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EDUCATION

# STUDENT'S HOUSEHOLD CHARACTERISTICS HIERARCHICAL REGRESSION MODEL PREDICTING PUBLIC DAY SECONDARY SCHOOLS VARIATION IN EXAMINATION SCORES, KENYA

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## ABSTRACT

**Purpose of the study:** The purpose of this study was to use hierarchical regression to model the relationship between student's household characteristics and variations in examination scores in public day secondary schools Tharaka Nithi County, Kenya.
**Problem statement:** Tharaka Nithi County is one of the 29 counties classified as the arid and semi-arid lands. In addition to the government of Kenya providing free tuition in the public day secondary schools, it also facilitates lunch costs in arid and semi-arid lands together with mobilizing community to support education through national council for nomadic education. The government efforts aim to ascertain equality of opportunity in attainment of quality secondary education in public day secondary schools. Nevertheless, compared to other public day secondary schools in other Kenyan Counties, Tharaka Nithi County public day secondary schools have had the highest variations in the examinations successively for five years, 2014 – 2018. Thus, raised the question on the relationship between student's household characteristics and the variations in examination scores in public day secondary schools of Tharaka Nithi County while controlling for the other predictor variables of variations in examination scores.

**Research methodology:** Convergent parallel design, a mixed method research approach was employed. The study was conducted in the public day secondary schools in Tharaka Nithi County, Kenya. Study target population comprised of all the principals and year 2020 form 3 students and their parents or guardians. Stratified random sampling technique was used to identify 738 (368 male and 370 female) students in form 3 and their parents or guardians while purposive sampling was used to identify 15 public day secondary school principals and 63 student group interview participants (31 male and 32 female). Questionnaires, interview schedules and document analysis sheets were used to collect data. Hierarchical regression was used on the quantitative data analysis to model the relationship between student's household characteristics and variations in examination scores in public day secondary schools. Further, a case study approach thematic analysis was used on qualitative data to obtain an in-depth knowledge on the model of relationship between student's household characteristics and variations in examination scores in public day secondary schools. Research findings were presented in tables.
**Results of the study:** A statistically significant positive relationship, $r = 0.662$ at $p < .01$ between student's household characteristics and variations in student's examination scores was found. The study findings revealed that variations in students' examinations scores enlarged by 0.438 of each standard deviation of student's household characteristics. Subsequently, the study null hypothesis; no statistically significant equation for predicting variations in examination scores from students' household characteristics was rejected.
**Conclusion and policy recommendation:** The study concluded that in public day secondary schools in Tharaka Nithi County, there is a relationship between student's household characteristics and variations in examination scores. Thus, equality of opportunity in attainment of quality secondary education in public day secondary schools in Tharaka Nithi County is not ascertained. The study thus recommends that the financing of the public day secondary schools to take cognizance of the differences in students' household characteristics.

**Keywords:** *Student's household characteristics, variations in examination scores, public day secondary schools, equality of opportunity, and hierarchical regression model***.**

## 1.1 INTRODUCTION

Worldwide education for all movements advocate for inclusivity and equality of opportunity in attainment of quality education. Education inclusion and equity takes a central role in education 2030 framework for action. In support of education 2030 framework for action, globally governments make effort to address inequalities related to education access, participation, learning process and outcomes. Consistent with UIS (2018) government efforts to enable their education systems to serve all students, have prioritized students traditionally excluded from education opportunities because of their background differences. Albeit, Global Education Monitoring Report (GEMR) points that in low and middle income countries, 20% of the richest households' adolescents are three times more likely to complete lower secondary than adolescent from poor households (UNESCO, 2020). More, UNESCO (2020) notes that adolescent students from the richest households are twice as likely as those from poor households to reach minimum proficiency in reading and mathematics. According to Psacharopoulos and Patrinos (2018) review of the global literature, return rate of one extra year of schooling is about 9% a year. Psacharopoulos and Patrinos (2018) notes that both the private and social returns to schooling have stably remained

high over decades and social returns to secondary education are above 10%. They elucidate that the high private returns to higher education have raised issues of financing and equity.

UNESCO (2017) analysis on education's impact on poverty, presented that if all individuals globally attained quality secondary education, 420 million people would not be considered poor. Returns on secondary education in low- and middle-income countries are high. Secondary education is a prerequisite for acquisition of tertiary education. It bridges the primary and tertiary education. Tertiary education is associated with greater employment opportunities and higher earnings. Cerdeira *et al*. (2018) study found that scores given by secondary school teachers were better predictors of succeeding performance. Nevertheless, Patrinos and Psacharopoulos (2020) in their recent study found that learning outcomes are significant in both determining the kind of tertiary education and earnings attained. Previously, Polcyn and Gawrysiak (2017), and World Bank (2005) research on secondary education learning outcomes maintained that secondary learning outcomes were positively interrelated with individual lifetime earnings. They explained that secondary education enhanced accumulation of human capital and consequent economic growth and development in a society.

Therefore, given the significance of the role of secondary education learning outcomes both to an individual and the society, equality of opportunity in secondary education attainment is of greater significance. Equality of opportunity in attainment of education is exemplified by lack of relationship between characteristics in students' household, parental/guardian, school resources and variations in learning outcomes indicated by examination scores (UIS, 2018). Equity in education financing guarantees equality of opportunity in attainment of quality learning outcomes (Baker & Levin, 2014). Consistent with Rakabe (2016) equity in education financing is demonstrated by the fairness and justice extended to all individuals willing to attain education, in resource distribution. Malusa (2017) argues that equity concept requires that resources are distributed taking consideration of unique individual needs.

A school funding formula is used in many developed countries when allocating government finances to students. In the Organization for Economic Co-operation and Development (OECD) member countries, the education funding formula comprise of five variables; student number, level, needs, curriculum and school characteristics (Konow, Saijo & Akai, 2016). Such kind of education funding formula depicts equality of opportunity in attainment of education learning outcomes as illustrated in the Program for International Student Assessment (PISA) scores (OECD, 2018). PISA evaluates problem unravelling and cognitive skills on 15-year-old students in all the OECD member countries. In line with OECD (2018), Finland and Estonia are graded among the countries with the highest PISA scores in the three assessed subjects; mathematics, science and reading. More, OECD (2018) points that Finland and Estonia education system depict equality of opportunity in attainment of quality learning outcome since student's variations in PISA scores were not found to relate to their differences in household, parental/guardian and school resource characteristics.

International Budget Partnership (2017) indicate that education in South Africa, is funded on equitable basis. Fee payment exemption is provided to needy parents and that schools are allocated finances depending on the necessity. Southern and Eastern Africa Consortium for Monitoring Educational Quality (SEACMEQ) endeavors to establish research-based policy in the South and East African countries (Hungi, 2012). In its research findings, Kyriakides *et al* (2017) recounts

that best performing education systems in Southern and Eastern African countries demonstrate equality of opportunity in attainment of quality education outcomes. Students' variations in examination scores were not found to relate to their differences in household, parental/guardian and school resource characteristics.

Unlike its neighbors, Uganda and Tanzania, Kenya employs the concept of equity in financing its secondary education. Free Day Secondary Education (FDSE) policy announced in 2008 presented a maximum secondary education charge for Public Day Secondary Schools (PDSS) of Ksh. 22,244. Moreover, the Kenyan government espoused various strategies to support lunch costs in PDSS. This was through School Health Policy and National Education Sector Plan (NESP) 2013-2018 recommendation on establishment of home-grown balanced school meals (Republic of Kenya, 2016). In Arid and Semi-Arid Lands (ASALs), the Ministry of Education Science and Technology (MOEST) implement School Feeding Programmes (SFPs) together with World Food Programme (WFP). Through the National Council for Nomadic Education in Kenya (NACONEK) under the nomadic policy, the government of Kenya mobilize community education support on school lunch and eradication of cultural practices inhibiting attainment of quality and equitable learning outcome in ASALs (Republic of Kenya, 2009).

Nevertheless, the Kenya National Examination Council (KNEC) Data, in the period (2014 – 2018) illustrate that the best performed PDSS in Kenya has had an average mean score of 7 points (C+) and the least performed PDSS a mean score of 2 points (D-), a variation of 5 points (KNEC Data, 2018). In the same period successively (2014–2018), Tharaka Nithi County, one of the 47 Counties and 29 Kenyan counties classified as the arid and semi-arid lands PDSS maintained highest variations of an average of 5 points in KCSE mean scores. Same as the national variation in the PDSS in KCSE mean scores. It is thus against this background, that this study sought to model the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS, controlling for the household, parental/guardian and school resource characteristics.

## 1.2 STATEMENT OF THE PROBLEM

Since 2008, the Kenyan government has invested heavily in realizing equality of opportunity in attainment of quality secondary learning outcomes. In addition to providing free tuition in PDSS, in the ASALs, the Kenyan government together with the World Food Programme (WFP) facilitates School Feeding Programmes (SFPs) to subsidize on the PDSS student lunch cost. The Kenyan government works through NACONEK to motivate the community education support. Its efforts aim to counterbalance the relationship between the differences in PDSS student's household, parental/guardian and school characteristics and variations in PDSS examination scores.

Nevertheless, compared to other public day secondary schools in other Kenyan Counties, Tharaka Nithi County public day secondary schools have had the highest variations in the examinations successively for five years, 2014 – 2018. Tharaka Nithi County is one of the 29 counties classified as the arid and semi-arid lands. Like in other ASAL counties, the Kenyan government facilitates SFPs, and mobilize the community education support through NACONEK. Thus, the variations in Tharaka Nithi County PDSS raise the question on equality of opportunity in students' attainment of secondary learning outcomes. This study was conducted to establish the relationship between student's household characteristics and the variations in examination scores in PDSS of Tharaka

Nithi County, while controlling for the differences in parental/guardian, conduct and school characteristics.

### 1.3 RESEARCH OBJECTIVES

To model the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS.

### 1.4 HYPOTHEIS

$H_O$: There is no statistically significant relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

### 2.1 THEORITICAL REVIEW/ FRAMEWORK

This study was grounded on theory of justice and Education Production Function (EPF) model. The theory of justice was advocated by John Rawls, in 1971 Rawls (1999) and Education Production Function (EPF) model by Bowles (Hanushek, 1979). Rawls theory of justice argue for justice as fairness to all individuals in the society. Theory of justice liberty of opportunity principle, states that all people have equal right to opportunities accessible in society (Rawls, 1999). Also, theory of justice difference principle points that societal interventions should provide greatest benefit to those already deprived. The EPF model explains knowledge production process and learning outcomes as the outputs (Hansen, 1970).

Theory of justice was employed in this study to aid understanding of the efforts employed by the Kenyan government in providing equality of opportunity in attainment of secondary learning outcomes through PDSS. In keeping with Wakwabubi *et a*l. (2016), students enrolled in PDSS in rural areas come from deprived households. Nevertheless, students' variations in PDSS KCSE discredit equality of opportunity value of equity in PDSS students' education outcomes. Further, the EPF model was employed in the study to describe the practical interaction of the education inputs through teaching and learning process in the PDSS to yield education production output that is learning outcomes summarized as the examination scores. Moreover, both the theory of justice and the EPF model guided the variable entry in hierarchical regression analysis. In modelling student's household characteristics using hierarchical regression, contributions of students' differences in parental/guardian, conduct and school characteristics on PDSS student's examination scores were controlled. As a result, the theory of justice and the EPF model guided the study variable entry during analysis.

### 2.2 CONCEPTUAL FRAMEWORK

The study conceptualized the independent, moderator and dependent variable. The study independent variable was the student's household characteristics. The government of Kenya finance PDSS supply side, with the assumption that the demand side, characterized by the student's household characteristics will be neutralized thus will have no relation with the variations in the PDSS students' examination scores. Examination scores in this study indicate the student academic achievement. Variations in the PDSS students' examination scores were conceptualized as the dependent variable. Also, the study conceptualized student's gender and category of primary school student attended as the moderating variable.

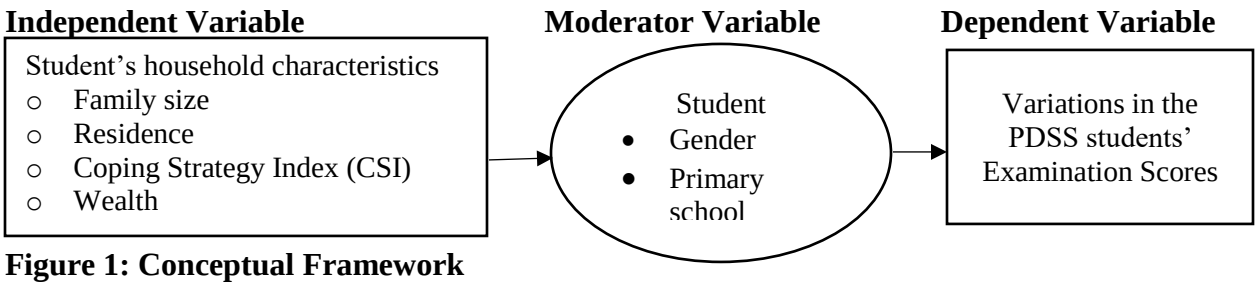


**Figure 1: Conceptual Framework**

### 3.1 RESEARCH METHODOLOGY

Mixed method research approach, convergent parallel design was employed in this study. Quantitative and qualitative data was collected in parallel, equally weighed, analysed independently and the results were interpreted together. The study was conducted in public day secondary schools Tharaka Nithi County, Kenya. The study target population comprised of 9,495 Form 3 students (4,611 boys and 4,884 girls) and 72 PDSS principals in the 72 PDSS. School lists obtained from the County Director of Education (CDE) were used as the sampling frames. While sampling the quantitative study subjects, proportionate stratified random sampling was used since the study participants were differentiated in location and gender. In identifying qualitative study participants, purposive sampling was used. The qualitative study participants were included in the larger quantitative sample to ensure comparison. Gay (1992) small sample proportion, 20% sample size was used to compute the number of PDSS in Tharaka Nithi County to participate in the study. Cochran equations were used to compute study participants quantitative sample size while the criterion sampling was used to determine the qualitative study participants sample size. Questionnaires were used to collect quantitative data while the interview schedules were used to collect qualitative data. Hierarchical regression was used to model the relationship between students' household, characteristics and variations in students' learning outcomes. Model findings were further explained by thematically analysed qualitative data.

### 4.1 RESULTS

**Quantitative Data Analysis Results**

The study sought to model the relationship between student's household characteristics and variations in examination scores. Student's household characteristics was operationalized as family size, residence, Coping Strategy Index (CSI) and wealth approximation. Students indicated their family size as the sum numeral of individuals they eat, drink and sleep with in the same household; residence as their household closeness in terms of approximate distances to the social amenities; Coping Strategy Index (CSI) as the food availability in the household and wealth approximation as the availability of assets in their household.

**Table 1: Description of Student's household characteristics**

| Indicators | N | M | SD | SK | Kur |
|---|---|---|---|---|---|
| Students residence | 705 | 1.82 | .640 | .396 | -.908 |
| Coping Strategy Index (CSI) | 705 | 5.39 | 2.535 | -.579 | -1.139 |
| Wealth approximation | 705 | 2.03 | 1.022 | .946 | -.600 |
| Family size | 705 | 1.67 | .519 | -1.245 | .525 |
| Computed Students household characteristics | 705 | 2.73 | 1.993 | -.431 | -.630 |

**NB:** N=Student sample, M=Mean, SD=Standard Deviation, SK=Skewness, Kur=Kurtosis

Table 1 illustrates that computed students' household characteristics differed from each other as the standard deviation was larger than 1, (M = 2.73, SD = 1.993). Also, students' indication of food availability at their household was not homogeneous as indicated by the CSI and their wealth approximation indications as revealed by a standard deviation greater than 1, (M = 5.39, SD = 2.535) and (M = 2.03, SD = 1.022) respectively. Table 1 demonstrates that both the skewness and kurtosis statistics values specify a normal distribution of the student's indication of their household characteristics (SK = -0.431, Kur = -0.630) less than +1.0. However, student's indications of their family size distribution skewed to the left as the SK = -1.245, greater than -1, denoting that most students indicated that their family size was small. Partial correlation analysis was conducted to establish the inter-relationship between indicators of students' household characteristics. Table 2 illustrates the correlation matrix.

**Table 2: Correlation on Student's household characteristic indicators**

| Indicators | 1 | 2 | 3 | 4 | 5 | N |
|---|---|---|---|---|---|---|
| 1. Family size | - | | | | | 705 |
| 2. Residence | .664* | - | | | | 705 |
| 3. Coping Strategy Index | .708* | .703** | - | | | 705 |
| 4. Wealth Approximation | .696* | .842* | .879* | - | | 705 |
| 5 Computed students household characteristics | .783** | .858** | .891** | .773** | - | 705 |

*Correlation is significant at $p < .05$ (2-tailed)
**Correlation is significant at $p < .01$ (2-tailed)

The findings presented in Table 2 show that correlations between indicators of students' household characteristics were statistically significant, strong and positive. Coping Strategy Index and Wealth approximation had the strongest correlations statistically significant at $p < .05$ since ($r = .879$, $p = .013$), trailed by a statistically significant relationship between Residence and Wealth approximation, at $p < .05$ since ($r = .842$, $p = .021$). Family size and Residence were found to have the weakest but statistically significant correlations at $p < .05$ since ($r = .664$, $p = .038$). More, computed students' household characteristic was found to have strong positive statistically significant correlation with all the indicators at $p < .01$. High inter-correlations on the students' household characteristic indicators confirmed that they were considerably alike and that they measured students' household characteristics.

In modelling the relationship between student's household characteristics and variations in academic achievement, the effects of other variables such as the student's parental/guardian, conduct and school characteristics were controlled. Controlling of the other variables and

modelling of the relationship between student's household characteristics and variations in academic achievement was aided by hierarchical regression analysis. Table 3 illustrates a summary model of the students' household characteristics and variations in examination scores.

**Table 3: Hierarchical multiple regression analysis summary model of student's household characteristics and variations in examination scores**

| Model[f] | R | $R^2$ | $\Delta R^2$ | $\Delta F$ | $\Delta df1$ | $\Delta df2$ | Sig.$\Delta F$ |
|---|---|---|---|---|---|---|---|
| 1 | .025[a] | .001 | .001 | .215 | 2 | 702 | .807 |
| 2 | .790[b] | .625 | .624 | 116.092 | 1 | 701 | .000 |
| 3 | .818[c] | .669 | .044 | 93.053 | 1 | 700 | .000 |
| 4 | .931[d] | .868 | .199 | 105.714 | 1 | 699 | .000 |
| 5 | .962[e] | .926 | .059 | 555.905 | 1 | 698 | .000 |

a. Predictors: (Constant), Category of primary school attended, Gender;

b. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics;

c. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics;

d. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, School Resource Characteristics;

e. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, School Resource Characteristics, Students Household Characteristics

f. Dependent Variable: Variations in examination scores

(N = 705)

Table 3 explains a five-stage hierarchical multiple regression model result summary examining the relationship between student's household characteristics and variations in examination scores after controlling for the effects of student's parent/guardian characteristics, conduct characteristics, and school resource characteristics. In addition, moderator variables which included student's gender and category of primary school attended were also controlled for.

Model 1 showed in Table 3 with student gender and category of primary school attended had R value 0.025, thus a positive relationship with variations in students' examination scores. However, the relationship was weak. The $R^2$ (0.001 or 0.1%) was not statistically significant at F (2, 702), $p > .05$; thus, confirmed that the moderating variables did not predict variations in students' examination scores.

Model 2, with moderating variables and students' parental/guardian characteristics had R of 0.790 and change of $R^2$, 0.624. The change in $R^2$ was statistically significant at F (1, 701) = 116.092, $p < .01$. Students parental/guardian characteristics could therefore account for 62.4% of the variance in students' examination scores in this model.

Model 3, with moderating variables, students' parental/guardian characteristics and student conduct characteristics had a R value 0.818, with a change in $R^2$ (0.044 or 4.4%). The change in $R^2$ was significant at F (1, 700) = 93.053, p < .01. Thus, Student Conduct Characteristics in the model could account for 4.4% of variance.

Model 4, with moderating variables, students' parental/guardian characteristics, student conduct characteristics and school characteristics had R value 0.931. It had a change in $R^2$ (0.199 or 19.9%) significant at F (1, 699) = 105.714, p < .01. Thus, school resource characteristics in the model could account for 19.9% of the variance.

Model 5, with the moderating variables, students' parental/guardian characteristics, student conduct characteristics, school characteristics and student's household characteristics had R value 0.962. It had a change in $R^2$ (0.059 or 5.9%) significant at F (1, 698) = 555.905, p < .01. Thus, controlling for all the other predictor variables, student's household characteristics in this model account for 5.9% variance in students' examination scores.

**Hypothesis Testing**

The study advanced the following null hypothesis:

$H_O$: There is no statistically significant relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

To test this hypothesis, a summary of hierarchical regression analysis for students' household characteristics prediction on variations in examination scores partial correlation coefficient was studied. Table 4 below demonstrates the results.

**Table 4: Relationship between student's household characteristics and variations in academic achievement**

| | B | Beta | t | Sig. | Partial Correlations |
|---|---|---|---|---|---|
| Students Household Characteristics | .433 | .438 | 23.578 | .000 | .662 |
| Dependent Variable: Variations in Examination Scores | | | | | |
| | | | | | (N = 705) |

Table 4 demonstrates that there was a statistically significant positive relationship, r = 0.662 at p < .01 between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. The study rejected the null hypothesis since the findings could not support it. It was thus concluded that students' household characteristics were significantly related to variations in students' examination scores.

**Qualitative Data Analysis Results**

Students' in PDSS from large family sizes reported that they lacked sufficient food thus attended school hungry and performed poorly in examinations. All the PDSS principals and the students in the group interviews explained that students' family sizes differentiated students' examination scores when the family had inadequate resources. They confirmed that despite the family size,

availability of food determined how well a student did in school. All the students in the group interviews and seven PDSS principals recounted that students from large family sizes with inadequate resources sought employment to raise funds for their basic needs.

Tharaka North and Tharaka South Sub-Counties PDSS principals acknowledged that their schools on termly basis received one bag of maize and beans. They however said that the food donation received was not sufficient for all students enrolled in their school. Consistent with these principals, received food donation did not caution students from incurring school lunch cost expenses. Considerable number of students in the PDSS had difficulty in meeting everyday food cost. This was confirmed by all the PDSS principals and 54 students in the group interviews.

Thirteen PDSS principals and sixty students in the group interviews observed that most students whose households were far from the school did better in their examination scores compared to those students whose households were near the school. However, eleven principals and 45 students in the group interviews explained that long distances to school contributed to students' indiscipline and poor performance. They further explained that because of the long distances to school, most of the students hosted by relatives performed poorly since they were assigned other home chores limiting their time to study at home. One PDSS student in the group interview stated the following:

> "I stay with my uncle's family which neighbors' this school because my home is far and am not able to travel to this school every morning without getting late. I would say my performance in examination has been declining because in my uncle's home am expected to feed his cows and goats sometimes in the evening when I leave school and other times during the weekends. I have little time to study" (PDSS Student Group Interview 5, 2020).

All the PDSS principals and students in the group interviews explained that most of the few PDSS students from the rich households did much better than PDSS students from poor households. They said that PDSS students from poor households did not have supportive study environment in their household. PDSS students from poor households lacked lighting equipment at night to help students do their school assignment thus they performed poorly in their examinations. This finding was supported by 13 PDSS principals and 59 students in the group interviews. One of the PDSS principals stated the following:

> "Some students' homes lack lighting at night therefore they are not able to do teachers' assignments, they also lack a seat or a chair for the student to work on, such students perform poorly in school and their examination scores are always lower than of those who have proper lighting in their homes at night" (PDSS Principal 9, 2020).

**Comparison and relation of Quantitative and Qualitative data analysis results**

General, the study found that students' household characteristics contributed 5.9% of the variance in students' examination scores after controlling for the consequence of other predictor variables. It established a statistically significant positive relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. The study also established that differences in student's family resources resulted to differences in extent to which students' family size contributed to variations in examination scores in PDSS.

Student's household characteristics indicators were found to correlate strongly with each other. In addition, availability of food at the household was most associated with household wealth approximation. Student's family size, food availability, wealth approximations and residence were reported to contribute to variations in student's examination scores. Study respondents indicated that government food donation was not sufficient for PDSS students thus resulting to students sustaining lunch cost. Subsequently, lunch cost in PDSS contribute to students' absenteeism. Students not attending school regularly because they cannot afford lunch fee regularly perform poorly.

**5.1 DISCUSSIONS**

Although most of the PDSS student's household characteristics likened, some PDSS students' household characteristics were diverse. This finding concurred with Huisman and Smits (2017) theoretical review finding in 30 developing countries on evidence that academic achievement was influenced by differences in household level factors and that students' household level factors depended on the context characteristics such as residence. Students' household characteristics were indicated by among other indicators student's residence. Strong, positive and statistically significant correlations between the indicators showed that they measured students' household characteristics. This study found a statistically significant positive relationship between student's household characteristics and variations in student's examination scores. Students' household characteristics predicted variance in PDSS students' examination scores. The study findings differed from earlier conclusions by Kariuki (2017) that family characteristics, operationalized as household characteristics, did not relate to form two students' achievement motivation in Nairobi County slum areas. The present study finding differences could be attributed to differences in participant characteristics. In this study, all the participants were form 3 students in the Kenyan rural set up unlike the participants in Kariuki (2017) study who were from an urban set up. Therefore, involvement of participants from different setups could result to dissimilar findings.

The study found that student's residence, an indicator of students' household characteristics, contributed to variances in PDSS students' examination scores. In Tharaka Nithi County PDSS, students from the rich households had better examination scores compared to those from poor households. These study findings allied with Wodtke (2016) conclusions on investigation of conditional effects on reading and mathematics capabilities. Wodtke (2016) concluded that changes in students' residential areas, whether advantaged or disadvantaged neighborhoods, had impact on students' academic achievement.

The government food donation in semi-arid sub-counties in Tharaka Nithi County PDSS did not caution PDSS student's weight of lunch costs. Thus, the study found that government intervention on food donation to PDSS did not prevent effect of the differences in PDSS students' household characteristics on the variations in examination scores. Variances in student's household food availability were associated with the variations in examination scores. The study results coincided with the findings made by Faught *et al* (2017) that low household food security is related with poor academic achievement. The difference however between the two studies is that the present study was conducted in a developing country, Kenya while Faught *et al* (2017) study was conducted in a developed country Canada.

The study found that differences in household wealth approximation differentiated PDSS students' examination scores. Household wealth approximations were also found to relate to PDSS student's

home conduciveness during their home study and ability to afford lunch cost required at school. PDSS students who approximated their household wealth highly were observed to attend school more regularly and attain high examination scores. These study findings reinforced Gustafsson *et al* (2018) findings which found that student's socio-economic status was the strongest factor of the variances in students' educational achievement. In Gustafsson *et al* (2018) study, student's socio-economic status was operationalized as household size and income. Nevertheless, Gustafsson *et al* (2018) study was conducted in countries participating in TIMSS but the present study was conducted in a country that is a non-participant in TIMSS.

Although large family size was found to contribute to the differences in PDSS student's examination scores, large family sizes with more wealth approximations were found to perform equally or sometimes better than PDSS students from small family size. Correspondingly, Azumah *et al*. (2017) case study in Kumasi Ghana, stated that large family sizes with financial problems enrolled students late in school and that the students performed poorly. However, unlike Azumah *et al*. (2017) study which employed qualitative data, the present study employed mixed methods research approach convergent parallel design to model the relationship between students' household characteristics and variations in examination scores.

## 6.1 CONCLUSIONS

Controlling for the student's parental/guardian, personal and school characteristics as well as the moderating variables, student's household characteristics are related to variations in examination scores in Tharaka Nithi County PDSS. Consequently, PDSS student's household characteristics were found as a predictor of variations in PDSS students' examination scores in Tharaka Nithi County. The model on the relationship between student's household characteristics and variations in examination scores predicts more than 5% of the PDSS variations in examination scores. Government efforts of ensuring equality of opportunity in attainment of quality learning outcomes in PDSS did not yield results in Tharaka Nithi County PDSS. Therefore, students attending PDSS in Tharaka Nithi County have no equal opportunity in attainment of quality learning outcomes.

## 7.1 RECOMMENDATIONS

This study found that variances in PDSS student's household characteristics indicated by family size, residence, Coping Strategy Index and wealth approximation related to and projected variations in PDSS students' examination scores. This challenged the principle of equality of opportunity in the realization of secondary education. This study thus recommends reconsideration of PDSS financing policy. The study recommends that the PDSS financing policy should consider the differences in PDSS students' household characteristics so as to repress the prediction of variations in examination scores by the PDSS student's household characteristics. This would consequently guarantee equality of opportunity in attainment of quality secondary education outcome among students in Tharaka Nithi County PDSS.

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