure that there is equitable learning outcome for all categories of enrolled learners. This has been a challenge in Kenya with opinions asserting that quality has deteriorated since FPE but with limited empirical analysis to ascertain if this is truly the case.

In this paper, we examine the relationship between the expansion of access, on the one hand, and the performance in KCPE on the other, relating both to pupils' socioeconomic backgrounds, school type as in between public and private schools, and gender. It is known that universal access policies such as Kenya's free primary education will eliminate selectivity, to some degree, by family background, or at least that is what such policies are intended to achieve. This will have the effect of increasing access to this first stage of the education pyramid. The hurdle is the next level, in Kenya's case, transition from primary 8 to form one, which is grade 9 (secondary level). This transition is based a pupil's performance in the grade 8 KCPE examination, also used as a measure of the learning gained over the 8 years of Kenya's primary level education, and therefore the effectiveness and relevance of the primary education system. KCPE has been used as a measure to gauge the 'quality' of the entire education system, under the presumption that more pupils who pass KCPE in any given year ad cumulatively over the years is an indication that the system is of high quality. The core principle is that KCPE which as we noted earlier is a standardised national examination tests pupils' cognitive growth as well as competency in literacy and numeracy. Analysis of the extent to which performance in KCPE has changed in line with the FPE access policy is the aim of this paper.

### ***Quality policies***

There are several ways through which Kenya has attempted to address the learning outcomes in schools but there are few straight forward policies that have been dedicated to measuring and improving quality. This is partly because whenever there has been a policy associated with an increase in access, there has been perception of a decline in quality and whenever attention has been directed towards addressing quality, access declines. It has been some sort of pendulum swinging, making it difficult to highlight quality gains when access is expanded. It is not surprising therefore that access which is easy to measure and implement has been dominant in Kenya's education policies and commissions since around the 1960s. We have indicated that some of these have clearly

been policies that have scrapped examination at some levels to enable expanded access, but Kenya again uses examination to control for access at other levels. This has been partly, the contradiction in Kenya's educational policies which has worked to the advantage of pupils from better socio-economic background, because when access is equalised or seem to have been equalised at one level, it is restricted through selectivity at the next level.

Some of the clear actions by government in recent years have included (GoK, 2005):

1. Increasing the educational attainment of teachers by requiring those selected into teacher training colleges to have higher pre-training educational qualifications; and scrapping recruitment of untrained teachers and encouraging in-service training for those already employed without teacher training.
2. Increasing supply of text books in schools.
3. Change of curriculum to make it both relevant and manageable for students in terms of the number of compulsory subjects and to increase opportunity to learn on specific subjects.

It is nonetheless important to note that the major education reforms have been guided by education Commissions such as the Kenya Education Commission Report of 1964 (Ominde, 1964), the first in post-independence Kenya, that focused on comprehensive revision of the education system to address segregation on racial basis and integrate Kenya's education system. It also dealt with the issue of language, recommending English as medium of instruction. It was followed by Report of the National Committee on Educational Objectives and Policies of 1976 (Gachathi, 1976) which mainly focused on redefining the objectives and policies of the education system to address what was perceived as negative attitude towards work, particularly agriculture. The Report of The Presidential Working Party of 1981 (GoK, 1981) not only recommended the establishment of the second university in Kenya, but provided the recommendation that Kenya changes its education system from 7 years of primary, 4 years of secondary, 2 years of A' Level secondary, and 3 years of university (The then British model), to a North American model of 8 years of primary, 4 years of secondary and 4 years of university (also known as 8-4-4 system). It is the system that has remained in place since it was implemented in 1985/6 despite calls to scrap it and revert to the old 7 years of primary. Report of the Presidential Working party on Education and Manpower Training for the Next Decade and Beyond of 1988 (GoK, 1988) which introduced cost-sharing and considered part of the structural

adjustment reforms and blamed for eroding the gains that Kenya had made in expanding access. The 1999 Commission Report on Totally Integrated Quality Education and Training, also known as Koech report is the first one to comprehensively address the issue of educational quality as quality is also in its title although as noted earlier, it among other things, recommended the scrapping of 8-4-4 and for this reason, it was considered too radical to be fully implemented as policy. The most recent is the 2011 Commission whose full recommendations haven't been publicised. While these Commissions have been influential in setting the key educational reform agenda, quality has not been central in their themes, except for the 1999 commission report that was also 'rejected' by the then government (Oketch & Rolleston, 2007).

Following the election of President Kibaki in December 2002, in 2003 he introduced Kenya Free Primary Education which had been one of his campaign pledges. It was a massive policy but mainly focused on removing cost-barrier to educational access. Besides the Commissions, there have been several Sessional Papers which lay the ground and operation of the education sector in Kenya. The most significant one in recent years is the Sessional Paper No. 1 of 2005 (GoK, 2005), which is also popularly known as KESSP (Kenya Education Sector Support Programme 2005-2010) (MoE, 2005). KESSP was aimed at fully operationalising the implementation of Kenya's FPE. Its title is "Delivering quality education and training to all Kenyans" (MoE, 2005) and it is one of the most comprehensive document to have laid the foundation on educational quality in Kenya under the FPE programme. The KESSP was also aimed at helping the Government achieve the following targets: Attainment of UPE by 2005 and EFA by 2015; ii) Achievement of a transition rate of 70 percent from primary to secondary school level from the current rate of 47 percent, paying special attention to girls' education by 2008; iii) Enhancement of access, equity and quality in primary and secondary education through capacity building for 45,000 education managers by 2005; iv) Construction/renovation of physical facilities/equipment in public learning. Institutions in disadvantaged areas, particularly in Arid and Semi-Arid Lands (ASALS) and urban slums by 2008; v) Development of a national training strategy for TIVET in 2005, and ensuring that TIVET institutions are appropriately funded and equipped by 2008; vi) Achievement of 50 percent improvement of levels of adult literacy by 2010; vii) and Expansion of public universities to have a capacity of at least 5,000 students each by 2015 and increase the proportion of all students studying



science- related courses to 50 percent, with at least one third of these being women, by the year 2010.” (MoE, 2005). Kenya applied the SWAPs framework and included all the departments of the Kenya government to work with the MOE. Again, as can be noted, it has integrated goals related to quality but none can be said to be specific on quality. Other aspects in terms of reforms geared towards quality include the setting up of National Assessment Unit under the Kenya National Examination Council which runs KCPE with the aim of improving literacy and numeracy. Collaboration with international assessment agencies (through participation), such as SACMEQ can also be considered as part of the government efforts to improve quality.

## **Enrolment and performance in KCPE: Empirical Analysis**

### ***Introduction***

As presented earlier, the aim of this paper is to assess the effect of increased number of candidates taking KCPE against the performance in KCPE over the years, and to associate this with the effect of enrolment on achievement. The outcome of interest is the county score in the Kenya Certificate of Primary Education (KCPE). Kenya has 47 counties which were constituted following the promulgation of a new constitution in 2010, but these counties are also what Kenya’s key administrative districts were formerly. The counties have now become the lower level of governance under the new devolved system of governance, with counties now being led by elected governors. It is therefore possible to review KCPE performance and enrolment in each of them. KCPE is a standardized examination taken at the end of eight year primary cycle. Besides its considered measure of the educational system effectiveness on achievement, it is widely regarded and used to screen who transits to few secondary schools which does not match demand. Kenya does not have a universal secondary education yet. KCPE is thus used to rationalise allocation and to also assign students to the tiers of secondary schools which exist in the country in order of prestige as follows: National schools; Provincial schools; District schools; and Day schools. Private schools do not participate in this screening and can admit students based on their own selection criteria. There are few such secondary schools in Kenya, which often are much more expensive than the subsidized state schools, and these private schools also have prestige ranking, with the expensive ones considered most selective and prestigious. Overtime, the number of candidates taking KCEPEhas been steadily growing, particularly after the introduction of the FPE policy in Kenya since 2003. In that year gross-enrolment in primary schools increased to about 104%. This figure includes

new entrants in grade one, and re-entries of those who had dropped out and who came back into the education system following the announcement of the FPE policy between grades 2 and 8. A lot has been written anecdotally or as mere descriptive correlation and case studies about the effect of this upsurge in enrolment on quality (Oketch & Somerset, 2010; Sawamura & Sifuna, 2008; Sifuna, 2007). Images of crowded classrooms has been used to drive the point that quality has declined under FPE, and indeed many assessment tests show that pupils are not reading at required competency levels. Many parents have shifted to private academies in such of better quality, and even poor parents living in the slums utilise 'private schools for the poor' because they perceive them to offer better learning outcomes than free government schools (Oketch, Mutisya, Ngware, & Ezeh, 2010). However analysis of the impact of access on performance on KCPE over time has been lacking. This paper seeks to assess how enrolment increment of those sitting grade 8 KCPE has changed over time and how this relates to mean score in KCPE. The goal is to assess, through association, whether the rise has had negative effect on KCPE performance. Quality in this paper is measured by county mean scores in KCPE. The county mean scores are standardized.

## **Description of the Data**

This study utilizes four different data sets: 1) Kenya Certificate of Primary Education (KCPE) data from the Ministry of Education; 2) Kenya National Household Integrated Survey (KNHIS) from the Ministry of Planning; 3) UWEZO data, and 4) African Population and Health Research Center (APHRC). In this section, we describe the different data sets, and specifically state the type of data obtained from each of the unique datasets.

### ***KCPE Data***

Kenya Certificate of Primary Education data was obtained from the Kenya National Examination Council (KNEC), which is under the Ministry of Education, Kenya. The KNEC is responsible for not only conducting annual national examination for primary schools, but also that of secondary schools and technical colleges and polytechnics. The body is also responsible for setting and marking of the examinations. For this analysis, we obtained nationwide KCPE datasets for the years 2002 to 2005 and 2009 to 2011. The datasets came in different forms and levels – some of the data was at school level and others at individual level. The datasets were stratified by gender of the pupils. Though we needed information on school type, it was missing from the datasets. We were however able to

merge the 2002 to 2005 data with the type of school, using pre-existing information from the Ministry. The KCPE dataset also contained key identifiers such as the school examination registration numbers. The registration number is a geographically generated (based on the provincial administration in Kenya) informative index number and one can identify the district and division in which the school is located. Three main variables were derived from the data, the county, achievement scores and enrolment.

Using the index number, the districts in which the schools are located were generated. The schools and or pupils were thereafter mapped into their respective counties. The data was thereafter aggregated at county level by calculating the mean score. The mean scores were thereafter standardized by calculating z-scores, using the formula below

$Z\ score = \frac{\chi - \mu}{\sigma}$ ; where  $\chi$  is the county mean score at time 't';  $\mu$  is the overall mean in the 7 years of observation;  $\sigma$  is the standard deviation. Therefore, the z-score, here after also referred to as the standardized score is the deviation of the county mean score on a particular year in respect to the overall mean score. In a regression analysis, the coefficient for a z-score is interpreted as “% change in one standard deviation”.

Enrolment data was calculated as the total number of pupils who sat for examination in each of the counties in a given year. A good measure of enrolment would have been relative enrolment rates other than the raw figures. However, since we lack information on the counties populations by age groups, we only present the actual number of pupils enrolled in standard 8 and who sat for KCPE in each of the years.

### **APHRC Data**

APHRC data used in this study is the household social-economic status data and teacher and pupil characteristics and achievement data from the classroom observation study (Ngware, Oketch, Mutisya, & Kodzi, 2010). APHRC has been running the Nairobi Urban Demographic Surveillance System (NUHDSS), an urban DSS since 2002 in two informal settlements (slums) in Nairobi. The NUHDSS collects data on vital events (e.g. Deaths, Births, Migration) as well as household social economic status- in terms of assets and amenities. The NUHDSS acts as platform for sampling and or nesting other studies. Since 2005, the Education Research Program at APHRC was in nested into the NUHDSS framework. In addition, the Education Program included two formal settlements (non-slum)

in order to be able to evaluate the impact of Free Primary Education across different urban economic groupings.

The Education program targeted households with individuals aged between 5 and 19 years. The education data by APHRC involved visiting households annually until 2010 to collect schooling information for individuals aged between 5 and 19 years. The information collected included schooling participation, type of school and the details of school enrolled in. Using the names of the pupil and school, we manually matched individual information with their KCPE information for the years 2005, 2006, 2009 and 2010. We also extracted social economic status data that included an index score calculated using household's assets ownership and amenities information. The wealth index was grouped into three categories, the poorest, middle poor and the least poor. Using this data, individual performance was related to the wealth index of their household for each of the year. We further calculated pass rate for each of the schools. Pass rate here is defined as scoring above 250 marks out of a possible 500 marks in KCPE. The proportion of schools within the county scoring above the pass rate was calculated by dividing with the total number of schools in that county for each of the years covered by this paper.

In 2009, the Education Research program at APHRC designed a classroom observation study with the objective of examining the effect of classroom teaching process on the quality of learning in primary schools in Kenya. In this study, six districts were selected according to their performance in KCPE over four years (2000 to 2004). That is, two districts that had consistently been ranked in the top 10%, two that had consistently been ranked in the middle 20% and two that had consistently been ranked in the bottom 10% in the national KCPE ranking of districts according to their mean score in the KCPE. After the selection of the districts, a total of 72 schools – 12 from each of the six districts were randomly drawn, stratified by the school performance in KCPE over the same period (that is from the top 20% and the bottom 20%). The study involved testing grade 6 pupils in Numeracy as well as their teachers, classroom observation by filming active lessons and analysing the video data using a defined rubric, collecting characteristics data from the subject teachers, head teachers and the tested pupils (see Ngware et al. 2010).

### ***UWEZO Data***

We use the 2011 Kenya Uwezo data. The dataset contained 168,227 individuals aged between 3 and 16 years in 70,763 households. The outcomes of interest were pupil

competencies in numeracy and literacy (Kiswahili and English). UWEZO a Kiswahili word, which when translated means “capability” in 2011 conducted a country wide representative household based survey. The survey collected information on the household, community and schools within the community. In the household component, individuals aged between 6 and 16 years were tested in numeracy, literacy (both English and Kiswahili)- which focused on reading and comprehension. The test survey was at grade 2. It tested different competencies. For numeracy, it tested numbers and their operations, with increment in the cognitive ability. The higher the level an individual is able to read and comprehend or do math, the higher the ranking. The household component also collected some household social economic characteristics.

Analysis for this study is restricted to individuals who at the time of the survey were either in grade 5 or 6 and or were aged 11 and 12 years. Individuals included in the analysis are those who had complete information on gender, age and wealth index besides the test competencies. In this regard, the numbers for the numeracy, English and Kiswahili test differed slightly since some individuals had missing information in either of the tests.

Using the household data, household social economic status was computed. The items included in the survey that were used in the computation of the wealth index included, source of lighting, type of the house, ownership of radio, TV, cart, bicycle or a motor vehicle. The items included had a scale reliability of 69%. Principle Component Analysis (PCA), for data reduction was used to generate household social economic status score. The score was grouped into quartiles (with quartile one representing the “poorest” and quartile 4 the “least poor”).

### ***Poverty Data***

Poverty data was obtained from the Kenya Household Integrated Survey, for the year 2005/2006. Poverty data obtained was the proportion of individuals within each of the counties ranked as poor. The poverty rate estimates for each of the county are derived simply by dividing the total number of poor people in each county in 2005/06 by the total population in each county.

## Analysis

Our analysis follows the use of the different datasets and or research questions. First we analyse the KCPE data to determine the effect of enrolment on KCPE performance. In our analysis, we first investigate the relationships between enrolment and time; and between performance and time. Using graphs, we plot enrolment Vs time as well as mean county scores Vs time of observation. In order to determine the effect of enrolment on pupil achievement, we fit a multi-level model (MLM), with the counties calculated z-scores (standardized scores) as the outcome. The MLM allows us to estimate the variance for the observations as well as that which is attributable to the counties. We assume that individual county scores are nested within the counties (7 corresponds with the time points) observations for each of the county), so level 1 is the actual county observations for each of the years, while level 2 (higher level) is the county. From this set up, we fit different models:

- Model 1 – outcome=county z-scores controlling for the year of observation
- Model 2 – outcome=county z-scores controlling for enrolment – by gender.
- Model 3 – outcome=county z-scores controlling for both year of observation and enrolment by gender
- Model 4 – in addition to variables included in the model 3, county poverty index is controlled for.
- Model 5 = outcome=county pass rate controlling for year of observation, enrolment by gender and county poverty index.

Secondly, we analyse UWEZO Data in order to establish the relationship between individual characteristics and learning outcomes. Learning outcomes is measured in terms of competencies in both literacy and numeracy. To determine the English and Kiswahili levels of literacy, those who were able to read a text i.e. a paragraph or a story were grouped as such. The literacy score is therefore binary- 1=able to read a text and 0 not able to read a text. Those coded zero means that they could only do literacy until 'word' level or below. In numeracy, two competency levels were generated: 1) those who could do two digit subtractions and above; and 2) those who could do division, which was the highest skill tested. Analysis was restricted to 1) individuals in grades 5 and 6, and in school and, 2) individual expected in terms of the age to be in grades 5 or 6- irrespective of whether they are in school or not.

In Kenya, the expected age for a child to have attained grades 5 and 6 is 10 and 11 respectively. However, in this data, when the mean age was calculated for those already in grade 5 and 6 and in school, the mean ages were found to be 11.58 and 12.61 years respectively. Therefore in order to have an understanding of the performance of pupils expected to be in grade 5 or 6, those aged 11 years were treated as if were in grade 5 and those aged 12 as if in grade 6 irrespective of the schooling status. Analysis of the UWEZO data involved descriptive statistics – both frequencies and percentages.

Lastly, APHRC and KCPE data was analysed. In this, data was analysed at individual levels and for individuals who we were able to merge both their KCPE and APHRC household data. Individual z-scores were calculated as described above. Analysis for these sets of data were descriptive and information was presented in both tables and graphs stratified by gender, household socio-economic wealth index and school type. The classroom observation data used in this study included 72 teachers and 2422 pupils from 72 schools. Data analysis for this dataset involved descriptive statistics for the teacher background characteristics as random effects model (pupils as level 1 and schools as level 2) to determine the effect of teacher characteristics on achievement. Three models were fitted: Overall and by school ranking (top 20% and bottom 20%).

## Results

### *Descriptive statistics*

Figure 1a: Enrolment and mean scores over time

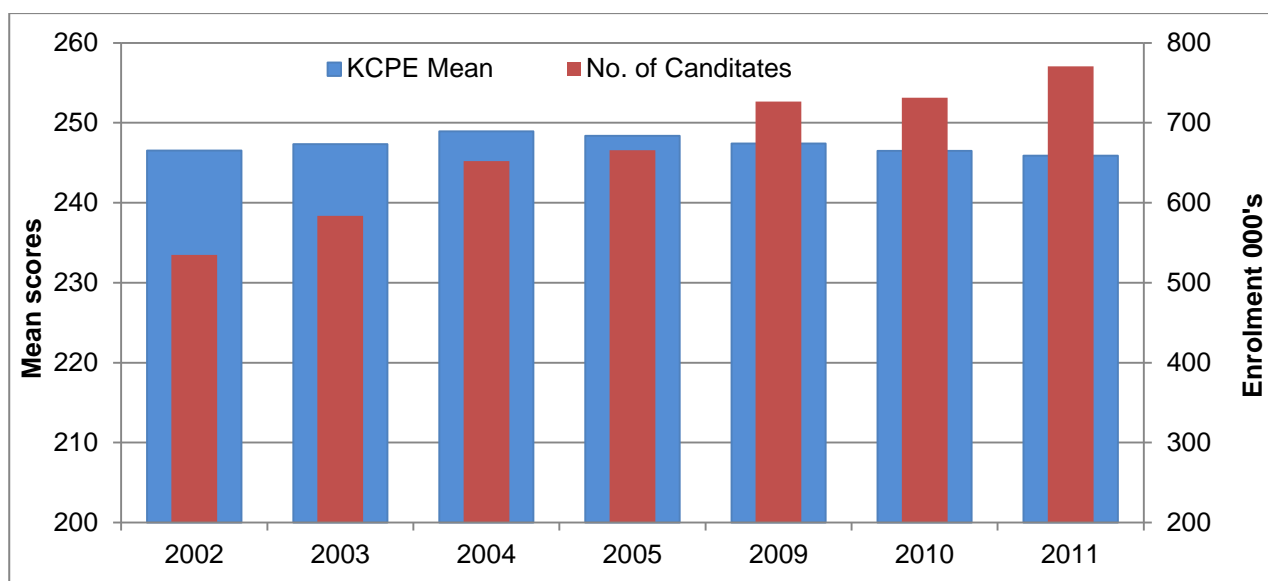
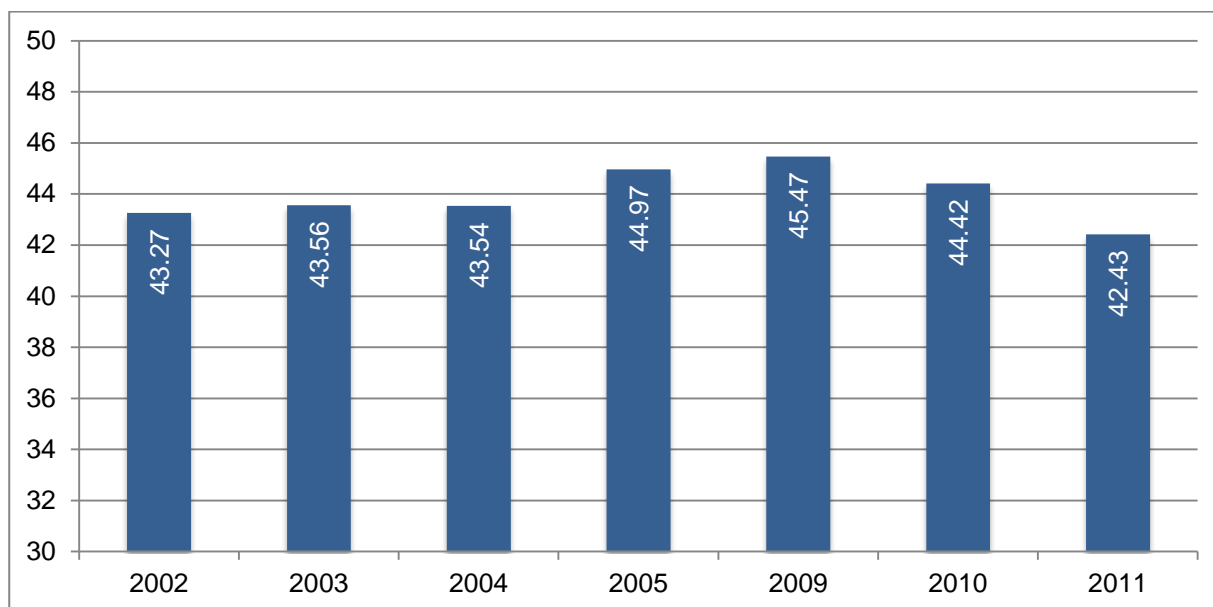


Figure 1a presents enrolment and county mean scores over time (as noted earlier, Kenya has 47 counties, formerly districts). On one hand, the number of candidates (enrolment) taking the KCPE exam is increasing year after year from slightly over half a million (0.53 million) in 2002 to 0.77million in 2011. On the other-hand, the performance over the years of observation is nearly flat in the mean score. The range is very close at 3 points/marks (lowest mean is 245.9 and highest mean is 248.9). The mean mark in the KCPE exam is 250 marks, which over the years has not been attained. In general, achievement over the years has remained relatively the same. After the year 2004, we observe increase in enrolment to be associated with decrease in achievement. The 2010 cohort is the cohort that is expected to have joined class 1 in 2003 when the FPE policy was introduced. Comparing 2003 and 2010, and 2004 and 2011 shows a decreased performance. However, as we all know, the mean score here is also a function of the total enrolment, so Figure 1 is not a simple correlation and shouldn't be interpreted without also considering enrolment. However, if there were to be a unit increase in enrolment and a unit increase in KCPE performance, then the mean should align much closer with the increased enrolment. It can be interpreted, based on Figure 1 that performance in KCPE has remained nearly flat while enrolment has grown each year. Enrolment here is absolute number of those pupils taking KCPE each year, and not a proportion of entire school enrolment.



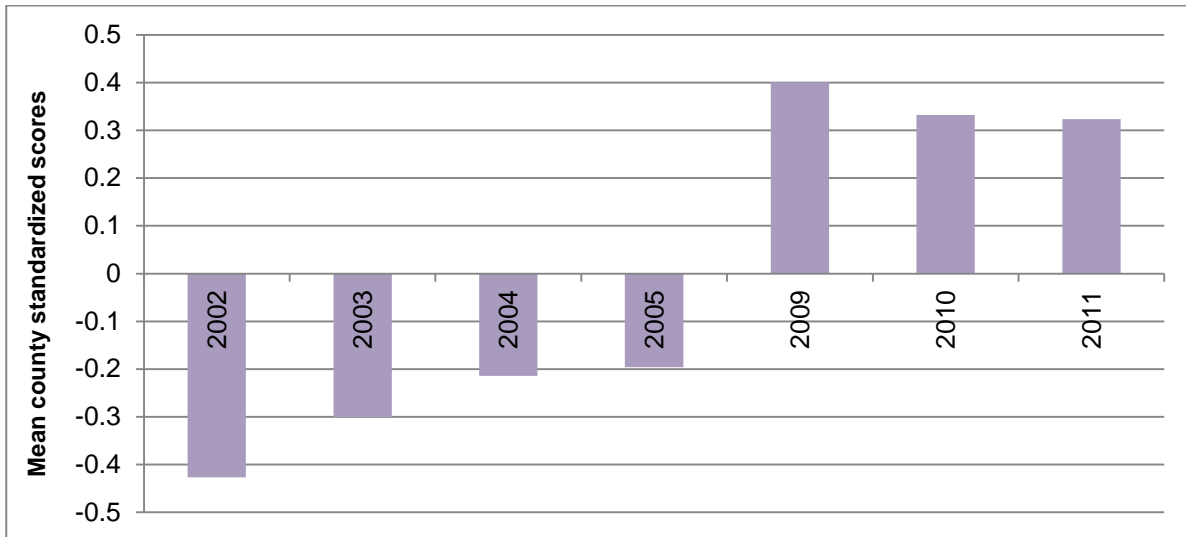
Figure 1b shows the proportion of the schools that scored 250 marks and above in the different years of study. On average, over the years, less than 50% of the schools scored above the pass mark of 250. The results in figure 1b mirror those seen in figure 1a, and show relatively little change in performance with increased enrolment over time.

*Figure 1b: Proportion of schools scoring 250 marks and above between 2002 and 2011*



Since the mean scores are very close, we plotted the standardized means (z-scores) for each of the years (Figure 2). The z-scores indicate how mean score for each year deviates from the overall mean scores for all the 7 years taken together. In this figure we plot the mean of the standardized scores for the 47 counties by the year of observation. The first 4 years shows on average the counties scored below the overall mean, which is calculated as 247 marks. The year, 2009 recorded the highest performance with an increase of 40% of a standard deviation in the counties mean scores (although this is a four year, possible gradual change. Data for 2006-2008 could not be merged meaningfully with other variables, so we left them out). The anticipation would be that FPE which has increased enrolment has negative effect on KCPE performance. What we are observing in Figure 2 is that there is positive trend although not much gain is being achieved. Kenya's system is one in which those pupils who manage to reach grade 8 are those who self-select and have a level of ability that doesn't seem to vary much each year. It is not surprising therefore that there has been considerable change for some years in the mean score against the overall mean score of all the 7 years taken together.

Figure 2: Mean of counties standardized scores over time



### **Regression Analysis**

Model 1 and 2 of Table 1 shows the bivariate association between county standardized means scores and time as well as enrolment respectively. From model 1, performance increased significantly from 2005 as compared to that of 2002. In 2009, performance was high as compared to other years– that is, it increased by 83% of a standard deviation as compared to 2002. The two years after the introduction of the FPE policy, though showing an increase in performance, this is was not statically significant.

In model 2, there is appositive association between enrolment of boys and county Z-scores and negative one for girls. Enrolment in this case is expressed per 1000 pupils. In this respect, for every 1000 increase in the number of boys, the county standardized mean score increases by 0.016% ( $0.00016 \times 100\%$ ) of a standard deviation. This means that for every 10,000 increase in the number of boys, there is an increase of about 1.6% of standard deviation in the county performance. For counties with high enrolment for girls, they are likely to post lower mean scores as compared to those with with more boys.

Model 3 in Table 2 controls for both year of observation and county enrolment: In this model 2006 is excluded since we are not able to split the enrolment by gender. A similar pattern as observed in model 1, for the year variable is evident. In the same model, 2004 seems to be significant at 5% (unlike in model 1, where the coefficient was not significant), with a 27% increment of a standard deviation in performance as compared to 2002. The enrolment of girls is negatively and significantly associated with county mean scores, while that of boys is positive and not significant.

Table 1: Multi-level regression coefficients: Bivariate analysis

Fixed part/Variables	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Constant	-0.4270	0.13876	-0.23112	0.177506
Year				
2003	0.1266	0.11677		
2004	0.2126	0.11677		
2005	0.2306*	0.11677		
2009	0.8274**	0.11677		
2010	0.7590**	0.11677		
2011	0.7504**	0.11677		
Enrolment				
Male			0.00016**	0.0000303
Female			-0.00013**	0.0000348
<b>Random Part</b>				
County	0.5845297		0.55416	
Observations	0.3204336		0.42280	
ICC	64.59%		56.72%	
# of counties	47		47	
# of observations	329		329	

In model 4 of Table 2, the year and enrolment remain significant as observed in model 3 after introducing the proportion of population ranked as poor. Increase in poverty levels is associated with a significant decrease in achievement. That is a 1% increase in poverty is associated with a decrease in county mean score by 2% of a standard deviation. In this model, we also controlled for the number of schools (excluded) in each of the county for every year, and the coefficient was not significant. The variable with the number of schools per county was correlated with enrolment, and found to be highly correlated with enrolment (rho of 0.88). Hence the two cannot be used in the same model.

The random part for the four models indicates a high Intra Class Correlation (ICC). For instance, in model 3, the ICC is 67%. This means that 67% of the variation in the county mean scores is attributable to the differences between the counties (the between variation). The remaining variation, which is approximately 33%, is attributable to differences in means for the different examination years within the counties (within county variation). Some of the difference could include differences in the examination if any as well as other unobservable year characteristics.

Table 2: Regression analysis z-score full model

		Model 3		Model 4	
<b>Fixed part</b>		Coef.	Coef.	Coef.	SE
Constant		-0.1936651	0.1911486	0.9398084	0.4446613
Year	2003	0.1483502	0.1193342	0.1574913	0.1186496
	2004	0.2715898*	0.1220998	0.2938446*	0.1215834
	2005	0.3020943*	0.1232472	0.3271512*	0.1227808
	2009	0.8401905**	0.1301829	0.872006**	0.1298218
	2010	0.7838036**	0.1292415	0.8171189**	0.1289312
	2011	0.796854**	0.1316209	0.8377224**	0.1315222
Enrolment	Male	0.0000352		0.0000296	0.0000317
	Female	-0.0000723*	0.0000318 0.0000344	-0.000084*	0.0000344
Poverty				-0.0199382*	0.0069754
<b>Random Part</b>					
County		0.6877217		0.62072	
Observations		0.3316863		0.327678	
ICC		67.46%		65.45%	
Number of counties		47		47	
Number of observations		329		329	

### **Pass rate**

The Table 3 shows the mean proportion of schools that in the different counties scored above pass rate of 250 marks. The distribution confirms the results seen above, where 2009 had the highest z-scores. Of interest is that, less than half of the schools posted mean scores of above 250 marks over time. This confirms our earlier results that show none of the years as having managed a mean of 250 marks and above. There is a remarkable increase in the mean number of schools in each of the county over time. On average, there is an increase of 14 schools a year in each of the counties.

Table 3: Mean pass rate and enrolment 2002 to 2011

Year	Mean number of schools per county	Mean of schools		95% CI	
		Scoring >250	Std. Err	Lower	Upper
2002	356	43.27	2.96	37.46	49.08
2003	369	43.56	2.72	38.21	48.91
2004	384	43.54	2.54	38.54	48.53
2005	398	44.97	2.30	40.44	49.51
2009	444	45.47	2.15	41.24	49.71
2010	452	44.42	2.24	40.01	48.82
2011	471	42.43	1.97	38.56	46.29

Using the proportion of schools above pass rate as an outcome, we fit a model (model 5) similar to model 4 above. The difference between model 4 and 5 is the outcome. The county pass rate from model 5 is a function of the examination year and population of the male candidates. That is, 2009 posted the highest number of schools scoring above 250 marks as compared to 2002. This is true in our earlier findings. Of interest is the enrolment by gender. While in our earlier finding the enrolment of boys was positive though not significant, in model 5 it is the opposite. That is, the higher the number of boys, the more likely the county will post fewer numbers of schools scoring above the pass rate.

Table 4: Regression analysis pass rate full model

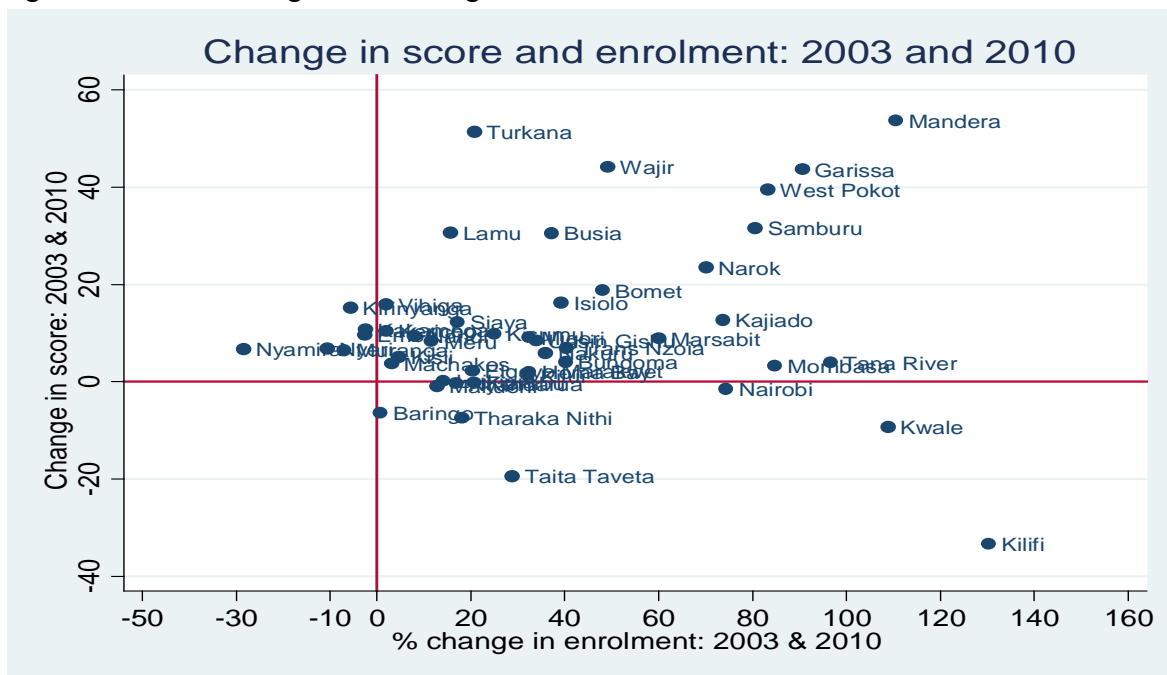
		Model 5	
<b>Fixed part</b>		Coef.	SE
Constant		57.50533	7.903257
Year	2003	0.7412032	1.715333
	2004	1.239537	1.76911
	2005	2.702663	1.790004
	2009	4.984243	1.899134
	2010	3.836547	1.889055
	2011	2.144765	1.939845
Enrolment	Male	-0.0012079	0.0004604
	Female	0.0002843	0.000512
Poverty		-0.179512	0.1275429
<b>Random Part</b>			
County		219.1207	
Observations		68.29806	
ICC		76.24%	
# of counties		47	
# of observations		329	

### ***Change in enrolment and pass rate: Comparing 2003 Vs 2010***

To generate a case study, we calculated the change in enrolment and performance for the different counties (see scatter diagram in Figure 3 below). The change in performance was calculated by deducting the county mean scores for the year 2010 from that of the year 2003. Similarly change in enrolment was calculated by getting the difference between the two years. To obtain the percentage change in enrolment, the difference was expressed as a percentage of enrolment for 2003. Through this, one is able to visualize how school enrolment has increased between 2003 and 2010. The years 2003 and 2010 were chosen since it is the latter when FPE was first implemented and the former when the first cohort

of the 2003 FPE sat for the KCPE. The changes in enrolment and performance for the different counties are as shown in Figure 3 (scatter diagram).

Figure 3: Scatter diagram – change in enrolment and mean score: 2003 and 2010



Kenya is generally unequal country and this has been reflected in its unequal education structure. Pupil's socio-economic status plays a key role in where they go to school and the kind of learning outcome they achieve. In fact, KCPE performance League Tables over the years has shown this and was even abandoned at some point and reintroduced in different ways because it was demonstrating the glaring inequalities in the educational opportunities in the country. Overall, the urban areas tend to perform better in national examinations except for Nairobi whose performance is affected by the large slums which surround it. Performance in the slums has been below national average. The arid and semi-arid areas of Kenya have also over the years shown low access and enrolment, some associated with the harsh weather conditions of these regions, nomadic lifestyle, and their higher poverty levels compared to the rest of the country. These arid-semi arid areas include those counties in the Northern part of Kenya. The coastal region has also over the years posted low access and enrolment. There have been concerns over the less value placed on education, while others have blamed the sometimes booming tourism as impediment for children going to school in the coastal region. However, government investment in education in the coastal region is much better than the northern arid and

semi-arid regions. There is also another common feature between the coastal region and the northern region- they both have higher than typical levels of poverty.

This context is reflected in Figure 3 above. Kilifi, a coastal County recorded one of the highest increments in enrolment (130%) between 2003 and 2010, while at the same time recording the highest decrease in its mean score. 2003 is used here because it is the cohort that started FPE in grade 1 and who in 2010 had progressed to grade 8. This is the first full FPE cohort to have sat for KCPE. So comparing 2003 KCPE and 2010 KCPE is to assess the change between these two year points- one associated with FPE cohort and the other non-FPE cohort. Kilifi is in the coastal region where as noted earlier, enrolment had been an issue. It appears that the number of pupils staying in school until grade 8 and able to sit for KCPE has gone up remarkably since the introduction of Free Primary Education policy. But Kilifi is not alone. Kwale and Taita Taveta appearing in the same quadrant and nearly as similar to Kilifi are all in the coastal region. Baringo is in the Rift Valley and Nairobi too appears in the same quadrant. Generally Baringo has dry parts and experiences pockets of poverty. Nairobi has large slum population, many of those living in these slums considered the poorest of the poor. It can be seen from Figure 3 that all these regions registered increased number of the pupils taking KCPE examination but performance also declined. Clearly, the coastal region counties of Kilifi, Taita Taveta and Kwale are worst affected- gaining in enrolment on the one hand and performing very poorly in the KCPE on the other.

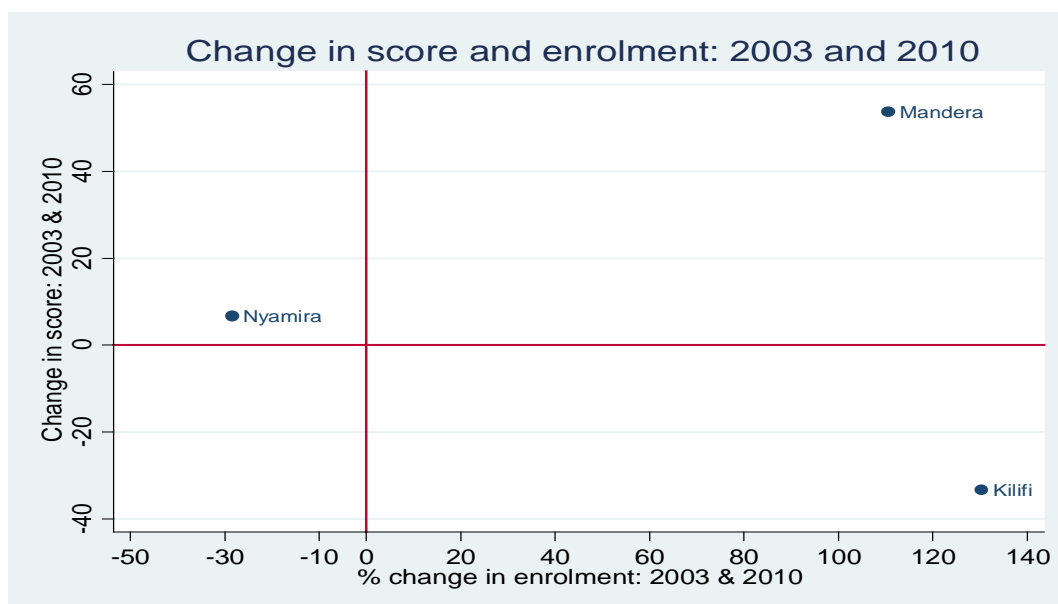
Nyamira is a district in the Western region of Kenya. It is a highly densely populated area of Kisii region. It is among the few counties that recorded declining enrolment (of 30%) and slightly increased performance in KCPE. Generally the Kisii region does not perform very well in the national examination but it is a highly agriculturally productive area with good rainfall and does not suffer food poverty.

Mandera, Turkana, Wajir, and Garissa are all semi-arid and arid counties located in the northern part of Kenya. These counties have over the years enrolled fewer pupils in schools and also performed poorly in the KCPE. What is evident in Figure 3 is remarkable improvement in these districts, in complete contrast with the coastal counties and the rest of the country. These counties show increased number of pupils taking KCPE and improved performance. It is hard to tell what explains this, but it is possible that they were starting from very low base in 2003 and by 2010, there was remarkable improvement. It is

also clear that in the northern counties, those who persisted to grade 8 were those able to do well in school, a possibility of self-selection. It is also possible that the better performance is a reflection of the efforts of a number of Non-governmental Organisations which have had sustained effort to increase enrolment and learning in these deprived regions of Kenya.

The middle part shows where most of the counties' cluster. It appears clearly that many recorded most improvement in the number of pupils taking KCPE examination and the performance in the KCPE.

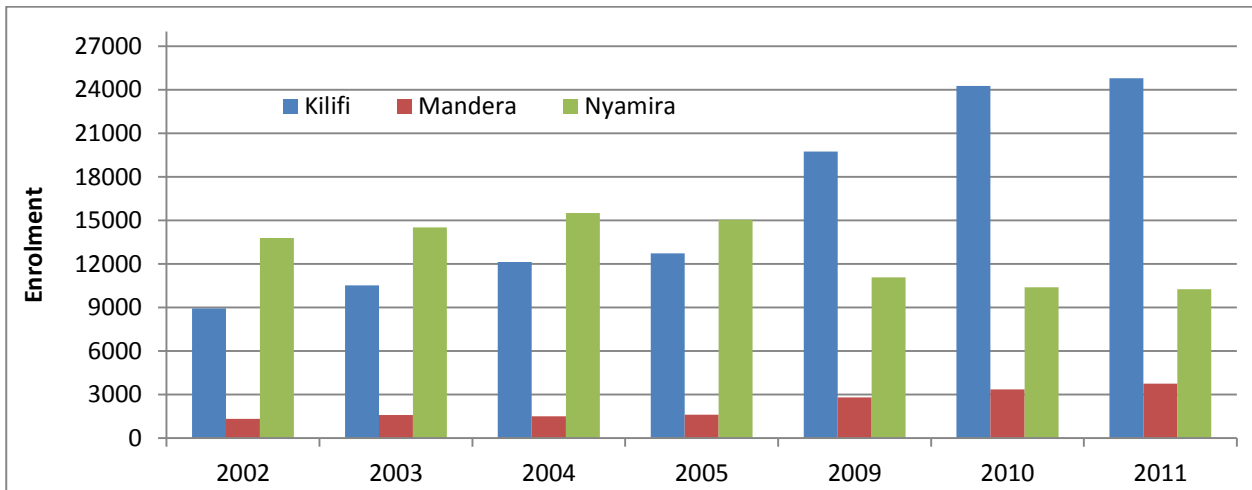
Figure 4: The case study counties



In the case analysis, we investigate over time how change in enrolment has affected county standardized mean scores – for the three counties (Figure 5). Nyamira recorded a slight annual increment in enrolment between 2002 and 2005, and a decline thereafter; in contrast, Kilifi which is a coastal town, recorded a steady annual increment, with the number of pupils growing by more than 100% in 2011 compared to 2002. Mandera, is characterized by a small number of pupils enrolled in school. Mandera is a district from the arid parts of Kenya. As noted above, it seems enrolment increased in the coastal region but learning outcome in terms of performance in KCPE did not. In the northern region where Mandera is located there was both increment in enrolment and improved scores in KCPE.

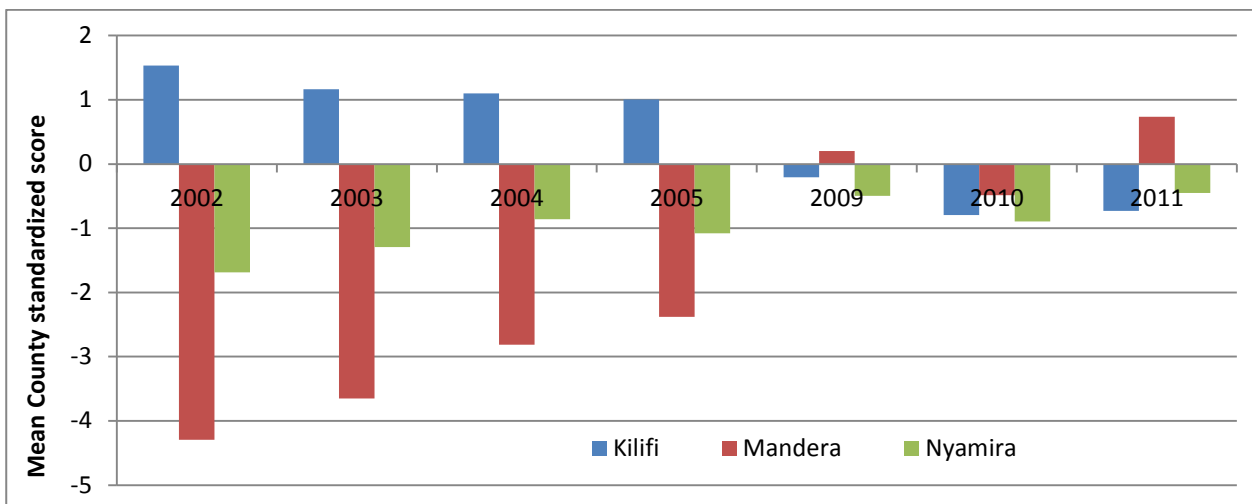


Figure 5: Mean enrolment for case study counties over time.



In terms of performance, Mandera in the earlier years posted worse results, but it kept rising (Figure 6). Nyamira over time has shown a positive change, but still remains below the average mark for the country. Kilifi on the other hand, performance has worsened over the period of observation.

Figure 6: Mean performance for case study counties over time.



### Description of the UWEZO data

We use the 2011 Kenya Uwezo data. The dataset contained 168,227 individuals aged between 3 and 16 years in 70,763 households. The outcomes of interest were pupil competencies in numeracy and literacy (Kiswahili and English). UWEZO a Kiswahili word, which when translated means “capability” in 2011 conducted a country wide representative household based survey, where they collected information on the household, community

and schools within the community. In the household component, individuals aged between 6 and 16 years were tested in numeracy, literacy- which focused on reading and comprehension. The test survey was at grade 2. It tested different competencies. For numeracy, it tested numbers and their operations, with increment in the cognitive ability. The higher the level an individual is able to read and comprehend or do math, the higher the ranking. The household component also collected some household social economic characteristics.

Analysis for this study is restricted to individuals who at the time of the survey were in either in grade 5 or 6 and or were aged 11 and 12 years. Individuals included in the analysis are those who had complete information on gender, age and wealth index besides the test competencies. In this regard, the numbers for the numeracy, English and Kiswahili test differed slightly since individuals had missing information in either of the tests.

Using the household data, household social economic status was computed. The items used in the computation of the wealth index included, source of lighting, type of the house, ownership of radio, TV, cart, bicycle or a motor vehicle. The items included had a scale reliability of 69%. Principle Component Analysis (PCA), for data reduction was used to generate household social economic status score. The score was grouped into quartiles (with quartile one representing the “poorest” and quartile 4 the “least poor”).

To determine the English and Kiswahili levels of literacy, those who were able to read a text i.e. a paragraph or a story, were grouped as such. The literacy score is therefore binary- 1=able to read a text and 0 not able to read a text. Those coded zero means that they could only do literacy until ‘word’ level or below. In numeracy, two competency levels were generated: 1) those who could do two digit subtractions and above; and 2) those who could do division, which was the highest skill tested.

In Kenya, the expected age for a child to have attained grades 5 and 6 is 10 and 11 respectively. However, in this data, when the mean age was calculated for those already in grade 5 and 6 and in school, the mean ages were found to be 11.58 and 12.61 years respectively. Therefore in order to have an understanding of the performance of pupils expected to be in grade 6 and 7, those aged 11 years were treated as if were in grade 5

and those aged 12 as if in grade 6 irrespective of the schooling status. The results are shown in the table below.

Table 5: Summary data for the UWEZO study

	Enrolment ratios (row %)		Percentage of <b>students</b> able to (in school)								Percentage of <b>children</b> able to (whether in school or not)							
			Grade 5				Grade 6				Median age for Grade 5 (11 years)				Median age for Grade 6 (12 years)			
	Grade 5	Grade 6	Read English text	Read Swahili text	Do two digit subtraction	Do division	Read English text	Read Swahili text	Do two digit subtraction	Do division	Read English text	Read Swahili text	Do two digit subtraction	Do division	Read English text	Read Swahili text	Do two digit subtraction	Do division
Total	130.11	97.16	89.6	90.55	90.09	67.44	95.59	95.57	94.68	79.68	75.43	76.97	80.13	56.45	81.29	82.51	83.75	64.4
Female	127.88	100.20	90.71	91.6	90.48	68.42	95.68	95.42	94.86	79.9	73.34	79.02	81.36	58.53	83.3	84.16	85.11	66.01
Male	132.29	94.28	88.55	89.54	89.72	66.51	95.5	95.72	94.51	79.45	77.57	74.97	78.92	54.42	79.37	80.94	82.45	62.87
Quartile 1; Poorest	135.17	84.45	87.08	87.83	86.93	63.16	94.8	94.72	93.2	77.52	61.35	64.24	67.61	42.26	69.67	72.07	73.26	51.67
Quartile 2	130.54	97.81	88.98	90.30	90.28	67.9	95.05	95.15	94.88	79.28	71.12	72.38	77.53	51.82	78.01	79.67	82.32	60.85
Quartile 3	131.39	104.57	90.26	91.26	90.94	67.56	95.88	96.23	95.01	80.2	81.03	82.87	85.26	60.79	88.52	89.06	89.25	71.19
Quartile 4; Least poor	122.88	106.14	92.74	93.37	92.7	71.78	96.88	96.36	95.75	82.03	90.17	90.25	91.21	72.46	94.2	93.83	94.01	79.16
Female Quartile 1	134.20	89.31	87.84	88.86	87.05	62.95	94.77	94.65	93.82	78.03	63.47	66.7	69.2	43.28	71.97	74.08	75.53	54.14
Female Quartile 2	126.14	100.46	89.77	91.86	90.84	69.91	94.58	94.63	94.73	79.54	73.04	73.55	78.19	55.18	80.01	81.42	83.89	61.88
Female Quartile 3	128.83	108.52	92.45	92.38	92.11	69.08	96.36	96.18	95.62	80.36	82.6	84.53	86.42	61.76	90.17	90.51	89.95	72.49
Female Quartile 4	122.65	104.85	93.22	93.51	92.09	71.94	96.56	96.44	95.32	81.89	91.8	92.06	91.62	73.82	94.71	93.75	93.3	79.02
Male Quartile 1	136.04	80.38	86.4	86.9	86.83	63.34	94.83	94.79	92.62	77.05	59.46	62.07	66.22	41.37	67.7	70.37	71.37	49.6
Male Quartile 2	134.81	95.24	88.27	88.89	89.77	66.09	95.54	95.67	95.03	79.02	69.29	71.26	76.9	48.59	76.08	77.98	80.81	59.87
Male Quartile 3	134.11	100.65	88.05	90.12	89.76	66.02	95.36	96.28	94.36	80.03	79.35	81.12	84.01	59.76	86.89	87.63	88.55	69.89
Male Quartile 4	123.12	107.49	92.24	93.23	93.32	71.61	97.19	96.28	96.18	82.17	88.51	88.41	90.78	71.06	93.67	93.91	94.74	79.32

## **APHRC and KNEC data analysis**

### ***Nairobi Low Private Schools***

The description of private schools is adapted from (Oketch, Mutisya, Ngware, Ezech, & Epari, 2010).

The low cost schools, which in this paper are referred to as '*private schools*' can be described by their ownership, location, and their registration status and type of teachers they attract. The ownership of the low cost school varies: private individual, private religious group or organization or owned by the community. About 50% of the low cost schools are owned by private individuals who operate them as private organizations or entrepreneurs, with about a third being community-owned. Like other private schools, majority of the privately-owned low cost schools charge low school fees. However, their fee charges are much lower than those that are paid in the typical of private schools in Kenya.

The low cost private schools have characteristics that are distinct from the typical private or public schools. First, they are not registered with the Kenya Ministry of Education; hence lack recognition as proper education establishments. They are however registered by other government bodies for other purposes such as children or rehabilitation centres. For instance, the Ministry of Culture and Social Services has registered (has records) of about two thirds of the low cost schools of the slums included in this study. The Attorney General's office also has record of some of these low cost schools. About 25% of these low cost schools are not registered with any government authority, hence operate completely without any notice by the authorities and are not recorded among the education providers in Kenya. This is the scenario described by Tooley et al. (2008) whereby the government claimed most pupils who were out of school had come to schools in 2003, yet it is the case that majority were simply those who had transferred from these unregistered, unrecognized, unrecorded private low cost schools (Tooley et al., 2008). In spite of lacking formal recognition by a government education authority, a majority of these schools offer the recommended curriculum by the Ministry of Education, and those that are not examination centres, register their pupils with the nearest examination centres to enable the pupils to sit the Kenya national examinations (Oketch et al, 2011).

## APHRC and KNEC data analysis

Research evidence on schooling in the urban context from 2000 to 2012 has shown a higher utilization of informal private schools for the poor despite Free Primary Education (Oketch, Mutisya, Ngware, & Ezeh, 2010). This is attributed to parental perception of better quality education being offered by the informal private schools for the poor. Further evidence shows that the poorest household in the informal settlements enroll their children in these private schools for the poor (Moses Waithanji Ngware, Oketch, Ezeh, & Mudege, 2009). From this evidence, the hypothesis is that poor pupils, enrolled in private informal schools perform better than those enrolled in the public schools.

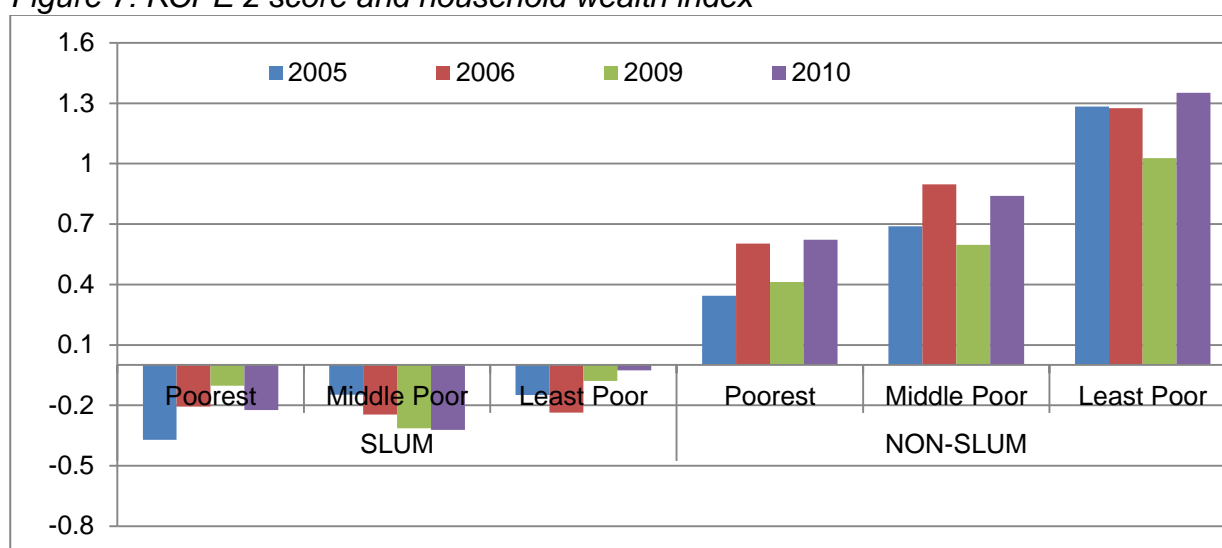
## Descriptive

Table 6: Background characteristics

Year	n	Wealth Index			Percentage in	
		% poorest	% middle poor	% least poor	Private sch.	slum
2005	393	32.06	33.59	34.35	22.65	78.37
2006	274	32.12	33.21	34.67	17.88	78.83
2009	466	33.48	33.91	32.62	33.91	81.33
2010	540	33.70	32.96	33.33	34.44	80.56

From table 6, a higher proportion of the sample was from the slum settlements. Similarly, we were able to match more pupils in government schools that were in the private schools. The wealth was calculated such that it is distributed equally within the sample.

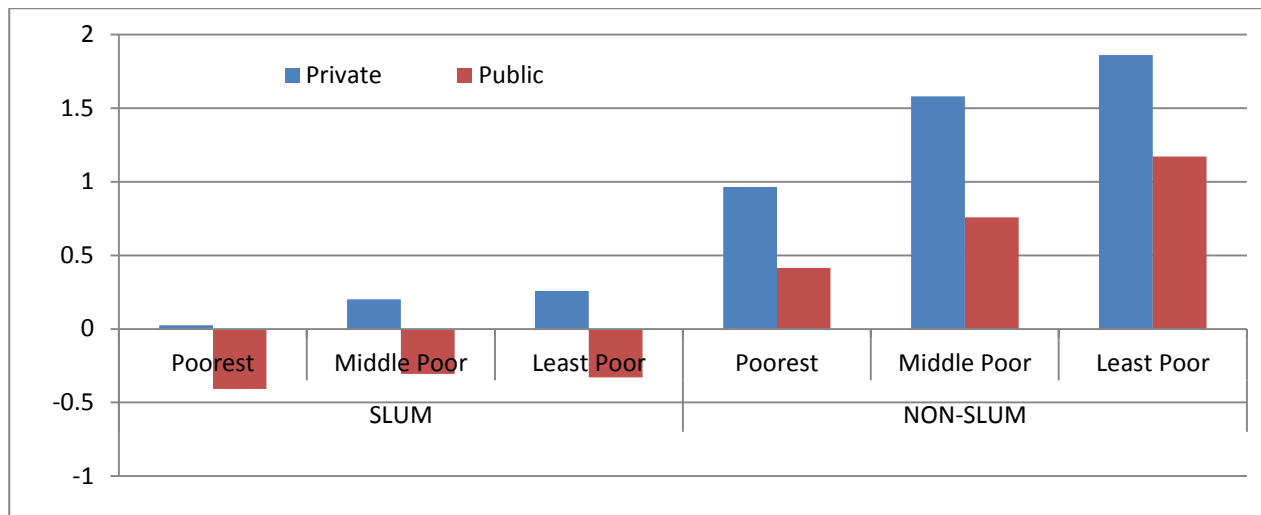
Figure 7: KCPE z-score and household wealth index



In Figure 7, we show the aggregated results for both private and public schools by residency type for the years 2005, 2006, 2009 and 2010. The overall results show that pupils from the informal settlements score lower than those from the non-slums. The least poor in the slums over the period performed better than those from poorest households. This pattern is also seen among the non-slum households as well. There are not huge differences observed over the years in each category of wealth quintile.

In Figure 8, we stratify the above by school type and report aggregates for all the years since minimal difference between the years is observed in figure 1.

Figure 8: KCPE z-score and household wealth index by school type for all the years (2005-2010)

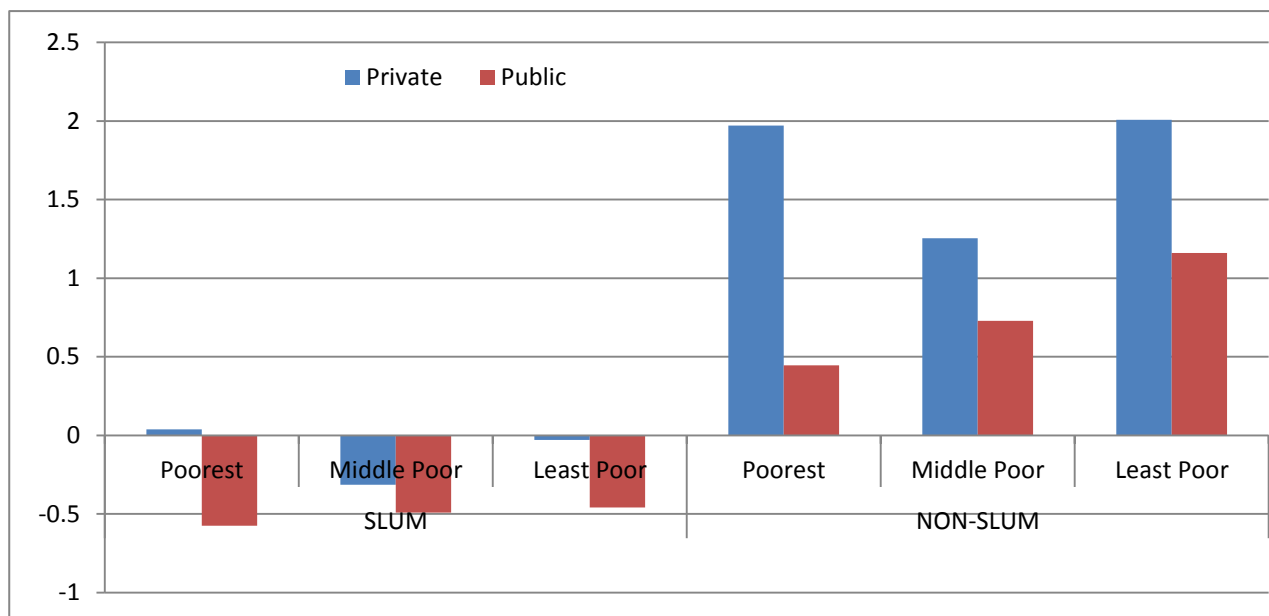


In Figure 8, among pupils from slum households, they perform poorly, and this does not differ by the household social economic status. Among those in private schools and in the slums, the least poor perform better than the middle poor and the poorest. The poorest in the low-cost private schools perform better than the least poor in the public school. The situation is different in the non-slum settlements. Increase in household social economic status in this case is associated with increase in pupil score irrespective of the school type. Pupils in private schools and from the poorest households in the non-slum perform nearly the same as those from the richest households and enrolled in public schools. It is worthy to note that the private schools in the non-slums are quite different from the low-cost private schools in the slums and hence the two cannot be compared. The private schools in the non-slum are high end academies that charge high fees and for those who enrol in

them is due to demand driven by quality perceptions (Oketch, Mutisya, Ngware, & Ezeh, 2010)

Figure 8 was further stratified by gender of the pupils (Figure 9 for girls and Figure 10 for boys). In Figure 9, girls from poorest households and from the slums and attending low cost private schools performed better than those from the middle ranked households and the least poor. In the non-slum, girls from the poorest household and in private schools performed slightly better than those from the middle poor households and were at par with those from the least poor households. In contrast, girls in public schools in the non-slum settlement, the least poor performed better than both the middle poor and the poorest. In the slums, girls in public schools performed nearly the same irrespective of the household social economic status.

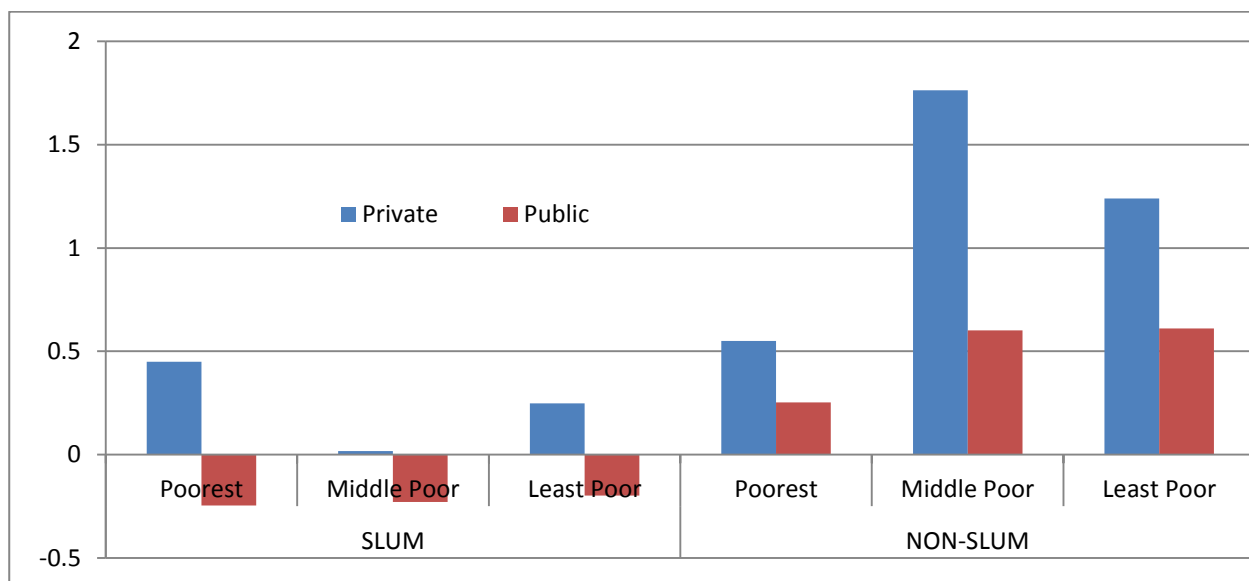
Figure 9: KCPE z-score and household wealth index by school type for all the years (2005-2010) - GIRLS



In figure 9, boys in public schools and in the slums performed nearly the same irrespective of the household wealth status; while those in private schools, the poorest performed slightly better than the least poor and the middle poor. In the non-slums, the middle poor posted better results than the poorest and least poor among the private schools. The non-slum public school shows a small difference in performance of boys by household social economic status.



Figure 9: KCPE z-score and household wealth index by school type for all the years (2005-2010) - BOYS



**Classroom Observation data: Teacher characteristics and pupil achievement**

Table 7 shows the background characteristics of Math teachers who participated in the classroom observation study – by the school ranking during sampling i.e. either consistently ranked in the top 20% in a district or bottom 20% in the same district over four years in KCPE. As expected, most of the teachers had secondary O level of education. In terms of teacher training, three quarters of the teachers had attained the minimum requirement (certificate) to teach in a primary school in Kenya. 22% of the teachers in bottom schools had no teacher training compared to 14% in top ranked schools. In-service teacher professional training from this study was uncommon, with one in every six teachers reporting to have received in-service professional teacher training in the last 18 months.

Table 7: Teacher characteristics by ranking of the schooling in KCPE performance between 2001 and 2004

Teacher Characteristics	Top schools	Bottom school
	Number (%)	Number (%)
<b>Education level</b>		
Junior Secondary Education	3 (8.33)	0 (0)
Secondary Education (O-level)	29 (80.56)	31 (86.11)
Secondary Education (A-level)	4 (11.11)	5 (13.89)
<b>Teacher Training</b>		
Untrained Teacher	5 (13.89)	8 (22.22)
Teacher Certificate	27 (75)	25 (69.44)
Diploma/Degree in Education	4 (11.11)	3(8.33)
<b>In-service teacher training (last 18 months)</b>		
None	30 (83.33)	31 (86.11)
At least once	6 (16.67)	5 (13.89)
<b>Teaching experience</b>		
10 yrs or less	11 (30.56)	15 (41.67)
Between 11 and 20 yrs	15 (41.67)	12 (33.33)
Above 20 yrs	10 (27.78)	9 (25.00)
<b>Teacher Wealth Index</b>		
Least poor	11 (30.56)	9 (25.00)
Middle	14 (38.89)	10 (27.78)
poorest	11 (30.56)	17 (47.22)

Source: Moses Waithanji Ngware et al. (2010) - also submitted for publication at IJED.

We further explored the effect of teacher characteristics on pupil Math achievement controlling for pupil and other school characteristics (Table 8). The results show the following:

- Teacher knowledge, measured by teacher performance in a math pedagogical test was associated with pupil achievement in bottom schools;
- Public schools scored significantly lower than private schools. This was consistent in the three models in Table 8;
- Increase in teacher workload measured by the number of hours a teacher is involved in teaching a week is significantly and negatively associated with pupil achievement in bottom schools;
- Experienced teachers who have taught for more than 20 years had lower pupil scores in math test compared to those who have taught for less than 10 years. This negative effect is large for bottom ranked schools, and could be the effect of lack of in-service teacher professional training to update their teaching skills, or lack of inspection to assess if teachers competencies were consistent with the current curriculum demands.

Table 8: Random effects model: Effect of teacher characteristics of pupil math achievement

	Overall n=2422 pupils; cluster=72 schools	Top schools model, n=1377 pupils; cluster=36 schools	Bottom schools model, n=1045 pupils; cluster=36 schools
<b>Fixed Effects</b>			
<b>Teacher Characteristics</b>	<b>Coef. (std. E)</b>	<b>Coef. (std. E)</b>	<b>Coef. (std. E)</b>
Teacher Math knowledge/score	0.08* (0.05)	0.06 (0.08)	0.13*** (0.03)
Teacher sex - Male ( <i>female</i> )	2.13 (1.51)	5.33* (2.93)	3.18*** (0.96)
Teaching practice -Recitation ( <i>individual seat work</i> )	1.62 (2.12)	-3.14 (4.14)	4.62*** (1.69)
Teaching practice -Whole class ( <i>individual seat work</i> )	-2.13 (1.84)	-3.91 (3.26)	-1.34 (1.25)
Availability of NBTLM ( <i>not available</i> )	1.82 (2.96)	8.49* (4.65)	-4.99** (2.05)
<b>Public school (<i>private school</i>)</b>	<b>-7.35** (2.5)</b>	<b>-13.20*** (5.22)</b>	<b>-6.59*** (1.74)</b>
Head teacher lesson observation ( <i>no observation</i> )	1.90 (1.56)	0.57 (3.18)	-0.40 (1.11)
Teacher work load: 16 - 20hrs ( <i>less than 16</i> )	-3.93** (1.87)	-2.06 (3.96)	-4.03*** (1.37)
Teacher work load: 21hrs & above ( <i>less than 16</i> )	-2.37 (2.09)	-0.54 (3.83)	-2.508
Actual duration of the lesson	0.21** (0.11)	0.07 (0.17)	0.29*** (0.08)
<b>School rank - bottom (<i>top</i>)</b>	<b>-9.25*** (1.66)</b>		
Teaching years: 11- 20 yrs ( <i>10 or less</i> )	1.14 (2.35)	10.09* (5.18)	-0.19 (1.36)
Teaching years: above 20 yrs ( <i>10 or less</i> )	-3.77 (2.53)	7.26 (6.63)	-4.07*** (1.56)
Teaching yrs * available NBTLM - 11 - 20 yrs	-0.44 (3.73)	0.58 (5.86)	1.35 (2.64)
Teaching yrs * available NBTLM - >20 yrs	11.64** (4.33)	7.86 (6.92)	7.39* (3.8)
Intercept	50.46*** (5.83)	53.86*** (10.8)	37.9*** (4.3)
<b>Random Effects</b>			
School Variance	5.34	6.11	0.92
Pupil Variance	11.2	11.88	10.2
Intra class correlation	0.18	0.21	0.01
<b>R-squared</b>			
Within	0.04	0.05	0.03
Between	0.74	0.73	0.73
Overall	0.37	0.31	0.24

Notes:

1. Significance level: \*\*\*=1%; \*\*=5%; \*=10%; NBTLM – non-basic teaching and learning materials; Std. E – Standard Error
2. Model controls for: 1) pupil characteristics – age, sex, repetition, wealth index, use of English at home; 2) school characteristics – PTR, school type and rank during sampling, class size; school safety (proportion of learners who reporting learners to hurt others while at school)

Source: Moses et al. (2010)

## Conclusion

The aim of this GMR background paper was to assess, to the extent possible, the effect of increased number of pupils taking KCPE associated with KCPE and their performance in KCPE. It was intended as trend analysis. What we have found is that the mean has remained flat over the years of analysis while the number of pupils taking KCPE has continued to rise. One explanation for this is that those who stay in the system to reach grade 8 are those who self-select and their ability is not any much different from those who were taking the examination prior to the increased enrolment. The mean remaining flat is not negative news because it does mean that FPE which can be associated with this rise in the number of pupils reaching grade 8 and taking the KCPE examination has not affected the overall mean negatively. However, we observe slight improvement in the KCPE mean score of about 3 marks.

Using the z-scores, we see that over time increase in enrolment has not led to decrease in performance. We believe this is the right measure of change in performance. This is because it measures performance over the years in relation to overall performance for the years. The mean of each year when considered against the overall mean of the all the years combined indicates that there has been improvement each year since the implementation of FPE in 2003, and the rise in the number of pupils taking KCPE. What is remarkable are the county differences. Majority of the counties cluster around modest gains in enrolment and modest improvements in mean score, comparing 2003 and 2010 in Figure 3. It is clearly noticeable that the arid and semi-arid areas have pulled apart from the rest. Majority of these counties have made gains in enrolment in terms of the number of those taking KCPE and improved performance in the mean score in KCPE, comparing 2003 and 2010. In contrast, the coastal region shows significant enrolment gains and declining performance. Kifili County in the coast, which is also considered a poor county, is the worst case.

There is differential performance by household social economic status and school type among the slums. Among the non-slums, the differences are seen mainly by school type. This is not surprising, but the main point here is that those who have ever attended private schools for the poor and are poorer perform better than those who are poorer and are in public schools. This analysis is limited to make the claim that these private schools for the poor offer superior learning outcomes, but it does show that there is something they do better that improves learning for the poorer who attend them than those who attend free

public schools. However, overall the least poor are performing better than the poor, meaning that there is unequal educational opportunity in Kenya associated with pupil's socio-economic background.

The teacher characteristics study by APHRC related to KCPE indicates that teachers had effect in low performing schools. This is because the high performing schools have household effect on learning and that schools didn't make that much difference for this group. This is worrying because majority of learners are found in the bottom performing schools. For Kenya to improve the learning outcome for majority of pupils there has to be effort directed at improving school level factors, particularly teachers pedagogical knowledge and the classroom teaching and learning processes.

To sum up, Kenya places high value in education and the Free Primary Education was a milestone in improving access to learners and keeping many more to the end of the primary cycle which is grade 8. However performance in KCPE remains dismal with mean score of less than 250 out of the possible 500 marks in the KCPE. It is nonetheless remarkable that growth in the number of candidates taking KCPE has not adversely affected the mean score, which has more or less remained flat. More research needs to be done to understand how to break this low achievement pattern that has characterised Kenya's primary education. It shows that majority of the learners are achieving below the average expected and even fewer are performing at higher standards in the KCPE. Policy wise, Kenya needs to start paying more attention to areas that improve learning outcome and raise the mean score not only in KCPE but performance overall. It may require that learning assessment is done in better way much earlier rather than waiting until grade 8, and for there to be national benchmarks that schools must be compelled to attain.

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