SCHOOL OF HUMANITIES

Masters

A LEXICAL – SEMANTIC ANALYSIS OF THE LANGUAGE OF THE LESBIAN, GAY BISEXUAL AND TRANSGENDER COMMUNITIES IN NAIROBI CITY COUNTY, KENYA

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This study undertook a lexico–semantic analysis of the language of Lesbian, Gay, Bisexual, and Transgender (LGBT) speech community in Nairobi. It sought to achieve the following objectives: Identify and describe the lexical items used in specific ways by the LGBT speech community; to determine the word formation processes involved in the development of lexical items in the language used by the LGBT speech community and finally, to identify the Socio-psychological factors that govern the use of those particular lexical items by the LGBT speech community. The study utilized a purposive sample of 44 participants who were members of the LGBT community. Data was collected using a brain storming session, questionnaires administered to all the participants, an interview with the leaders of the various categories in the entire LGBT community and also the researcher's participation in the WhatsApp group whose membership drew from the categories of the LGBT. Guided by Carol Myers-Scotton (1993) Markedness Model (MM), data from respondents was analyzed in various ways. Data from questionnaires was analyzed descriptively and presented in terms of percentages and frequencies while data from the interviews, brain storming session and the WhatsApp conversations was presented in form of a list of lexical items together with some qualitative verbatim expressions that provided a context within which the semantics of such lexical items can be appreciated. The findings indicated that lexical items commonly used by the LGBT speech community are in seven broad categories including those describing sex roles/acts, those that are discrete/unique to the speech community, those that describe the sex organs/body physique, those that identify the various categories of the LGBT from their mode of dressing, those that reveal the socio-economic status of the members of the LGBT community among others. The study also established that the main word formation processes involved in the LGBT lexicon mainly include; same word acquiring different meaning, borrowing, coinage, compounding, acronyms, abbreviations, blending and clipping. Finally, the study revealed that the main socio-psychological factors that influence the use of the LGBT lexicon include the creation of a sense of belonging and to conceal their identity for fear of arrest, oppression or stigmatization. Findings indicated that the formation of the LGBT lexical items follows similar processes like any other mainstream languages hence there is every possibility for the lexicon to develop into a discrete language, despite the social stigma associated with its speakers.

KIKAMBA LANGUAGE SHIFT AND ENDANGERMENT IN AN URBAN UPMARKET SETTING: A SOCIOLINGUISTIC ANALYSIS

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The purpose of this sociolinguistic study was to investigate Kikamba language shift/maintenance and to identify attitudes towards Kikamba among Kamba parents and their children in an urban upmarket in Nairobi. Another aim was to determine the evidence and nature of Kikamba language endangerment among the Kamba children. The study took an eclectic theoretical approach; Gaelic Arvanitika Model (GAM) by Sasse (1992) and the Marked Bilingualism Model by Batibo (2005). Qualitative and Quantitative methods were used to collect and analyze data. It also used a combination of research instruments namely; questionnaires and participant observation to collect data on language attitudes and language choice. A semistructured interview was used to collect data on decline in knowledge of the basic vocabulary of kinship terms within the Kikamba lexicon among the Kamba children. The informant sample consisted of 24 respondents; 12 parents and 12 children. The results indicate Kikamba in an urban upmarket is losing its territory; children speak English followed by Kiswahili. Kikamba is considered as having little socioeconomic value and a lot of its native words are ceasing to exist making it quite susceptible to endangerment. The results of the research thus augment language shift and endangerment studies done on the major indigenous languages in Kenya. They will also help researchers and policy makers in the formulation of clear language policies to revitalize shifting and dying languages in urban centres, they will also empower indigenous communities to perceive language shift/maintenance as a phenomenon they can control through their attitudes towards language choice. Language is a marker of identity and by documenting and recommending its maintenance, this work will contribute in saving this rich heritage.

TRANSFORMATION OF FEMALE CIRCUMCISION AMONG THE KIPSIGIS OF BOMET COUNTY: KENYA; 1945-2014

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Female Circumcision (FC) has been an issue of debate globally in the recent past, with intense campaigns against the practice. A practice that was initially carried out in many communities in the world, started facing hostility from the legal and human rights activists as a violation of human rights. Nevertheless, this practice has persisted even after the ban globally in states such as New Zealand, and most African nations including Kenya. Owing to the prohibition of the practice of female circumcision, other communities have come up with alternative rites of passage, educational programs that comprise of the girls being secluded and given specific instructions instead of the cut. Female Circumcision has undergone significant changes regarding rituals, the practice itself and the significance of the act among the Kipsigis. These changes have come along with educational, religious and activists programs. The study was necessitated by the controversies surrounding FC between the fight against the practice and the conservatives who advocate for upholding the practice as part of their culture thus the need to preserve it. This study focused on the transformation in Female Circumcision among the Kipsigis of Bomet County in the period 1945-2014. It began by interrogating the significance of Female Circumcision among the Kipsigis community. Secondly, the study sought to examine the impact of Christianity on FC among Kipsigis and thirdly, it investigated the changes and continuities of Female Circumcision practice among the Kipsigis since independence to 2014, given the intense campaign against Female Circumcision and the introduction of the new Kenyan constitution that has been more elaborate against the practice. Functionalism Theory guided the study. Both primary and secondary data were used in the study. Descriptive research design was applied in the study; both qualitative and quantitative approaches were used. However, a qualitative approach was the primary approach. Purposive and snowballing sampling techniques were used in selecting the research participants. The findings indicated that female circumcision played a key role as a mark of transition from childhood to womanhood among the Kipsigis. The ceremonies and teachings that accompanied it were imperative in the construction of a woman and preparing her for wifely roles. Additionally, it was noted that the missionary penetration in Rift Valley impacted on FC among the Kipsigis. Christianity termed FC as barbaric and primitive practice thus, to be done away with. However, despite such campaigns against FC, it still continued in a less intense manner. The findings also indicated that after independence, FC was declared illegal in Kenya and new forms of the practice emerged. The places, circumcisers, tools, and rituals that are used in the entire exercise changed over time. Accordingly, if the war against FC continues the practice is likely to be extinct in the near future. The study is significant because it enriches the historiography of gender studies as well as act as an impetus to studying Female Circumcision among other communities. The study results are helpful as far as Female Circumcision-related policy formulation and implementation are concerned.

A MORPHOPHONOLOGICAL ANALYSIS OF NOUNS BORROWED BY KISWAHILI AND HAUSA FROM ARABIC

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This study is a morphophonological analysis of some nouns borrowed by Hausa and Kiswahili from Arabic. Despite the fact that Hausa and Kiswahili belong to different linguistic families and are spoken in such distant areas of Africa they share a special historical background. The three main objectives of this research are: to identify the Kiswahili and Hausa nouns borrowed from Arabic; to determine the word formation processes applied in the Hausa and Kiswahili nouns borrowed from Arabic; to determine the morphophonological differences between the adaptation of nouns borrowed by Kiswahili and Hausa from Arabic. The research respondents are selected Kenyatta University students from both West and East Africa. The source of data for this research used was written literature. Informants who are native speakers of Hausa and Kiswahili speakers had also been used to supplement or justify the data generated; the study narrowed itself on nouns only, a hundred (100) loanwords were collected and analyzed within the framework of the Optimality Theory (OT) which accounts for loanword adaptations using internal phonological grammar of the borrowing language only. The presentation of the data analysis of this research was based on loanword adaptation in the two languages that depends on three repairs that is vowel epenthesis, consonant deletion, and feature change respectively. The analyses revealed that in dealing with disallowed codas and consonant clusters, three main strategies: insertion, deletion and feature change were applied in order to satisfy highly-ranked markedness constraint in Hausa and Kiswahili. In a few examples, however, faithfulness prevails over markedness, leading to change in the phonology of Hausa and Kiswahili. The findings of research have implications on the expansion and growth of the two languages as the research discusses phonological and morphological modification of which loanword makes languages develop their vocabulary. Finally, the research endeavored to show that morphophonology is involved in the adaptation of Hausa and Kiswahili from Arabic.

READING ABILITIES OF CLASS FOUR LEARNERS OF ENGLISH IN FOUR SELECTED SCHOOLS IN THARAKA-NITHI COUNTY, KENYA

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The importance of reading skills in today's society is great since one has to rely on reading to get information from many sources. This study focused on assessment of learners' reading abilities in rural areas of Maara sub-county in Tharaka-Nithi County. This provided insight into the reading abilities of learners during their early grades in primary schools since the main objectives of this study is to assess the reading abilities of class four learners in rural areas, to assess reading readiness in using English as the language of instruction, and to determine challenges faced by class four pupils in reading of English. The study used EGRA sub-tasks and teachers' interview schedules in collecting data. The bottom up theory of reading by Flesch and Gough (1985) was used in the study in order to achieve the objectives. The study used qualitative research design. The sample size included 44 respondents, 40 learners and 4 teachers of English, who were sampled purposively and systematically. Data was analyzed and presented using Microsoft Excel pivot tables and graphs. The findings of the study showed that class four learners in Tharaka-Nithi County face challenges in reading and comprehending materials of their level. The learners have not acquired the reading skill because they are below the oral fluency national benchmark proposed by RTI in 2010. These findings show that these learners are not ready to use English as their language of instruction. This study emphasizes on the need to expose learners to numerous reading materials so as to build new vocabularies. Learners should also be assessed individually so as to establish individual challenges in reading and deal with those challenges.

CHANGE AND CONTINUITY IN WOMEN SELF-HELP GROUPS IN MARAGUA, KENYA; 1895-2013

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Since the pre-colonial period, women have been organising themselves in diverse ways. This study sought to examine the transformation of women self-help groups in Maragua, Murang‟a County from 1895 to 2013. The study examined women experiences in their self-help groups evaluating how they have evolved and remained resilient in the wake of changing times, adapting and adjusting accordingly. 1895 is a significant year because Kenya became a British protectorate and consequently there was social change that disrupted traditional structures, especially women self-help groups. The study ends in 2013 with a focus on recent changes in women self-help groups. The study objectives were: to examine the political and socio-economic women organizations in Maragua in the pre-colonial period up to 1895, examine the impact of colonialism on the growth of women self-help groups in colonial Maragua from 1895 to 1962. This study also interrogated the transformation of women self-help groups in the first two decades of independence in Maragua from 1963 to 1985 and to investigate the emerging trends in women self-help groups in Maragua from 1986 to 2013. The analysis of the primary and secondary data was done using patriarchy and resilience theories. Qualitative approach was used in the study. Oral interviews were conducted in the study area. A total of 60 respondents were interviewed. Annual reports of the province and district from the Sub-County Social and Development officer, the Kenya National Archives and the Jomo Kenyatta Memorial Library Archives provided significant primary data. Secondary data was gathered from written works both published and unpublished such as books, theses, journals, periodicals as retrieved from The Post Modern Library, The Jomo Kenyatta Memorial Library. The data was analyzed and interpreted using diachronic and synchronic approaches. The study found out in the pre-colonial period that women organized themselves in groups. Colonial penetration and missionary work altered the day to day activities of the women. Many men were either killed or taken away in to exile. Women were not left out in the struggle for independence as they were also active in the fight, others came together to give supplies to the men. Additionally, women took care of their homes in the absence of the men. *Maendeleo ya Wanawake* was formed in 1952 as a way of diverting women from the independence struggle. However on gaining independence the government did not reward their efforts accordingly and so women came and pooled resources together. They joined dance groups for entertaining the former president Jomo Kenyatta through groups like *Nyakinyua* and *Kang'ei* self-help groups and bought land. With time there were the *Mabati* groups and later home improvement self-help groups that bought cups, plates, *sufurias*, mattresses, beds, blankets, sofa sets among other household goods. They had „merry-go round‟ activities and these activities spread and they started income generating activities and table banking. These groups have enabled them buy land, shares, set up businesses and educate their children. The study further revealed that women later started coming together to go „seek blessings from parents‟ through *kamweretho*. The latter has been viewed with suspicion from men but with time men have also joined in groups to assist each other pay bride price.

1   LA PLACE DES DOCUMENTS AUTHENTIQUES DES DANS LA DIDACTIQUE DE FLE AU KENYA: LE CAS DES ÉCOLES SECONDAIRES DE KISUMU

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This research is in the domain of teaching of French as a Foreign Language. It has come to our attention that in Education in Kenya, the aspect of the practice of oral skills leaves a lot to be desired during the teaching of French in secondary schools; this is according to the KNEC manual reports. This is partly due to the time allocated to the teaching of this subject/language and partly because there seems to be no fixed time allocated to the teaching of the oral expression in French, and if it is done at all, this is done at the discretion of the teacher. According to Perrenaud (1980), there can never be learning or teaching of oral skills in language teaching without time dedicated to it. The teacher seems to embrace the tendency of speaking too much, explaining or dictating while the role of the learner seems to be confined to listening at times, copying or keeping quiet. This study aims to establish whether the authentic document could be used to put the learner in direct contact with the language so that as he learns the grammatical aspects, he also learns the culture of the French and hence communicate better. With the use of authentic document, he could be able to speak the language, not as a foreigner but as a native speaker and hence promote communication, given that these documents often originate from the mother country. Elsewhere in this study, we have made proposals on how these documents could be exploited and we are setting out to establish whether the said documents could enhance speaking if used in the suggested manner or any other way. The Kenyan situation in the learning of French is even worse because French is not allocated as much learning time as other languages in the school time-table, and this makes the time allocated by individual teachers to the speaking skills even less, given that the teacher has insufficient time to tackle grammar and comprehension. In form three and four, which are the final classes, French is only allocated two hours of learning per week, as compared to almost three and a half hours given to English and Kiswahili which they actually started learning in primary school. There is always pressure on the teacher to complete the syllabus and so the learner leaves secondary school without being able to communicate effectively in French. By the time they leave school, French is still

abstract and the school leavers who can afford it, have to sharpen their skills at the Alliance Française or elsewhere. This study purposes to examine the role of the authentic document in the teaching of French as a language and whether these documents could be of help in the acquisition of speaking skills and if possible make recommendations to the Ministry of Education.

INTERGENERATIONAL CAREGIVING OF ORPHANS AND VULNERABLE CHILDREN: A CASE OF NYUMBANI VILLAGE, KITUI COUNTY KENYA

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The society is increasingly marked by the number of children who are left without parents due to economic disenfranchisement, residential displacement, drug and alcohol addiction, homicide, high rates of incarceration and diseases such as Acquired Immuno Deficiency Syndrome (AIDS). The AIDS epidemic has yielded a remarkable generational shift pushing the responsibility for child rearing. The present situation is that grandparents are now taking on parenting roles for which they are not well prepared emotionally, socially, legally and economically. In the face of this observation, a Catholic priest, Father D'Agostino envisioned building self-sustaining villages that could house two groups adversely affected by HIV/AIDS pandemic – orphans and the elderly. This is what he called *Nyumbani* (home) village in Kitui County. The aim was to give care to the Orphans and Vulnerable Children (OVCs) affected by HIV/AIDS, who were left in the hands of the grandparents. The Village which is built on a 1,000 acre of land houses 100 grandparents (female and male) and about 1,000 children. This study sought to assess and document the *Nyumbani* grandparents parenting approach. The study was important in understanding the roles that the grandparents performed, and the challenges they faced in the course of caregiving. The study used a descriptive cross-sectional research design and was guided by social exchange theory and activity theory. A sample size of 25 grandparents who were the caregivers to the children was selected. The sample size was achieved through first getting information of all the one hundred households and analyzing it critically. Using systematic sampling 25 grandparents were selected and for the households headed by grandfathers purposive sampling technique was used. In-depth interviews were conducted with the grandparents. In addition, three focus group discussions were held, two discussions with the children in *Nyumbani* village and one discussion with community Self Help Group. Key informant interviews were held with the administrators and other Kitui county stakeholders who interacted with Nyumbani village. The findings were thematically analyzed and then presented under various themes as well as using tables. The study findings revealed that having grandparents to take care of the orphans and vulnerable children has its strengths and weaknesses. Great strengths include both the children and the grandparents benefit. For the grandparents, they benefit in that their grandchildren get education, shelter, warm nutritious meals, medical services, spiritual, moral, psychosocial and parental care. The direct benefit of the grandparents: engaging in income generating activities, exposure on dry land farming techniques. For the children, they benefit in that: they still live as a family despite being in a different

set-up; they get education, food, shelter and clothing. The study revealed challenges grandparents face like; intergenerational gap, old age and its health-related problems, Based on the study findings it was concluded that grandparents are playing major caregiving roles amidst a multitude of challenges that include limited knowledge, skills, resources and social support. The approach can be more helpful if; the age of grandparents was considered and if the beneficiaries embraced the modern farming techniques. Recommendation for further study on interventions for stress and coping strategies of grandparent caregivers and also to establish the impact of expanding this approach in other parts of the country to take care of both the elderly and OVCs.

ZAKES MDA'S SOCIAL VISION FOR POST-APARTHEID SOUTH AFRICA: AN EXAMINATION OF *FOOLS, BELLS AND THE HABIT OF EATING*

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Prof. Oluoch Obura

This thesis seeks to establish how Zakes Mda crafts his social vision for post-apartheid South Africa through his three plays: *The Mother of All Eating, You Fool How Can the Sky Fall?* and *The Bells of Amersfoort* collected under the anthology *Fools, Bells, and The Habit of Eating*. The study is premised on the recognition of the fact that a writer does not only create works of art for art"s sake but create art that is aimed at educating the readers about the present and future realities. The thesis aims to study Mda"s social vision not as a novelist as he is popularly known but as a playwright. The study focuses on the examination of the thematics and characterization respectively. It then moves on to an examination of the specific literary styles and devices that Mda uses to bring out the above mentioned concept. The study engages the Dialogism theory as articulated by the Russian philosopher and literary critic Mikhail Bakhtin. These ideas are invoked as a theoretical tool for shedding light on how Mda creates his social vision for post-apartheid South Africa. This study employs textual analysis to collect, organize, analyze

and interpret data on Mda‟s social vision for post-apartheid South Africa as portrayed in his plays under study. It is qualitative in nature and informed by the phenomenological research philosophy. The study found that elements such as characterization, thematic concerns and choice of diction are instrumental in communicating a writer‟s vision. Metaphors of social vision in the dramaturgy is one of the tenable areas for further research.

ANTHROPOCENTRIC - ECOCENTRIC CONTROVERSY: FINDING A COMMON GROUND

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This study is an attempt to resolve anthropocentric – ecocentric controversy over whether a new, nonanthropocentric, ethic as opposed to the dominant anthropocentric one is necessary. Ultimately, anthropocentrists and ecocentrists differ on whether intrinsic value, a prerequisite for moral concern, can be extended to nonhuman beings. Opposed to the quest for new ethic, anthropocentrists limit intrinsic value to human beings. They hold to preferential treatment of man in the event of competing claims between human and nonhuman beings' needs. On their part, ecocentrists seek to extend intrinsic value to nonhuman beings thereby supporting nonanthropocentrism. They hold to the principle of biotic egalitarianism. The conflict is understood as dialectical conflict with anthropocentrism and egocentrism as thesis and antithesis respectively moving towards an objective common moral ground (synthesis). The resolution to the controversy presupposes a critical analysis of both the notion of intrinsic value and the metaphysical assumption of both anthropocentric and ecocentric moral theories. Upon analysis, it is discovered that neither the concept of intrinsic value nor the metaphysical assumptions of either anthropocentric or ecocentric moral theory fully meets the objective criteria for acceptability of philosophical theories.

The concept of intrinsic value is negatively and subjective defined and identified respectively. As such, it does not provide objective criteria for determining the intrinsically valuable entities. The inadequacy of the metaphysical assumptions of anthropocentric and ecocentric moral theory implies indefensibility of either preferential treatment of man or biotic egalitarianism respectively. Upon further analysis however, both theories are found to share a lot in common. It is demonstrated that nature, man included, has both intrinsic value and instrumental value. Between the two values however, instrumental value is most objective and practical. It is modified in a way that it motivates wider preservation of environment. Lastly, a pragmaecocentric moral theory is suggested as an anthropocentric – ecocentric synthesis is proposed. Adherence to environmental justice is emphasized as way to resolve the conflicts between human and nonhuman needs.

SOCIAL-ECONOMIC RELATIONS BETWEEN NUBIANS AND THE AMERU OF MERU COUNTY; 1925-2014

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Relations between communities in Kenya have been at the center stage of political, social and economic debate, and the Nubians have not been an exception.Nubian community landed in various parts of Africa during the colonial period. In 1900s, many of the Nubians came into East Africa as British soldiers under the command of Fredrick Lugard. In East Africa, majority settled in Uganda and Kenya. In Kenya, the Nubians first settled mainly in Kibera, from where they dispersed to other regions in Kenya. This study focused on the Nubians who settled in Meru County in the period 1925-2014 and itexamined the migration, dispersal and settlement of the Nubians in Meru County. The main objectives of the study were;to trace the dispersal and settlement of the Nubians in Meru County in the period 1925 to 1963, examine the socio-economic relations between the Nubians and the Ameru of Meru County from 1964 to 1978, investigatethe changing socio-economic relations between the Nubians and the Ameru in the period 1979-2002 andinterrogate the dynamics in the socio-economic relations between the Nubians and the Ameru of Meru County in the period 2003 to 2014.The study was qualitative innature and historical research design was used to provide chronology of the relations between the Nubians and the Ameru as they unfolded. The study was guided by social network theory and resilience theory. The study was carried out in Meru County and more specifically in Mjini slums. The population sample comprised of   Nubians and the Ameru of Meru county aged 18 years and above. Random and purposive sampling techniques were used to select the population sample. The researcher used both primary and secondary data. The findings indicated that Nubians are a minority group in Kenya and they originated from South Sudan, but moved to East Africa and more specifically inMeru as KAR soldiers. Itwas also established that once in Meru; the Nubians settled around Meru hospital and formed Nubian villages,which are referred to as Mjini slum, Kibra Ndovu, and Salama. Itwas further established that settling in Meru led to increased interaction between the Nubians and the Ameru through culturalexchange. It was also apparent that social, economic and political factors led to the changing relations between the Nubians and the Ameru.The findings also indicated that Nubian-Ameru relationship had certain implications such as political discrimination and assimilation of the Nubians into the Ameru culture. The study is significant because it helps to identify the contribution of the Nubians towards Kenya's cultural heritage. It also enriches the historiography of ethnic interaction not only in Kenya but also globally. The study concluded that the interaction between the two communities has led to the assimilation of the Nubians and the marginalization of the Nubians and this threatens the future existence of the Nubians in Meru County. From the study, it was recommended that

the government should look for a way of tapping manpower of Nubians in the social, economic and political development in Kenya. Additionally there is need of establishment of a cultural center so as to preserve the rich and beautiful Nubian culture to avoid its extinction

SCHOOL OF PURE AND APPLIED SCIENCES

Masters

VARIATION OF CYANIDE LEVELS IN PROCESSED SWEET CASSAVA (*Manihot esculenta* Crantz) **LEAVES GROWN IN BUSIA AND KILIFI COUNTIES, KENYA**

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Cassava (*Manihot esculenta* Crantz) is the third most important food source around the world especially in sub - Sahara Africa. It is preferred due to its agronomical attribute such as ability to grow in poor soils and drought resistance. The consumption of its tubers and leaves has dual antagonistic contribution to mankind. On one hand, this perennial tropical crop contains carbohydrates, vitamins, calcium and iron which are of nutritional benefit while on the other hand, they contain cyanogenic glycosides. The latter when hydrolyzed by the enzyme linamarase produces hydrogen cyanide which is poisonous and can lead to upper motor neuron spatic paraparesis (Konzo condition). A number of deaths have been reported associated with consumption of cassava containing more than WHO allowed levels of 10 mg HCN equivalent/Kg body weight. This has been mainly attributed to among other factors, the methods of processing tubers and leaves. Proper processing is therefore necessary before consumption and it is therefore in this light that this study monitored the variation of cyanide levels following different processing methods of leaves of sweet cassava varieties. Leaves of *sifurosa, adhiambolera, nambamunane, maachure* and *palisa* varieties and *kabandameno, munguvu mambasa* and *mzazakahu* varieties were purposively

sampled from Busia and Kilifi Counties in Kenya respectively. Prior to boiling the leaves for up to 25 minutes, two processings' were done; one involved leaves being pounded to form a soft paste while in the other, leaves were pounded followed by soaking in water. Unpounded leaves were also boiled for the same duration. Determination of cyanide levels was done using picrate papers and UV - Vis spectrophotometer and data analyzed by Student t - test and Analysis of Variance. The cyanide levels ranged from (576.30 0.32 - 128.34 0.34) mg HCN equivalent/Kg in raw cassava leaves. There were significant differences (P < 0.001) in levels of cyanide in varieties grown under the same environmental conditions and in different environmental conditions. The initial cyanide levels significantly reduced by 85.17%, 90.88% and 91.00% after 25 minutes of boiling unpounded, pounded and pounded then soaked leaves respectively (P < 0.001). However, unpounded leaves still retained cyanide levels above the WHO recommended levels after boiling for 25 minutes. The findings of this study promote longer duration of boiling cassava leaves with prior processings' of pounding and that of pounding and soaking to minimize the risks associated with cyanide poisoning. A sensitization campaign is recommended following these findings in order for consumers of cassava leaves to be well informed on the processing procedures that reduce the toxic cyanide levels. It further necessitate adoption of internationally acceptable standards for permissible levels of HCN in cassava food products.

ANALYSIS OF ESSENTIAL TRACE ELEMENTS IN SELECTED MEDICINAL PLANTS USED IN KENYA

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Prof. Ruth Wanjau

Kenya is endowed with nature where hundreds of medicinal plants are available. During photosynthesis and respiration process in plants, animals and other organisms, ions of metal elements play a major role with a few of the elements being essential to the body as nutrients. Trace elements Zn, Cr, V and Se with known immunological response and healing properties were analysed from selected medicinal plants available in Kenya. These plants were; *Prunus africana, Urtica massaica, Maytenus obscura, Maytenus putterlickiodes, Azadiracta indica* (Neem), *Mondia whytei, Zanthoxylum usambarense, Maerua edulis, Trigonella foenum-graecum* (fenugreek) and *Glycyrrhiza glabra*. The concentrations of elements were determined using Energy Dispersive X-ray Fluorescence Spectrometer (EDXRF). The levels of zinc varied from 25.94 ± 1.89 to 70.58 ± 4.70 mg/kg (mean 45.94 ± 12.42 mg/kg). Vanadium from 1.69 ± 0.18 to 9.99 ± 0.86 mg/kg with an average level of 5.89 ± 2.09 mg/kg. Chromium from 1.44 ± 0.30 to 6.94 ± 0.59 mg/kg with a mean of 3.49 ± 1.32 mg/kg. For selenium the levels varied from 53.21 ± 5.45 to 124.01 ± 4.41 µg/kg with a mean of 90 ± 19.17 µg/kg. The levels of the trace elements were compared with recommended dietary intake (RDI) and were found to provide these essential elements as part of therapeutic utility. The levels in different plant parts were found not to be statistically significantly different (P>0.05) except for vanadium levels in *urtica massaica* (P=0.05). The results of this study will be used to sensitize the public on the presence of essential trace elements in the studied medicinal plants and to contribute to the advancement of knowledge.

DEFLUORIDATION OF WATER BY ADSORPTION WITH TRIETHYLAMINE MODIFIED MAIZE TASSELS

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Supervisors : Dr. Isaac W. Mwangi

Prof. Ruth N. Wanjau

Lack of access to safe drinking water is a major concern due to negative health effects experienced by people in many parts of the world. The quality of such waters is mainly affected by pollutants from natural and anthropogenic sources when they get incorporated in the water sources. These pollutants are either organic or inorganic species. Among the inorganic pollutants are fluorides. Continuous consumption of high concentrations of fluoride ions leads to their accumulation in the body tissues which causes dental fluorosis, skeletal fluorosis and other non-skeletal disorders. These health effects are irreversible and the only way to overcome them is by removing fluoride from water. Several methods for the removal of fluorides in water have been proposed, most of which rely on the use of biomaterials and bone char. In such processes, the adsorbents become loaded with the pre-concentrated pollutants leading to disposal problems. This study reports on the modification of the maize tassels with triethylamine followed by its subsequent application on the removal of fluoride ions from water. The maize tassels were collected, washed, dried, ground and then modified with triethylamine. Modification was carried out in two steps which included chlorination of maize tassels using thionyl chloride followed by amination using triethylamine. The modified and unmodified biomaterial were characterised using FTIR (Fourier transform infrared) spectrophotometer and then used in the removal experiments on both model solutions and water sample from Lake Baringo. The effects of pH, contact time, initial fluoride concentration and modified biomaterial resin dosage on removal of fluoride were investigated. The experimental data were analysed using Langmuir and Freundlich isotherms. FTIR spectrophotometer results confirmed the presence of the anchored functional group on the maize tassels. The removal of fluoride by the modified biomaterial increased with increase in concentration up to an optimum of 60 mg/L. The optimum pH and time were found to be 4.0 and 20 min, respectively. The biomaterial was very effective in fluoride removal as 86% was removed within the first 20 min in model solution containing 20 mg/L of fluoride. The amount adsorbed on the modified biomaterial increased with increase in the modified biomaterial dosage. The uptake of fluoride however, in real water sample from Lake Baringo was found to be slightly lower compared to the experimental water. The experimental data fitted best in the Langmuir isotherm with an adsorption capacity of 5.26 mg/g. This implied a monolayer chemisorption process. It was also found that when the adsorbent was packed in a SPE column, it could be regenerated by stripping the attached fluoride ions with dilute hydrochloric acid. The theory underlying the removal method was based on the interaction of the permanently charged quaternized

material with the highly electronegative fluoride ion. This is a regeneratable, eco-friendly and sustainable water remediation method of this toxic water pollutant.

VARIATION IN LEVELS OF VITAMINS A AND C WITH MATURITY OF *Amaranthus hybridus* (L) LEAVES GROWN IN DIFFERENT SOIL - TYPES IN KWALE COUNTY, KENYA

OTIENO
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The prevalence of vitamins A and C deficiencies (VAD and VCD) in Kenya are 84 % and 45 % respectively, pointing towards health hazards among human beings. The deficiencies are mainly attributed to poverty and limited accessibility to expensive but rich food sources that contain vitamins A and C. Fruits and vegetables are however cheaper and easily available as sources of vitamins A and C. These are grown in various soils and are consumed at various stages of maturity thus being factors that present a research gap for investigation on their effect on the vitamin levels. *Amaranthus hybridus* L. vegetable is known to have high contents of beta-carotene (β-carotene) and ascorbic acid. In Kenya, it is grown in clay, loamy, and sandy soils of different climatic conditions including Kwale County. The mean amounts of β-carotene and ascorbic acid in the leaves of *A. hybridus* L. grown in clay, loamy, and sandy soils from Matuga, Msambweni, and Kinango Sub-Counties of Kwale County were investigated at different maturity stages. The levels of N, P, K, S, Mg, and Ca in the soils were determined using Flame Atomic Absorption Spectroscopy (FAAS), flame photometry, and UV-vis spectrophotometry as appropriate. The levels of ascorbic acid and β-carotene were investigated at 25, 50, and 75 days after sowing (DAS) using HPLC and UV-vis spectrophotometry respectively. Data analysis and ranking of means were done using analysis of variance (ANOVA) and Student Newman Keuls test (SNK) respectively. The range of mean levels of macro-nutrients (µg/g) in soils was: N (0.58 ± 0.01-0.93 ± 0.01), P (0.01 ± 0.01-1.04 ± 0.02), K (0.04 ± 0.02-8.41 ± 0.03), S (2.30 ± 0.01-5.93 ± 0.01), Mg (0.41 ± 0.09-20.35 ± 0.25) and Ca (0.04 ± 0.06-3.81 ± 0.20). The mean value of β-carotene (mg 100 g_{-1} DW) ranged from 1.63 ± 0.14 for leaves grown in sandy soil in Matuga Sub-County at 25 DAS to 12.74 ± 0.58 in clay soil from Msambweni Sub-County (CSMS) at 75 DAS. The mean amount of ascorbic acid (mg 100 g_{-1} DW) ranged from 20.79 ± 1.62 for leaves grown in sandy soil from Kinango Sub-County (SSK) at 25 DAS to 108.11 ± 14.94 in clay soil from Kinango Sub-County (CSK) at 75 DAS. It was found that the levels of vitamins in the leaves of the plants grown between the different soils were different. Also observed was the variation in the levels of vitamins was due to maturity of the plants as well. Findings showed that, depending on the type of soil and its macro-nutrient content, plant maturity had a significant effect on the levels of β-carotene and ascorbic acid in the leaves as the amounts of β-carotene increased significantly with maturity while that of ascorbic acid decreased

(*P*<0.05). Specifically the leaves of the plant grown in CSMS and CSK are recommended for consumption at 75 DAS, a period that they showed the highest levels of the vitamins. It is envisaged that for soils with sufficient macro-nutrients in Kwale County, *A. hybridus* (L) vegetable should be consumed with consciousness based on the soil type and plant maturity inorder to adequately address the health related problems associated with VAD and VCD.

FABRICATION AND CHARACTERIZATION OF A GRAPHITE DISPERSED TITANIUM DIOXIDE SOLID SOLAR CELL

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Energy is globally recognized as one of the most fundamental inputs to social and economic development. Most energy sources are serious pollutants resulting to serious negative effects on the environment. To overcome this challenge, the presence of abundant sunshine has been exploited through the use of solar cells to generate this vital resource through photovoltaic cells. However most photovoltaic cells are silicon based photovoltaic cells which are expensive. This study reports on the fabrication of a cost effective and environmental friendly solar cell by the use of TiO_2 and I_2/ KI (dispersed in graphite-C_x) layers in their solid form to provide an alternative source of clean energy. TiO_2 was preferred due to its photo generation property when excited with a radiation and chemical stability over a wide pH range. The photo excited electrons were replenished by use of iodine/iodide complex and their migration was facilitated by graphite. The mixtures at varying ratios were made into pellets and their electrical properties investigated. The experimental design involved preparation of various ratios of titanium dioxide: graphite /iodine/KI mixtures in each respective layer. Optimization was carried out by varying the mass of the constituents of each layer while maintaining the others constant to obtain the highest current - voltage outputs. The study investigated the effect of the thickness of TiO_2, (the photo active layer) and the electronegative material layers on current-voltage output of the fabricated solar cell. The optimum electricity generation was observed at the ratio of TiO_2/ C_x: I_2: KI as 0.4: 0.3: 0.17: 0.01 g respectively. The presence of KI enabled solubility of iodine enhancing it disperse evenly in graphite whose mass was constant at 0.01g in all the cells fabricated. The effect of the optimized thicknesses of the photo active layer and that of the electronegative layer were investigated and the optimal thicknesses were found to be 2.00 and 1.00 mm respectively. The highest open circuit voltage (Voc) of 0.979V and a short circuit current density (Jsc/cm^2) of 12.037µA was observed, giving efficiency (η) of 0.006% and a Fill factor (FF) of 0.64. During the entire three years of study, no corrosion effects were observed because the medium for the charge carrier migration was in dry solid

state and thus it was suitable for photovoltaic application. A solar cell was successfully fabricated and characterized. The ratio of constituent materials (TiO$_2$/ Cx: I$_2$: KI) and the optimal thickness of both the photo active and the electronegative layers which generated the optimum Current-Voltage output were determined. The efficiency and Fill factor were calculated from the fabricated overall corrosion-free solar cell. It is therefore recommended that further research work be done using TCO (transparent conducting oxide) as the cathode in addition to employing technologies that can reduce air packets in the solar cell.

BEHAVIORAL RESPONSES OF *Tuta absoluta* TO A WILD AND CULTIVATED TOMATO PLANTS AND CHARACTERIZATION OF THE MEDIATING SEMIOCHEMICAL BLENDS

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Tomato is rated the second most important horticultural crop after potato in most parts of the world. However, its cultivation is threatened by infestations of *Tuta absoluta* (Lepidoptera: Gelechiidae). The pest originated from South America and is now invading fields and greenhouse production sites in the world. *Tuta absoluta* was first officially reported in Kenya in March 2014 at Isiolo and has spread to all parts where tomato is grown. The pest has been nicknamed tomato ‗Al–shabaab‗ as it leaves unimaginable damage of the crop after infestations. Chemical methods used to control the pest have led to high levels of residues, hence risking consumers, harming the ecology and the environment. The present study was based on field observations that a wild tomato, *Lycopersicon esculentum var. cerasiforme*, which grows in the tea zones of Mount Kenya region, Kenya, is not attacked by *T. absoluta,* unlike the cultivated commercial tomato varieties. It was hypothesized that the wild variety may be actively avoided by gravid females because of the presence of constituents that deter gravid *T. absoluta* females. The objective of the present study was to compare the behavioral responses of *T. absoluta* to wild and cultivated tomato plants and characterize their mediating semiochemical blends. The responses of gravid *T. absoluta* females to the wild tomato and cultivated tomato, *Solanum lycopersicum* L. (Rambo F1 variety) intact plants in a dual–choice olfactometer was conducted where the gravid females were attracted to the cultivated species but repelled by the wild species, PI = -45.45%, X$_2$ = 10.47, df = 1, p < 0.05. The levels of infestation of the pest in mono–crop and intercrops of the two varieties were also compared. There was significant reduction in the levels of infestation in the intercrop arrangements (P<0.001, at α=0.05). Gas chromatography–linked mass spectrometry (GC–MS) of the headspace volatiles collected from the two tomato species revealed large differences in their chemical profiles. A total of 162 compounds were positively identified and quantified: 85 from cultivated tomato‗s day volatiles, 73 from wild

tomato's day volatiles, 68 from cultivated tomato's night volatiles and 64 from wild tomato's night volatiles. Principle component analysis (PCA) resolved the compounds into 12 distinct principle component (PC) clusters. Of these clusters, PC1 and PC2 captured over 79.0% of the total variation. MANOVA and ANOVA tests on PC1 and PC2 revealed that there were significant differences in the volatile compositions, $P < 0.00001$, $\alpha = 0.05$. Gas chromatography–linked electroantennography (GC–EAD) showed a large proportion of electroantennography (EAG)–active compounds from the two species of tomato plants. Of these, hexanal, trans-3-hexenol, verbenene, 4-keto-isophorone, camphor, citronellal, isopulegol, limonene oxide, linalool propanoate, germacrene A, β-elemene, germacrene B, germacrene D, and β-bisabolene were unique to the wild tomato. A blend of available compounds, at the time of study, (*trans*–3–hexenol, camphor, citronellal and limonene oxide) showed dose-dependent repellence to gravid *T. absoluta* females in the dual–choice olfactometer. The study lays down some groundwork for exploiting semiochemical traits of the tomato species in novel management of *T. absoluta*.

PREVALENCE OF *PLASMODIUM* SPECIES INFECTION AMONG PRIMARY SCHOOL CHILDREN AND PERFORMANCE OF MALARIA RAPID DIAGNOSTIC TEST KITS IN BARINGO COUNTY, KENYA.

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DR. KARIUKI NJAANAKE

Malaria causes the greatest public health burden in sub-Saharan Africa where high mortality mainly occurs in children under five years of age and pregnant women. Majority of Kenyan population are at risk of malaria infection. Traditionally, malaria has been studied mainly in Western and Coastal Kenya while the rift valley especially Baringo County few malaria studies have been conducted indicating seasonal transmission. This has resulted in scanty information on actual malaria prevalence and transmission patterns which may hinder setting up of proper control strategies. Moreover, primary school children seem to be endangered due to minimal protection by insecticide treated nets. The purpose of this study was to determine the prevalence of *Plasmodium* species infection among primary school children and to evaluate the performance of malaria rapid diagnostic test kits in diagnosis of malaria in Baringo County, Kenya. One thousand six hundred and sixty eight (1668) children from fifteen primary schools located in 4 ecological zones (lowlands, midlands, highlands and riverine) of three sub-Counties of Baringo County were recruited into the study. Finger prick blood sampling was done every four months (during the dry season in January/ February, during the long rains in June/July, short rains in November 2015 and during dry season in January/ February 2016). *Plasmodium* species infection was tested using three rapid diagnostic test kits (CareStart Pf, SD Bioline Ag Pf and SD Bioline Ag P.f/ Pan). Microscopic examination was done on all RDT positive and 10% of negative

cases. A total of 268 (16.1%), out of 1668 pupils tested positive for *P. falciparum* by RDT; 78% had a single episode of infection, 16.8% had 2 episodes, 4.9% had 3 episodes and 0.4% had 4 episodes of infections. *Plasmodium* species infection varied within local ecological zones. For instance, the riverine zone had the highest cases of *Plasmodium* species infection compared to lowland, highland and midland (Fisher's exact test = 0.005). More cases of *Plasmodium* species infection (10.7 and 6.2%) were reported in dry season compared to 2.6% in the long rains (Fisher's exact test= 1.000) and 5.7% in short rains (Fisher's exact test= 0.197). Risk of *Plasmodium* species infection was significantly higher in riverine zone compared to midland, lowland and highland (IRR= 40.24165 (95% CI: 7-1623). Infection rate for males and females was similar (IRR = 1.02 (95% CI: 0.55-1.88). The study also established that children aged between 10 – 15 years were at higher risk of *Plasmodium* species infection than those aged between 5- 9 (IRR 1.6 (95% CI: 0.9- 3.1). The kits performed relatively well in the diagnosis of malaria using microscopy as reference. SD Bioline Ag-Pf/ Pan RDT kit had a higher sensitivity (90%) compared to that of CareStart Pf (70%) (McNemar's χ^2 = 0.5, df = 1, p-value = 0.4795). Similarly, the sensitivity of SD Bioline Pf was the same as that of CareStart Pf (82.4%). The kits can therefore be used to guide treatment of febrile illness within Baringo County. In addition, present study findings, indicate that *Plasmodium* species infection was relatively low within Baringo County compared to endemic regions of Kenya; however, there is a need for continued monitoring of transmission dynamics under changing climatic conditions as well as establishing expanded malaria control strategies especially within the riverine zone.

DISTRIBUTION, ABUNDANCE,POPULATION RATIOS AND ACOUSTIC BEHAVIOUR OF*CONOCEPHALUSMACULATUS* (ORTHOPTERA: TETTIGONIIDAE) IN KAGERA REGION NORTH-WESTERN TANZANIA

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Dr. Nicodemus D. Matojo

The longhorn grasshopper, *Conocephalus maculatus* (Le Guillou, 1841),is reported to be distributed over a wide range ofgrassland habitats in tropical Africa, Asia and Australasia. The species has gained attention in Asia as an important biological control agent of rice pests. In Tanzania, the species has been reportedaroundMount Kilimanjaro ecosystem with no reliable information in Kagera region, north-western Tanzania.The present study sought to bring to light the distribution, abundance, population ratios and acoustic behaviour,of this tettigoniid in Kagera region. The study was carried out in Bukoba, Karagwe, Kyerwa, Missenyi and Muleba districts at various randomly selected sites including; Maruku, Bugorora and Nshambya. It involved *in-situ* observation of the species for nine months from September 2014 to May 2015. A cross-sectional design was used in this study. Quadrat method, acoustic search, sweep-netting and

direct hand-picking were applied in data collection.Distribution pattern was tested using the index of dispersion (I_D). One-way ANOVA with LSD post hoc tests were used to analyse spatial and temporal variations in *C. maculatus*populations. Linear regression and Pearson`s correlation analyses were used to test the relationship of*C. maculatus*distribution, abundance and population ratios with ecological factors, and time of the day with sound signaling. Students` t-testswere used to compare laboratory and field sound characteristics and also to test the significance in population ratios. Results revealed that distribution of this species was of aggregated nature (z = 3.09) and it was abundantly present in the area.Results also indicated a male-biased adult sex ratio (t= 3.473), a 1:1 nymph sex ratio (t = 1.107), and an adult-biasedage ratio (t = 5.578).Distribution and abundance were positively related to temperature (r = 0.556; p < 0.0001) and grass vegetation (r = 0.49; p = 0.001)but inversely related to altitude (r = -0.611; p<0.0001), humidity (r = -0.341; p = 0.012), herbal vegetation (r = -0.340;p = 0.022) and shrubs (r = -0.387; p = 0.009). There weresignificant differences in abundances between the three sites in the orderNshambya< Maruku <Bugorora (f = 16.968; p<0.0001).There were seasonal differences in abundance in the order Short dry <long rains<short rains (f = 5.591; p = 0.005).Results further revealed that sound signaling in *C. maculatus* was a daylight activity(r = 0.798, p = 0.000),which varied with environmental conditions.The results provide resourceful ecological information on thespecies. Thestudy recommends the Tanzanian environmental authorities to enforcecomprehensive conservation measures for grasslands which are a preferred habitat of this species.

EVALUATING PHYTOCHEMICAL PROFILES, MOLLUSCICIDAL AND SCHISTOSOMICIDAL ACTIVITY OF AQUEOUS AND ETHANOL EXTRACTS OF *Vernonia amygdalina* AND *Harrisonia abyssinica*

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Schistosomiasis is considered one of the neglected tropical diseases caused by blood flukes. The disease kills 200,000 people annually in Sub Saharan Africa and stunts cognitive and physical growth. In Kenya, the total population requiring preventive chemotherapy in the year 2015 was estimated at 2.5 million out of which 1.8 million were school aged children. Fresh water snails of genus *Biomphalaria* are the intermediate hosts of *S. mansoni*. Chemical molluscicides used to control snails also kill non target species and have long term detrimental effects to the environment. Chemotherapy is thus the most widely applied control method. Praziquantel is the only drug recommended for mass administration hence there is a high risk of developing resistance. The search for alternative molluscicidal and schistosomicidal herbs is inevitable. This study investigated the molluscicidal and schistosomicidal potential of *Vernonia amygdalina* and *Harrisonia abyssinica* known for their broad spectrum medicinal values. The plants were sourced from Bungoma County where they are traditionally used to treat worm infections. The root and stem bark were ripped off

using a knife and air dried at room temperature then crushed and sieved to standardized particles, and extracted in ethanol and distilled water. The extracts were qualitatively screened for phytochemicals by reacting the plant extracts with standard reagents and observing color change. *V. amygdalina* was rich in saponins, glycosides and phenols while *H. abyssinica* had abundant phenols, and alkaloids. Batches of ten snails were exposed to each of the plant extracts at 50, 150 and 300 mg/l in 500 ml plastic containers. One positive and one negative control were set using niclosamide and distilled water respectively. The numbers of dead snails were counted and recorded after 24 hours. Ten miracidia and ten cercariae were exposed separately in each well of a 24 well microtitre plate to lower concentrations of 5, 15 and 30 μg/l and monitored for 60 minutes. This was followed by exposure to higher concentrations of plant extracts at 50, 150 and 300 mg/l and monitoring for another 60 minutes. The number of dead miracidia and cercaria were enumerated and recorded at 5, 10, 15, 20, 30, 45 and 60 minutes. Data on snail deaths were analyzed using ANOVA at $p \leq 0.05$ to compare the three dosages of plant extracts followed by the Dunnet test to compare with the positive control. *Harrisonia abyssinica* root water extracts had the highest molluscicidal activity, similar to the positive control, Niclosamide (50 mg/l $p = 1.00$, 150 mg/l $p = 0.095$, 300 mg/l $p = 1.00$). Finney probit analysis was used to calculate the LD_{50} for snails and LT_{50} for miracidia and cercariae. The root water extract of *H. abyssinica* was the most effective against snails with the lowest LD_{50} value of 2.437 mg/l while the stem ethanol extract of *V. amygdalina* was the most effective cercaricidal agent (LT_{50} of 6.72 minutes). The best miracicidal agent was 300 mg/l of *V. amygdalina* stem water extract (LT_{50} 57.73 minutes).*H. abyssinica* root extracts should be considered for development of molluscicides since they had the best LD_{50} value. The stem ethanol extracts of *V. amygdalina* can be considered for development of cercaricidal agents in combination with other plants proved to have cercaricidal properties since the extract was lethal at high dosages. Miracidia were relatively tolerant to extracts from the two plants hence the plants may not be good candidates for miracicidal activity as stand-alone extracts. This study provides baseline information which can be used by pharmaceutical companies, researchers and the ministry of health in their quest to develop new molluscicides and schistosomicides.

PREVALENCE OF *PLASMODIUM* INFECTION AND ANAEMIA IN PRIMARY SCHOOL CHILDREN FOLLOWING UNIVERSAL DISTRIBUTION OF INSECTICIDE TREATED BED NETS IN KASIPUL, HOMA-BAY COUNTY, KENYA

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Malaria is devastating diseases afflicting humans, in Kenya; the disease is endemic in areas around Lake Victoria and along the southern coast. Untreated malaria in school children, result in anaemia, reduced ability to concentrate and learn in school and if fallen sick may lead to

school absenteeism. Insecticide treated nets (ITN) have been shown to provide significant protection against *Plasmodium* infection. Available data show that the overall prevalence of *Plasmodium* and anaemia among primary school aged children in Kasipul is 25.8 % and 14.1%, respectively. However, there is limited information on the *Plasmodium* and anaemia prevalence in Kasipul following mass distribution of ITN in 2014. The objective of this study was to assess the prevalence of *Plasmodium* and anaemia among school children living in Kasipul and their reported use of insecticide treated bed nets, one year after mass distribution of ITN in Kasipul, Homa-Bay County. A descriptive cross-sectional study of 398 primary school pupils was conducted in Kasipul. Pupil's fingers were pierced using a lancet to obtain blood sample for malaria parasite detection and haemoglobin level determination. Data on insecticide net use was collected using self-administered questionnaire. The overall prevalence of *Plasmodium* among children was 10.05% and anaemia was 2.3%. The association between net ownership and *Plasmodium* prevalence among pupils was significant ($\chi2= 14.46$, df =1, p = 0.000). The difference in malaria prevalence in terms of sex was not statistically significant ($\chi2= 0.814$, df= 1, p = 0.367). However, anaemia was slightly more prevalent in girls (3.6%) than boys (1.0%) were. Although the difference was not statistically significant ($\chi2= 3.217$, df= 1, p = 0.073). The study established that only 51.0 % of the study population owned ITN, which is below the 80% target set by the government. A negative correlation of -0.3874 existed between the use of ITN and malaria prevalence. The study observed a significant decline in *Plasmodium* prevalence from 25.8% in 2011 to 10.05% in 2016, which is evidence that ITN, which was the major control strategy implemented in Kasipul reduced *Plasmodium* infection in the study population. Decline in *Plasmodium* infection could also have reduced the prevalence of anaemia in the study area from 14 % in 2010 to 2.3% in 2016. In conclusion, this inquiry revealed that the prevalence of *Plasmodium* and anaemia has significantly reduced following distribution of free ITN in Kasipul. *Plasmodium* prevalence was lower in schools, which recorded a large number of pupils using ITN. Prevalence of *Plasmodium* in Kasipul is still high compared to the national average of 5%; this study recommends that other control measures apart from insecticidal nets should also be introduced in Kasipul, by the Kenya government to eliminate *Plasmodium*. Ministry of health and other stakeholders should ensure that hang-up' campaigns to sensitize residence on the relationship between ITN and *Plasmodium* prevalence, forms an integral part of future treated nets distributions. Further studies using households as sampling units need to be conducted in Kasipul, since this study did not include pupils absent from school on the sampling days.

COMPARISON OF ANALYTICAL PROFILE INDEX, MICROSCAN WALKAWAY 40 PLUS AND BRUKER MALDI BIOTYPER SYSTEMS FOR IDENTIFICATION OF ENTERIC PATHOGENS IN KENYA

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Developing countries experience diarrheal disease at a higher rate than industrialized nations. A key contributor to increased morbidity and mortality from diarrheal disease is the lack of efficient diagnosis methods. In Kenya diagnosis of enteric pathogens is mainly performed using manual methods which involves colony morphology, gram stain and biochemical tests. Although these methods are generally reliable they are labour intensive, have a long turn-around time and they occasionally fail to differentiate closely related species. There is therefore need to introduce alternative methods. Fast and reproducible methods for identification of microbial pathogens have been developed include the Matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) and MicroScan WalkAway 40 Plus (MicroScan). This study involves a retrospective analysis to compare the performance and agreement of MALDI-TOF and MicroScan against Analytical Profile Index (API) method for diagnosis of enteric pathogens in a Kenyan environment. The isolates were randomly picked from archive stocks previously collected in a surveillance study. The samples were characterized using the three methods. American type concentrate culture (ATCC) were used as controls. Polymerase chain reaction was used to resolve discrepant results. Data on continuous variables and costing were coded, entered in spreadsheet and analysed using SPSS 20. Out of the 196 isolates recovered 100 were *Enterobacteriaceae* and 96 were yeast. For yeast *Candida albicans* was the most frequent (22%) and *Magnusiomyces capitulum* the least (6%), and all the three methods had the same identification accuracy. For the bacterial isolates 25 genera were identified and the most frequent were *Escherichia coli* (27%), *Raoutella ornitholytica* (7%), *Klebsiella pneumonia* (7%), *Shigella* (6%), *Salmonella* (4%) and *Citrobacter freundii* (4%). MicroScan and MALDI TOF were able to significantly ($p < 0.05$) identify more bacterial isolates than the API method. However, three was no significant difference ($p > 0.05$) in the number of yeast isolates identified by the three methods. Identity of 42 isolates with discrepant results was confirmed using the gold standard PCR method and API, MicroScan and MALDI TOF were able to correctly identify 19.1%, 71.4% and 76.2% of the isolates, respectively. Identification turnaround time for API was 42-144 hours, MicroScan it was 4-24 hours and for MALDI it was 6-8 minutes. The cost per sample with API, MicroScan and MALDI TOF was Ksh 1800, 3200 and 380, respectively; therefore making MALDI-TOF the most inexpensive. In conclusion, MicroScan and MALDI TOF were better than API in accuracy and performance. Both methods can therefore be introduced in the Kenyan environment for identification of microbial pathogen.

EFFECT OF EXCHANGE AND ABSORPTION POTENTIAL IN THE DISTORTED   WAVE CALCULATION OF ELECTRON IMPACT EXCITATION OF AUTOIONIZING STATE OF CESIUM

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Study of electron impact excitation of autoionizing states of alkali metal atom is very important because it can explain the near threshold features observed in the ionization curves of these atoms. Many theoretical methods, for example, R-matrix, close coupling and distorted wave methods have been used for this study. In the distorted wave method no calculations have been performed for electron impact- excitation of cesium atom using complex distortion potential.

That is why in this study, I have used the distorted wave method to calculate differential cross sections and integral cross sections for the electron impact excitation of the lowest autoionizing level of cesium (Cs) atom using the complex distortion potential which comprises of, static, exchange and absorption potentials. I have applied a linear combination of the static potentials of the target atom in its initial and final states plus exchange and absorption potentials as the final channel distortion potential and the static potential of the target atom in its initial state plus exchange and absorption potentials as the initialchannel distortion potential. I have used multi zeta (MZ) wave function by Mclean and Mcleanfor cesium atom. Numerical calculations have been performed using modified computer code DWBA1 developed by Madison and Bartschart. The results of this study have been compared with previous experimental data and theoretical data available in literature. It is seen that the present differential cross section, integral cross section and angular correlation parameters are in reasonable agreement with the available theoretical and experimental results. Inclusion of absorption potential lowers the integral cross sections at intermediate energy region and brings them closer to the experimental results.

SUITABILITY OF SELECTED DROUGHT TOLERANT GRASS SPECIES AS TRAP PLANTS FOR *CHILO PARTELLUS* (SWINHOE) IN KISUMU COUNTY, KENYA

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Dr. Oscar Magenya

The stem borer, *Chilo partellus* Swinhoe(Lepidoptera: Pyralidae) is a pest that attacks plants in the poacea familyin tropical lowland areas of Africa. Yield losses in maize are caused by the borer feeding on plant stems, leaves, grains and tussles. It is difficult to control *C. partellus* since larvae hide in stems. Spraying with insecticides only kills eggs and adults. Other methods used to control *C. partellus* include biological, physical, geneticaland cultural methods. Trap plants are used to control *C. partellus* and they fall under culturalpractices. Trap plants are crops grown to attract pests to feed or oviposit on them hence protect target crops from pest attack. Trap plants are eco-friendly and locally available. The purpose of this study was to seek for an alternative control measure by use of trap plants to manage *C. partellus*. The grasses that were

selected from 42 grass species at Kenya Agriculture Livestock Research Organization– Kisii for this study included*Pennisetum sphacelatum, P. mezianum, Hypperhania tamba, Hyparrhenia cymbaria, Panicum maximum, Sporobolus pyramidalis, S. consimilis, Chloris gayana, Bracharia brizantha* and *Bracharia mulato II*. These grasses were selected because they can withstand drought. The field experiments were conducted at Nyakach Sub-County in Western Kenya. The grasses were planted in plots measuring 2 m x 2 m with spacing of 30cm by 70cm in a randomized complete block design and there were three replicates. Greenhouse experiments were conducted at KALRO – Kisii. Each grass was transplanted into ten plastic pots measuring 30cm diameter and 60cm depth. The pots were arranged in rows with three replicates. *Sorghum sudanensis* was used as a control trapplant for *C. partellus*. Ten *C. partellus* larvae were introduced onto potted plants two weeks after transplanting. Data on the number of larvae, entry and exit holes, "leaf window", eggs and tunnel lengths were collected from five grass stems from field and greenhouse experiments one month after planting and transplanting respectvely. The grasses were selected using simple random sampling method. Subsequent data collection was done after every two weeks for 4 months. The data obtained was subjected to ANOVA and analysed using Statistical Analysis System 2010. The means that were significant were separated using theStudent-Newman-Keuls test at a significance level of $p = 0.05$.The results of this study showed that there were significant differences in the mean number of egg batches and eggs in both field and greenhouse experiments.In the field experiments,*Sorghum sudanensis* and *Pennisetum sphacelatum* had the highest mean number of egg batches which significantly differed from those of *Sporobolus pyramidalis, Hyparrhenia tamba, Bracharia brizantha, Bracharia mulato II, Chloris gayana, Pennisetum mezianum, Hyparrhenia cymbaria*and*Panicum maximum. Sorghum sudanensis* and *Pennisetum sphacelatum* had the highest mean number of entry holes.*Chloris gayana* had lower mean number of entry holes but this did not significantly differ from those of *Sporobolus pyramidalis, Bracharia mulato II, Hyparrhenia tamba, Panicum maximum* and *Bracharia brizantha. Sporobolus consimilis, Hyparrhenia cymbaria* and *Pennisetummezianum* leastattracted *C. partellus* for feeding in both experiments.

IN VITRO ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES OF METHANOLIC AND DICHLOROMETHANOLIC SEED EXTRACTS OF KENYAN *Annona squamosa*Linn

STEPHEN KIRUTHI MWIHIA – MS.c

Department: Biochemistry and Biotechnology

Supervisors: Dr. Mathew P. Ngugi

       Dr. John M. Maingi

Enterobacterial constitute a large family of Gram-negative bacteria which reside in the intestines of the animals and can be pathogenic. Penicillins and fluoroquinolones have been used as antibiotics to combat enterobacterial infections. Challenges in treatment of enterobacterial infections with conventional drugs have led the physicians to opt for phyto products and other alternative medicine for treatment of enterobacterial infections. Heavy bacterial load leads to

oxidative stress. *Annona squamosa* (sugar apple) is used traditionally as an anti-infective and antioxidant. This study was carried out to determine the antibacterial and antioxidant activities of organic seed extracts of *Annona squamosa*. The fruits were collected from local farms at Mwea, Wang'uru Sub-county of Kirinyaga County and transported to Mount Kenya University laboratory. The seeds were air dried and then ground into a fine powder before being subjected to extraction with three different solvents: DCM, MeOH and DCM: MeOH (1:1). The extracts were screened for antibacterial activities against standard Gram negative microbial strains of *Salmonella typhirium* (ATCC 1408), *Klebsiella pneumoniae* (ATCC700603)*, Escherichia coli (*ATCC 25922) and *Shigella flexneri* (ATCC 12022), that were procured from KEMRI. The results were obtained through the use of Agar-Disc Diffusion Method and minimal inhibitory concentration (MIC) of each extract noted. Discs impregnated with Ciprofloxacin were the standard while dimethyl sulfoxide (DMSO) was negative control. Sterile discs were dipped in different extracts concentrations for one minute and then placed on Luria Bertania agar plate inoculated with each bacterial species separately. Incubation of plates was done at 37^0C for 16 hours. The MIC of each extract with clear zones of inhibition was recorded in millimeters. The extracts were found to inhibit the test bacteria at varying degrees. The antibacterial data obtained was compared with that of the reference drug (Ciprofloxacin). The MeOH extract was the most efficacious in terms of inhibitory activities, exhibiting the MIC ranging from 15mg/ml to 31.17mg/ml. Methanol: DCM extract ranked second in terms of inhibitory activity with the MIC range of 16.4mg/ml to 56.57mg/ml, DCM showed the least inhibition activities with the MIC ranging from 47.50mg/ml to 61.83mg/ml. The extracts were found to possess antibacterial activities that were significantly lower compared from Ciprofloxacin, though in some concentrations they had the same zones of inhibition. The antioxidant activities of the extract were evaluated through scavenging effect of DPPH, H_2O_2 and the FRAP assay. The antioxidant data obtained was assayed against that of the standard (Ascorbic acid). The methanol extract was found to be the most potent extract with highest antioxidant activities. The qualitative photochemical screening indicated the presence of secondary metabolites associated with antioxidant and antibacterial activities. The present study therefore, recommends that organic seed extracts of *Annona squamosa* may undergo further research for development of phytomedicine with antibacterial and antioxidant properties.

ANTIBIOTIC SUSCEPTIBILITY PATTERN OF BACTERIAL UROPATHOGENS ISOLATED FROM PATIENTS IN NAKURU LEVEL 5 HOSPITAL, KENYA

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Dr. Anthony Kebira

Urinary tract infections (UTI) are bacterial infections encountered in the hospital and community and is preventable. It is among bacterial infection encountered with increasing antibiotic resistance to uropathogens, although there is availability of antibiotics. Despite the wide spread of antibiotics, it remains the common bacterial infections. Antibiotic susceptibility testing therefore provides information that allows clinicians to select the most appropriate antimicrobial drugs. Over the years, the UTIs antimicrobial resistance patterns have been changing. The study was carried out to establish the prevalence of bacterial isolates and their drug susceptibility patterns among the study population. A descriptive cross-sectional study was

conducted in outpatients and inpatients presenting with symptoms of UTI. Purposeful sampling was used to obtain 385 respondents. Mid-stream urine sample were obtained from respondents using sterile bottles and bacterial isolates identification was done using biochemical tests. Culture and sensitivity pattern of uropathogens were determined using disc diffusion method. A questionnaire was administered to consenting respondents and data associated with risk factors was collected and analyzed at α=0.05. Out of 385 urine samples 112 (29 %) patients were confirmed positive for UTI. The prevalence of UTI was higher among females (62.1 %) compared to males (37.9 %). *Escherichia coli* 66 (55 %) was the most predominant followed by *Klebsiella pneumoniae* 12 (10 %), coagulase negative staphylococci 25 (20.9 %), *Staphylococcus aureus* 11 (9.2 %) and *Proteus mirabilis* 6 (5 %). Antimicrobial profiles of *E. coli* strains showed the following susceptibility pattern to nitrofuratoin (100 %), cefotaxime (86.3 %), ciprofloxacin (83.3 %), gentamicin (81.7 %), ampicillin (45.3 %) nalidixic acid (48.5 %) and cotrimoxazole (44.1 %). Further 85% of the isolates were observed to be multidrug resistant, limiting treatment of UTIs with routinely used antibiotics. Hence, there is need for constant monitoring of antibiotic resistance for better management of patients on antibiotic treatment. In addition, the collected data could be use in determination of trends in antimicrobial susceptibility patterns and therefore assisting in policy formulation on the currently used antibiotics for management of UTIs.

CHARACTERIZATION OF Cd$_x$Se$_{1-x}$S/PbS THIN FILMS DEPOSITED BY CHEMICAL BATH DEPOSITION FOR *P-N* JUNCTION SOLAR CELL APPLICATION

EPHANTUS NYAGA NJERU – MS.c

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Dr. W. K. Njoroge

The CdS and PbS are of great research interest due to their outstanding electronics and optical properties such as winder energy band gap phase and good antireflective properties respectively. CdS has been earlier doped by Zn and used as a window layer combined with PbS as the absorber material using the CBD method. It realised an efficiency of 0.9. It is for this reason in my research, I doped CdS with Se in the fabrication of Cd$_x$Se$_{1-x}$S/PbS P-N junction for solar cell application to see whether the efficiency could be enhanced still employing the CBD method. The chemicals used in preparation of Cd$_x$Se$_{1-x}$S were; Solutions of 0.004M Cadmium nitrate, 0.008M Ammonium nitrate, and 0.008M Thiourea. Doping of the CdS films with Se was done using varying volumes of uniform concentration of Sodium Selenosulphate (Na$_2$SeSO$_3$) solutions by volume at a constant deposition temperature of 80± 2^{0}C. The PbS films were prepared from an alkaline bath using aqueous solutions of lead nitrate solution (Pb(NO$_3$)$_2$.3H$_2$O) and Thiourea (CS(NH$_2$)$_2$) which acted as a source of Pb^{2+} and S^{2-}

ions, respectively. The Tri-ethanolamine solution was used as a complexing agent during the deposition process. The $Cd_xSe_{1-x}S$ thin film deposition was done at a temperature of $80°C \pm 2°C$ for 25 minutes while PbS deposition was done at room temperature of $27°C \pm 2°C$, both at normal atmospheric pressure utilizing aqueous conditions for approximately 120 minutes. In the deposition of both window and absorber layers, chemical bath deposition method (CBD) was employed. The precursor solution pH level was maintained at 9 using pH meter. Optical optimization of the thin films was done using DUV UV-VIS-NIR spectrophotometer 3700. Electrical characterization was done using four point probe connected to a Keithley2400 source meter interfaced with computer respectively for both thin films. The $Cd_{0.5}Se_{0.5}S$ film was selected as the best candidate for cell fabrication with E_g of 2.83 eV and transmittance of 89.7%, low absorbance of 1.77% and Resistivity of 1.97×10^4 Ω-cm in the VIS region was noted. The PbS from a 0.5M concentration was selected as the best candidate with a transmittance of 26.8%, Absorbance of 38.79% and band gap of 1.43eV. The $Cd_{0.5}Se_{0.5}S$/PbS fabricated cell had the following cell parameters: Open voltage (V_{OC}) of 0.36V Short circuit current (I_s) of 0.031A, Fill factor (FF) of 0.65 and cell efficiency of 1.15%. In conclusion, the $Cd_{0.5}Se_{0.5}S$/PbS P-N junction is appropriate for photovoltaic applications and especially in the VIS and IR region of the electromagnetic spectrum.

ANTIDIABETIC ACTIVITY AND SAFETY OF *PIPER CAPENSE, BERBERIS HOLSTII, SONCHUS ASPER, VERNONIA LASIOPUS AND GALINSOGA PARVIFLORA* IN ALLOXAN-INDUCED DIABETIC ALBINO MICE

KIMANI LUCY NJERI – MS.c

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In Kenya, diabetes mellitus is of health concern to the public, because it causes substantial morbidity, mortality, and long-term complications. Synthetic drugs used in the management of diabetes are unavailable, have numerous side effects and are expensive. Many plants such as *Piper capense, Berberis holstii, Sonchus asper, Vernonia lasiopus* and *Galinsoga parviflora* used traditionally to manage many diseases including diabetes mellitus but their efficacy and safety after long-term use are not scientifically validated. This study aimed to determine *in vivo* antidiabetic activity and safety of aqueous plant extracts of *Piper capense, Berberis holstii, Sonchus asper, Vernonia lasiopus* and *Galinsoga parviflora* in male albino mice. Aqueous plant extracts were screened for antidiabetic activity in diabetic mice using the intraperitoneal and the oral routes. In the study, albino mice were assigned into eight groups of five mice each.

For this purpose, reduction in blood glucose relative to their initial values was determined after oral and intraperitoneal administration of 25, 48.4, 93.5, 180.9, and 350 mg of aqueous extracts/kg body weight. 1IU/kg body weight dose of insulin and 4.6 mg of glibenclamide (200 mg/kg body weight) were used as a standard hypoglycemic agent to compare the results. Glucose levels were estimated at the beginning of the experiment and repeated after 2, 4, 6, 8, 10 and 24 hours after administering the drugs. Significant reduction in blood glucose relative to their initial values was determined for all treated non-diabetic and diabetic groups at the end of experiment. Mineral composition of the aqueous plant extracts was determined using TRXF (total reflection X-ray fluorescence system) while the quantities and types of phytochemicals present were determined using standard procedures. Toxicity of the aqueous plant extracts to normal mice was studied by orally and intraperitoneally administering them with 450, 670 and 1000 mg/kg body weight daily for 28 days and kept under close observation. Changes in body and organ weight, hematological and biochemical parameters were also determined. After the 28th day, mice were sacrificed and pieces of pancreas, lungs, brain, testis, heart, kidney, spleen and livers were removed for weight change evaluation. Aqueous extracts orally and intraperitoneally administered at 25, 48.4, 93.5, 180.9, and 350 mg/kg body weight showed antidiabetic activity through either route. Oral and intraperitoneal dose of 450, 670 and 1000 mg/kg body weight of the plant extracts significantly reduced the body weight gain. The same oral and intraperitoneal dose of *Piper capense, Berberis holstii, Sonchus asper, Vernonia lasiopus* and *Galinsoga parviflora* altered the hemoglobin levels, mean cell hemoglobin concentration, platelets, red blood cell count, packed cell volume, mean cell volume, white blood cell count and their differential counts. The dose also altered activities of aspartate and alanine aminotransferases, alkaline phosphatase, α-amylase and lactate dehydrogenase. The plants extract contained phenols, tannins, saponins, flavonoids, and alkaloids. Minerals present were potassium, calcium, titanium, bromine, iron, zinc, copper, chromium, manganese, vanadium, rhubidium, strontium, and heavy metal lead. The observed antidiabetic activity toxicity observed in the plants extracts could be due to the phytochemicals and minerals present in the plants extracts. The study recommends use of safe plants with antidiabetic activity as herbal remedies. Comprehensive safety studied on the plants and organic solvent extraction for comparison of the activities of both organic and aqueous extracts.

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING *Citrullus lanatus* RIND EXTRACT AS A REDUCTANT FOR SELECTED ANTIBACTERIAL APPLICATIONS

MICHAEL NDUNDA NDIKAU – M.Sc

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Dr. Naumih Noah

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Silver nanoparticles (AgNPs) are the most studied metal nanoparticles due to their ever growing range of applications in areas such as chemical sensing, nanomedicine and electronics which has led to their increased demand. The AgNPs synthesis involves the use of hazardous reagents and toxic solvents. There is need to develop methods AgNPs that use environmentally benign reagents and solvents. This research work reports a green method where AgNPs were synthesized using silver nitrate as a precursor with

aqueous extract of *Citrullus lanatus* fruit rind as the reductant as well as capping agent. The optimized conditions for AgNPs synthesis were a temperature of 80 °C, pH 10, 0.001 M AgNO$_3$, 250 g/L watermelon rind extract (WMRE), and a reactant ratio of 4:5 (AgNO$_3$WMRE). The resultant AgNPs were characterized by Ultra violet–Visible (UV/Vis) Spectroscopy, Cyclic Voltammetry (CV) and Transmission Electron Microscopy (TEM). UV/Vis results showed a λ_{max} at 404 nm which is consistent with the spectra of spherical AgNPs within the wavelength range of 380-450 nm. CV results showed a distinct oxidation peak at +291 mV while the standard reference AgNPs (20 nm diameter) oxidation peak occurred at +290 mV and TEM micrographs revealed spherical shaped AgNPs. The AgNPs were found to have an average diameter of 17.96 nm. Their antimicrobial activity against clinical isolates of *Escherichia coli (E.coli) and Salmonella typhi (S.typhi)* were evaluated using the disc-diffusion method. The Minimum Inhibition Concentration of the nanoparticles was found to be 45.00 ± 0.01 μg/mL for *S.typhi* and 38.50 ± 0.00 μg/ml for *E.coli* while the Minimum Bactericidal Concentration was found to be 60.00 ± 0.05 μg/ml for *S.typhi* and 50.00 ± 0.00 μg/ml for *E.coli*.

ISOLATION, IDENTIFICATION AND ANTIMICROBIAL TESTING OF

***Salmonella typhi* FROM WATER AND FOOD SAMPLES IN MWEA**

REGION, KIRINYAGA COUNTY, KENYA

MAINA LUKAS MWAURA – M.Sc

Department: Microbiology

Supervisors:Dr. John Maingi

         Dr. Anthony Kebira

Typhoid fever is a major cause of human mortality throughout large areas of the world. Human typhoid occurs following the ingestion of the *Salmonella typhi* bacteria, mostly found in contaminated water, animal products or close association with an infected individual. This study aimed to investigate the major factors contributing to the persistent attacks by typhoid fever among people of Mwea region. In addition, the study also aimed at investigating the microbial load of the water and food samples, resistance pattern of *Salmonella typhi* isolates and identification of *Salmonella typhi* serotype isolated from foods (cow milk, raw cow's offals, mango peelings) and water samples in Mwea. To identify factors that predispose people of Mwea to typhoid fever, a questionnaire was used. Twenty five grams of food sample (offal and mango peelings) was weighed and put in a blender with 75 ml of sterile distilled water for 2 minutes. This mixture became a 10^{-1} dilution. Aseptically, 1 ml of the mixture was put in a tube having 9 ml of diluents.This mixture was labeled 10^{-2} dilution. Further dilutions were achieved by putting 1 ml of the succeeding dilutions in tubes containing 9 ml diluent to realize ten-fold dilutions. Inoculation was done in Selenite F broth and then incubated at 37 °C for 24 h. Hundred milliliters of each of the samples of milk, river and paddy rice plot water, was filtered using membrane filters of pore size 0.45 μm, 47 mm diameter. The filters

were placed in Selenite F broth for selective enrichment and further put in an incubator at 37 ^{0}C for 24 h. The cultures were then streaked on XLD (xylose lysine deoxycholate) agar and Salmonella - Shigella agar. Pure isolates of these colonies were confirmed by biochemical tests. Serotyping of the confirmed *Salmonella* isolates was done using slide agglutination tests. Colonies on nutrient agar were counted using colony counter technique and the plates having 30 to 300 colonies were recorded. Antibiotic susceptibility tests were performed based on Kirby Bauer disc diffusion method done on Mueller – Hinton agar. Sampling took a period of four months. Analysis of the results was done using Chi-square test which was used to determine the association between predisposing factors and cases of typhoid fever, Analysis of variance (ANOVA) at 5% confidence level was used to compare the means of the results of sample analysis and all numeric analysis for the total plate count was made using arcsine logarithm bacterial count values in Excel spreadsheet. Ages of the respondents, level of education, occupation, kitchen and personal hygiene, hand washing practices, method of human and animal waste disposal, presence of blocked sewage system in the area, sources of water and water treatment method were significantly associated with transmission of *Salmonella typhi* while method of food storage and disposal of used water did not influence transmission of *Salmonella typhi*. The food and water samples that tested positive for *Salmonella typhi* in Mwea region were actually contaminated with the pathogen. *Salmonella typhi* isolates in Mwea were sensitive to Chloramphenicol, ceftriaxone, ampicillin, Co-trimoxazole and ciprofloxacin. However they were highly resistant nalidixic acid. Officers from the department of public health in Kirinyaga County should sensitize residents of Mwea on the need of maintaining high hygiene levels coupled with provision of safe drinking water by the water company so as to prevent a typhoid fever outbreak in the area.

ON-HOST BEHAVIOURAL INTERACTIONS BETWEEN ADULT *Rhipicephalus appendiculatus* AND CHARACTERISATION OF THE MEDIATING PHEROMONES

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                        Dr. Wilber Lwande

                        Ahmed Hassanali

Rhipicephalus appendiculatus (Brown Ear tick) is an efficient vector of *Theileria parva* the aetiological agent of East Coast fever (ECF) in cattle. Currently, ECF threatens about 28 million cattle in eastern, central and southern Africa. Control of this tick has largely depended on synthetic acaricides. The use of these chemicals for tick control has however, been compromised by increased cases of tick resistance, high cost of the acaricides and concerns over environmental pollution as a result of extensive use of the acaricides. There have been calls therefore, for alternative tick control approaches that minimise or eliminate the use of synthetic acaricides. Pheromone aided tick control can be one such an approach. Effective use of pheromones in controlling ticks however, demands an understanding of the

ticks' behaviour and the identity of the pheromone(s) mediating these behaviours. This study sought to understand the on-host behavioural interactions between adult *R. appendiculatus* ticks and to characterise the pheromone(s) mediating these behaviours. The findings show that female *R. appendiculatus* attach readily on the host even in the absence of male ticks. After feeding for at least 4 days, female ticks not only attract sexually mature males for copulation but also attract and induce the attachment of unfed males. GC-MS analyses of SPME trapped tick volatiles from 5 days fed *R. appendiculatus* females showed the presence of phenol, *p*-cresol and 2,6-dichlorophenol in the ratio 11:5:6. All the three phenols and their blends were found attractive to unfed male *R. appendiculatus* ticks in a two choice climbing assay. *P*-cresol at a concentration of 2.5ng/μl exhibited the highest relative percentage attractancy (50.41 ± 1.88) among the individual compounds tested. A blend consisting of 5.5ng/μl phenol and 2.5ng/μl *p*-cresol exhibited the highest relative percentage attractancy (50.90 ± 1.77) among the blends tested. 2,6-dibromophenol, an analogue of the identified phenols was also found attractive to the unfed male ticks with a concentration of 5.0 ng/μl exhibiting the highest relative percentage attractancy (37.90 ± 2.76) among the 2,6-dibromophenol doses tested. Behavioural interactions in this tick species could thus be simply mediated by phenols. Male ticks seem to play a critical role on the repletion time and engorged mass of the female ticks. The time and the physiological state of the males (partially fed or unfed) at the time they join females on the host had an impact on the females' engorged mass and repletion time. Females that attached on the host the same day with males attained an engorged mass of 402.60 ± 37.30 mg and reached repletion in 10.47 ± 0.36 days. 5-Days feeding females that were accompanied on the host by 5-days fed males attained an engorged mass of 237.22 ± 22.28 mg and reached repletion in 11.17 ± 0.23 days while those 5-days feeding females that were accompanied by unfed males attained an engorged mass of 387.90 ± 32.42 mg reaching repletion in 13.40 ± 0.34 days. These findings lay some ground work for deploying the brown ear tick's pheromone in its control especially so by targeting the male tick which appears to play a critical role in the successful feeding of the female.

<u>Ph.D</u>

EFFECT OF CHANGE IN LAND-USE ON ELEPHANT ABUNDANCE AND HUMAN-ELEPHANT CONFLICT IN THE MARA-NAROK DISPERSAL AREA, KENYA

PATRICK OMONDI MOL ODUOR – Ph.D

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Supervisors: Dr. Eunice Kairu

Dr. Phillip Muruthi

Prof. Noah Sitati

The Narok Mara dispersal area has experienced intense human-elephant conflict (HEC) over two decades and no study had been done before the current one to establish the underlying causes. The aim of this study was to investigate the implications of land-use changes on elephant population abundance andon the extent of human-elephant conflicts. Data on evolution of land ownership and land use were obtained from secondary sources, household surveys and focus group discussions. Land use and land cover changes were analyzed by undertaking supervised classification of Landsat satellite imagery for 1986, 1995, and 2010. Elephant population trend was investigated by analyzing aerial elephant surveys' secondary data of 1984 to 2009 and 2010. Elephant location and movement data were obtained from one male elephant fitted with a satellite-linked GPS collar from August 2006 to December 2008 and aerial surveys. Data on the nature, extent and trends of human-elephant conflicts were acquired through interviews using questionnaire surveys; focus group discussions; Occurrence Books (OB) and daily monitoring and recording. Rainfall data were acquired from the Kenya Metrological Department. Analysis of Variance, Chi-square and regression were performed to test for statistical significance using SPSS Version 12.0, STATVIEW, STATISTICA, and Microsoft Excel 2007 computer software. The study established a decline in grasslands, forests and shrub-land by 76%, 32%, and 17% respectively, between 1986 and 2010. In contrast, area under farmland increased by 56% in the same period. Further, elephant population increases threefold in the Great Mara Ecosystem between 1984 and 2010. A significant increase was recorded in the dispersal area ($P<0.05$) unlike in the reserve ($P=0.4588$). Large herd sizes were recorded in the study area (36 individuals per herd) compared to those in Masai Mara National Reserve (10 individuals per herd) and the dispersal area (14 individuals per herd). The higher elephant herd sizes in the Mara-Narok dispersal area could be due to confinement as a result of land transformation from wildlife range areas to cultivation. This study found an elephant sub-population of 181 individuals, in Narok North Sub-County, that had not been recorded before. The study recorded ten different types of HEC in Narok North Sub County. The worst of these HEC's included human deaths and injury, crop destruction, interference with school attendance, and destruction of food stores. The study links HEC to habitat destruction and fragmentation and subsequent loss of elephant range. The studyconcludes that the ongoing habitat destruction threatens long term elephant conservation efforts. The study recommends development of a comprehensive land zoning plan to manage human activities and promote elephant conservation. If this is not achievable, translocation of the sub-population from the study area

to MMNR or to other viable conservation areas would be the most viable and sustainable option for mitigating increasing cases of HEC.

FUNCTIONAL CHARACTERIZATION OF *STRIGA* RESISTANCE GENES IN RICE AND *IN VITRO* CULTURE OF THE PARASITE

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Dr. Damaris A. Odeny

Rice, the second most important cereal crop globally, is mainly grown for food and is a staple food for more than half of the world's population. In sub-Saharan Africa biotic stresses and lack of resources are major production constraints to food production. An estimated yield loss of 16% attributed to weed infestation is recorded in the region with *Striga* spp. being the most prominent. *Striga hermonthica* and *Striga asiatica* constrain production of cereals while *Striga gesnerioides* parasitize cowpea in West Africa. Cultural control methods have for a long time been applied against *Striga* with only modest gains. *Striga* resistance in certain crops has been attributed to having particular genes or QTLs within the genome. Growth regulating factors (GRF) are plant specific transcription factors that play a role in parasitic interactions of *Striga*, nematodes and *Arbuscular mycorrhiza*. This study determined the fold change in gene expression of the 12 rice Growth Regulating Factors during *Striga* infection in a susceptible and a resistant rice genotype. All the 12 rice GRFs were expressed in rice roots. A relative fold change in gene expression of between 0.6 and 1.9 indicated that these genes could be playing a role in susceptibility or resistance to *Striga* infection. Rice GRF 1, 2, 10 and 12 were upregulated in the resistance rice, Nipponbare, at 4 days post infection while in the susceptible rice, Koshihikari, they were downregulated. To find out if heterologous expression of a resistance gene can induce resistance against *Striga*, rice was transformed with the resistance gene *RSG3-301* and phenotyped for resistance to *Striga hermonthica* and *Striga asiatica*. Molecular analysis of the transgenic plants was done through PCR, RT-PCR and southern blot analysis. *Arabidopsis thaliana* transformed with *RSG3-301* was also phenotyped for resistance to *Striga gesnerioides*. Heterologous expression of this gene did not induce resistance against any of the three *Striga* species. To develop a tool for functional validation of *Striga* genes, *Striga hermonthica* calli were transformed with GUS gene through *Agrobacterium tumefaciens*. *Striga asiatica* was found amenable to host free culture, a method that proved useful in production of clean explant for tissue culture. One-month-old whole seedlings and stem explants produced calli

and there was no significant difference in callus induction frequency between the two. Identification of genes that can be used for development of *Striga* resistant crops and development of strategies for genetic transformation of *Striga* are critical in solving the menace in Africa.

FABRICATION AND CHARACTERIZATION OF MAGNETORESPONSIVE CARBON NANOTUBE-INFUSED POLYSULFONE (CNT-IPSF) NANOCOMPOSITES FOR WATER PURIFICATION

Shisia Kuboka Silvanus – Ph. D

Department: Chemistry

Supervisors: Prof. Hudson Nyambaka

$\qquad$ **Dr. Naomih Noah**

$\qquad$ **Dr. Dickson Andala**

The search for materials for purification of polluted water is growing daily with the advent of nanoparticles. This is particularly important because many populations of people in the developing countries lack clean water due to water pollution. Water pollutants such as heavy metals and polycyclic aromatic hydrocarbons (PAHs) are known to have adverse effects on humans and environment. This work investigated the potential of synthesized magnetoresponsive CNT-polysulfone infused polymeric nanocomposites (CNT-IPSF) in water purification against heavy metals and polycyclic aromatic hydrocarbons (PAHs)pollution. Adsorption mechanism was studied at constant initial Pb(II) ion concentrations, nanocomposite dosage, contact time, and pH. Carbon nanotubes (CNTs) with internal diameters in the range of 20-30 nm were prepared via chemical vapour deposition (CVD) process. Magnetite and silica coated magnetite nanoparticles (NPs) prepared by solvothermal and sol gel methods respectively exhibited UV-Visible spectrometric spectra at about 395 nm and 396 nm respectively. Successfully synthesized Fe_3O_4 nanoparticles exhibited FT-IR absorption bands at 460and 521 cm^{-1}which ascribedfor the vibrations of Fe-O bond. X-ray diffraction analysis of core shell NPs showed strongest peak at D(311) plane, characteristic of a cubic spinel structure. The core shellnanoparticles obtained displayed a thin hysteresis loop havingsaturation magnetization of 2.2 $emug^{-1}$ with ferrimagnetic property. Removal efficiency of the synthesized CNT-PSF/Fe_3O_4nanocompositefor Pb(II) ions and phenanthreneswas 69 % and 63 % respectively compared to that for a commercially available activated carbon which recorded 54 % and 53 % respectively. Adsorption of Pb(II) ions and phenanthrenes followed pseudo-second-order while Freundlich adsorption isotherm gave the best-fit for the two pollutants. Regeneration for Pb(II) ions of above 60 %and a gradual decrease in desorption efficiency for

phenanthrenes of up to 50 % after three desorption cycles confirmedthe reusability of the fabricated magnetoresponsive CNT-IPSF/Fe_3O_4 nanocomposites.This study has developed a novel CNT-IPSF/Fe_3O_4 nanocomposite material with higherremoval efficiency for water pollutantsthan commercially available activated carbon for use in water treatment.

SCHOOL OF BUSINESS

Ph.D

QUALITY MANAGEMENT STRATEGIES AND PERFORMANCE OF OIL MARKETING COMPANIES IN KENYA

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The business environment within which the oil marketing companies operate has been very volatile. Political anxiety, competition from new entrants, social reforms, technological advancement and global changes are some of the challenges that have greatly affected the growth of the industry. The dynamism of the petroleum firms' operating environment in the current times is posing a lot of challenges to all oil marketing companies. This study sought to assess the relationship between quality management strategies and performance of oil marketing companies in Kenya. The specific objectives that the study sought to address were: to determine the relationship between quality planning strategy and performance; to establish the influence of quality control strategy on performance; to establish the influence of quality improvement strategy on performance; to establish the influence of management commitment on the relationship between the quality management strategies and performance; to examine the influence of firm operating environment on the relationship between quality management strategies and performance; and to examine the influence of quality preparedness on the relationship between quality management strategies and performance. The philosophical foundation of this study was positivism. To achieve these objectives, the study adopted a descriptive cross sectional research design. The target population was all the 73 oil marketing companies in Kenya as outlined by the KRA report of 2014. Semi-structured questionnaires were issued to the respondents using a drop-and-pick-later method. A pilot study was conducted to test the validity of the questionnaire and the Cronbach's Alpha was used in testing its reliability. Descriptive statistics, which included the mean, standard deviation and relative frequency, were used to describe the characteristics of the variables of interest in the study, while inferential statistics of multiple regression analyses were used to establish the type and strength of the relationship between the variables as well as to test the hypothesized relationships. An assessment of the model's underlying statistical assumptions was conducted through tests for Homoscedasticity, Multicollinearity and Normality. The frequencies on the respondents identified that most respondents were male, had attained some level of education, had some level of experience and most were in managerial level in their companies. Generally, the respondents agreed to the statements on the study variables where the responses were ranked on a five point Likert scale. The results showed that the quality management strategies, quality planning ($p<0.05$; $\beta=0.386$), quality control ($p<0.05$; $\beta=0.295$) and quality improvement($p<0.05$; $\beta=0.301$) had a significant influence on the firm's performance. It was also observed that quality preparedness ($p<0.05$; $\beta=0.283$) had a significant mediating effect on the relationship between quality management strategies and firm performance. For the moderating variables, only top management commitment had a significant moderating effect at $p<0.05$; $\beta=0.085$, while the data showed that firm operating environment did not have a significant effect ($p>0.05$; $\beta= 0.335$) on the relationship between quality management strategies and firm performance. The study recommends that the management should be more committed to quality and provide resources and direction in regard to quality management strategies, and these should be in line with the firm's objectives and goals. Policy makers should provide a good environment by providing sufficient resources if the intended improved performance of the oil marketing companies is to be realized.

SCHOOL OF EDUCATION

Masters

PUBLIC PRIMARY SCHOOL HEADTEACHERS INVOLVEMENT IN EARLY CHILDHOOD CURRICULUM IMPLEMENTATION IN NANDI COUNTYKENYA

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Pre-primary schools in Kenya are established for the major purpose of providing conditions and services to enable children to grow, develop and learn in readiness for primary education andfuture levels of learning. In order for these institutions to accomplish this main objective, proper administrative and managerial practice must be established. Most Early Childhood Development and Education (ECDE) centers of public primary schools and those attached to them are not getting appropriate managerial and administrative services from headteachers of such schools. Lack of significant management and administration impedes effective implementation of Early Childhood Education (ECE) curriculum and transition of children to primary school. The purpose of this study was to establish the degree of participation in curriculum implementation, of headteachers of public primary schools in Early Childhood Education programs in Emgwen Division of Nandi Central District, Nandi County. The main objective of the study was to establish headteachers' management abilities in ensuring the implementation of the ECE curriculum and the strategies they put in place to facilitate transition of children from pre-primary to primary school. Exploratory approach using descriptive survey research design was employed. The study targeted a population of 7 quality assurance and standards officers (QASOs), 74 headteachers of all the public primary schools in Emgwen Division and 74 Early Childhood Development Education (ECDE) teachers. The education officers were purposefully sampled. The randomized cluster sampling was adopted using the lottery method to come up with an equal number of schools in every zone (Kapkangani, Chepkumia, Kapsisiywa, Kaptel and Kamoiywa). From each sampled school, the researcher scheduled an interview for the headteacher. The pre-primary teacher in the ECDE center within such a school and 1 ECDE teacher from one of the centers attached to it were given a questionnaire to fill. This sample group was selected using the simple random sampling technique of the lottery method to ensure every individual had a chance to be selected. Stratified random sampling method was employed to select respondents from the strata of headteachers who had received training in ECE and those who had not. Apart from the Quality Assurance and Standards Officers (QASOs) who were treated to purposive sampling, all the other groups in the study had a sample size of 30%. Thematic-based analysis and presentation of collected data was done qualitatively and organized systematically using descriptive statistics of tabulation of frequencies and percentages. The study found that administrative and management functions of headteachers in ensuring ECDE curriculum implementation in ECDE centers in public schools were not quite well performed. Based on these findings, the researcher concluded that the effectiveness of headteachers of public schools in executing the two major functions; managerial and curriculum implementation was minimal at the ECDE level. As such, the study

recommended among others, the need for a well-integrated approach that seeks to involve the central government through the Ministry of Education in linking up with the county governments and other stakeholders in implementing Early Childhood Development and Education programs. The findings and recommendations of the study, if considered, will help headteachers and QASOs realize the gap in administrative and curriculum implementation at ECDE centers and take necessary measures to curb the situation. Policy developers will come to know of the gap in policy direction to headteachers in their involvement in ECE curriculum implementation and transition of children from the pre-primary to primary level. This is because there is need to put policies in place that will go a long way in improving the status of management in public ECDE programs in tandem with dynamics facing this sub-sector of education following the implementation of the constitution that has seen ECDE functions devolved to county governments.

IMPLICATIONS OF LIFE SKILLS EDUCATION CURRICULUM ON PEER

INFLUENCE RELATED BEHAVIORS AMONG STUDENTS IN

SECONDARY SCHOOLS IN KIRINYAGA COUNTY, KENYA

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             Dr. Salome Nyambura

Life Skills Education plays a major role in enabling individuals to translate knowledge, attitudes and values into actual abilities in reference to what to do and how to do it. There has been a concern over the rising cases of peer influence related behaviors among secondary school learners necessitating the need to carry out the study in secondary schools in KirinyagaCounty. The study objectives were; to establish trends in peer influence related behaviors among secondary school students in Kirinyaga County, to explore the perceptions of teachers and students on the role of LSE in enabling secondary school students deal with peer influences, to analyze the LSE content in relation to enabling learners deal with peer influences and to examine the LSE teaching approaches and peer related influences in secondary schools in Kirinyaga County. The study was based on Bandura's social learning theory. The descriptive survey design was employed. Qualitative and Quantitative data was collected by use of questionnaires, semi-structured interview guide and Focus Group Discussions. The target population was32 public secondary schools, 1310 Form three students, 32 principals and 120 teachers .Stratified random sampling was used to select schools for the study depending on the school type. Simple random sampling was used to select students while purposive sampling was used to select teachers and school principals. The study sampled 10 public schools, 10 heads of institutions, 131 form three students and 45 form three LSE teachers. The qualitative data was analyzed systematically by organizing it into categories and themes guided by research objectives. Quantitative data was analyzed using descriptive statistics and presented in pertinent themes. The responses were then coded, analyzed and presented in form of frequency tables and charts. Conclusions were based on measures of central tendency (mean, mode and median) and measures of dispersion (range, deviations) using a computer program called the Statistical Package for Social Sciences (SPSS). The findings were presented in tables, pie charts, graphs and narrations. Research findings showed that students are still involved in peer related behavior including drug abuse, theft, examinations malpractice, bullying, violence and strikes despite the efforts to impart life skills to students in school. Teachers felt there is need for a review of the content to make it more effective.School principals need to involve parents, NGOs and other stakeholders in facilitating and funding life skills programs as well as creating an enabling school environment to promote inculcation of the said psycho-social skills. Further research is

recommended to investigate the role of modern technology (use of mobile phones, computers) in promoting risky behaviors among students.

GENDER DIFFERENCES IN MATHEMATICS PERFORMANCE AT SECONDARY SCHOOL LEVEL IN KANDARA SUB-COUNTY, MURAN'GA COUNTY, KENYA

MWALYA SAMUEL KYAVOA – M.Ed
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The purpose of this study was to investigate gender differences in mathematics performance in secondary schools. The study was carried out in Kandara Sub-county in Murang'a County. The study was guided by four objectives: - (1) determine the level of gender differences in mathematics performance in secondary schools. (2) determine students related perspectives about mathematics that contribute to gender differences in mathematics performance in secondary school. (3) determine how school environment contributes to gender difference in mathematics performance in secondary schools. (4) examine mathematics teacher's opinion towards gender difference in mathematics performance in secondary schools. The variables for the study were mathematics content taught and student's performance in mathematics. The target population was all the 50 secondary schools in Kandara sub-county. Ten schools which constituted (20%) in the region were sampled using stratified random sampling techniques. Schools were classified into county schools, sub-county boarding schools, and day schools. From sampled schools, simple random sampling technique was used to pick 20 Form Three students per school to make a total of 200 students. Out of the total 74 mathematics teachers in the sub-county, 20 (27%) mathematics teachers were sampled. The study used cross-sectional descriptive survey design. Data was collected using written test items for students, and open ended questionnaires for students and teachers. The study collected both quantitative and qualitative data and analyzed using statistical package for social science (SPSS – Version 21). The descriptive statistics used in this study included mean and percentages. Data was presented using frequencies, bar graphs and charts. Results revealed that there are gender differences in mathematics performance in Kandara sub-county, Murang'a county secondary schools. The student test item results revealed that male students in Kandara sub-county, Murang'a County outperform female students in mathematics. More so, county boarding boys secondary school students are the best performers in mathematics, followed by county boarding girls, Sub-County boarding boys while Sub-County day secondary schools had the poorest performance with female students scoring the lowest on the set test items. Through various statements from teachers and students, the researcher corroborated these results as the findings generally indicated that boys outperformed girls in Mathematics. Further, the study also revealed that though female students trail male students by performance in mathematics, some female students also outperform some male learners in the subject with majority of such girls coming mainly from county boarding girls' schools. Based on the findings, we recommend that policymakers should target more on the programs that would improve performance of girls in Mathematics especially addressing variables that affect girls negatively. Further, some programs to sensitize various teacher's opinions on gender differences and their impact on performance in Mathematics should be developed and implemented in schools.

FACTORS AFFECTING STUDENTS' ACQUISITION OF SPEAKING SKILLS IN ENGLISH AMONG SECONDARY SCHOOLS IN TURKANA EAST DISTRICT, KENYA

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The purpose of the study was to identify the factors affecting the acquisition of speaking skills in English amongst secondary students in Turkana East District, Kenya. Teachers use Standard English for instruction yet the learners find it difficult to communicate using Standard English and this is reflected when expressing themselves. The main concern was to identify factors affecting students" acquisition of speaking skills in English. The objectives were to: establish the instructional resources used in teaching speaking skills in English, establish the methods teachers of English use in the teaching of speaking skills, establish the common errors that students made when speaking in English and to identify other factors affecting the acquisition of speaking skills in English. The findings of the study were to provide teachers of English, students and the heads of English department with insights on the problems that students face in the process of acquiring speaking skills in English as well as help them improve their verbal communicative ability. The scope involved students from 5 public secondary schools in Turkana East Sub-county, Kenya. The research was guided by Krashen"s theory of language acquisition and learning. Literature was reviewed as per the study objectives and a descriptive survey design was employed to gather information on the factors that affected students" acquisition of speaking skills in English. The variables under investigation were independent, intervening and dependent variables. The target population comprised 1210 students and 9 teachers of English out of which 4 were Heads of Department. In one school, a Kiswahili teacher was the HoD. The total population was 1219 respondents. The sample size comprised 3 randomly and purposively selected public secondary schools, 137 form three students, 6 form three teachers of English out of whom were 3 were heads of the English department making a total of 145 respondents. Data was collected using questionnaires, interview schedule, observed schedule and a checklist then analyzed using the Statistical Package of Social Sciences (SPSS) program. The analyzed data were presented descriptively using tables, charts, graphs and percentages. The findings indicated that English course books, literary texts and the chalk board were the most available and accessible instructional resources in the schools. Teachers used few learner-centred teaching methods that enhanced students to speak English in the classroom. Role play was disliked by teachers as it was time consuming. However, in the questionnaires teachers indicated that they employed the method in teaching English speaking skills. Students made errors when they spoke in English.

Students" acquisition of speaking skills in English was affected by their age of enrolment, lack of motivation and lack of practice. It was concluded that schools lacked variety of instructional resources. Age of enrolment in school affected acquisition of speaking skills. Teachers did not employ enough teaching methods that could give students opportunities to practice speaking good English. This would minimize the errors they made while speaking English. The researcher recommended provision of a variety of instructional resources and teachers to vary the teaching methods that enable students to acquire speaking skills in English successfully. Children should start school at the right age.

EFFECTOF MOTIVATIONAL STRATEGIES ON THE LEARNERS'PERFORMANCE IN SECONDARY SCHOOL CHEMISTRY INTHIKA- EAST DISTRICT, KIAMBU COUNTY, KENYA

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For learning to take place it requires an active participation of a learner and an instructor. For active participation, motivation is an essential element especially in science subjects which are perceived as difficult by most learners. A student may be intrinsically or extrinsically motivated. This study focused on five motivational strategies that may enhance and sustain intrinsic motivation of learners so as to improve conceptualisation, increase initiation and persistence, sustain interest, active participation and consequently lead to a better performance of learners in Chemistry. The purpose of the study was therefore to assess the effect of motivational strategies used during instruction on the student"s performance in secondary school Chemistry. The study was guided by the following objectives: To explore the motivational strategies that were used during instruction of Chemistry; to find the relationship between use of motivational strategies and students" performance in Chemistry; to find out whether there existed a significant difference between the effect motivational strategies on the performance of boys and girls and to determine the challenges teachers of Chemistry faced when attempting to motivate learners. The motivational strategies under consideration were; feedback, content relevance, nature of learning environment, performance standards and learning goals. The research was carried out within the framework of self-determination theory. The study used quasi-experimental research design. The target population were form two students and Chemistry teachers from public secondary schools in Thika- East District. Random sampling was used to sample ten public mixed secondary schools from the target population for the research. Data was collected using interview schedules, observation schedules and written chemistry

tests. Piloting was done to determine reliability and validity of the research instruments. Data was analysed using Micro-Soft Excel, SPSS, SAS and presented by use of tables and figures to enhance clarity. The key findings of the research were that, the mostly used motivational strategy used by teachers of Chemistry promoted extrinsic motivation, use of motivational strategies led to a better performance of learners in secondary school chemistry and there was no significant difference on effect of motivational strategies on the performance of boys and girls in secondary school Chemistry. The study resulted in the conclusion that use of motivational strategies leads to a better performance of learners in secondary school Chemistry. The researcher recommended that there is need to sensitise teachers of Chemistry on the importance of learner"s intrinsic motivation and how it can be enhanced and sustained.

EFFECTS OF PARENTAL INVOLVEMENT IN 'MVULA' OCCULT PRACTICES ON PRESCHOOL CHILDRENS' SOCIO- EMOTIONAL ADJUSTMENT AND LEARNING IN CHONYI DIVISION, KILIFI COUNTY, KENYA

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'Mvula' occult is a secret occult among the Chonyi sub-tribe of the Mijikenda language group of Kilifi County. Members operate in sets of five with powers said to control rain by use of unholy formulae whose 'unholy communion' involves eating human flesh serially sacrificed by its members, for potency in their endeavours. These people are feared and shunned in equal measures by the community and are believed to cause mysterious death to anybody who dares challenge their authority. The research was intended to investigate the school adjustment of their 5-7 year olds which is an at risk group because of the atrocities their parents allegedly do in the community. The study was pegged on Urie Bronfenbrenners' Ecological Contextual Theory of 1979 which contends to child's personality shaped by the environment through interrelated systems referred as Micro, Messo, Exo, Macro and Chrono systems. The research targeted was children whose parents were members of the Mvula occult practices from a population of 2500 aged between 5 and 7 years in Chonyi Division of Kilifi South Sub County in Kilifi County. The Independent Variable was Parental involvement in Mvula Occult Practices and the dependent variables were Social problems, Emotional problems and learning problems affecting the children influencing the child's school adjustment. The research adopted a mixed Research Methodology that involved collecting and analysing data using both qualitative and quantitative methods. Data was collected from school heads, lower primary and pre-school teachers and learners aged 5-7 years olds spread between preschool and class three. The data was gathered using questionnaires, interviews and observations and was analysed using the Statistical Package for Social Sciences (SPSS version 21). The findings of this research indicated that 70% of the children whose parents are involved in the 'Mvula' occult

practices have school adjustment problems and fail to meaningfully gain from school experiences hence need for xiii

interventions. This study recommends streamlining of the school/learning environment by initiating strategic programs for teachers in handling the learner as addressing learner attitude to school, social interactions as in art and music and Christian Spiritual approaches to address the spiritual aspects of emotional regulation. The researcher recommends research on post school life of the children whose parents are members of the 'mvula 'occult as a strategy in looking for viable solutions as another strategy that could be used.

TEACHER CHARACTERISTICS THAT INFLUENCE DEVELOPMENT OF ORAL LANGUAGE SKILLS AMONG PRE-PRIMARY SCHOOL PUPILS IN NAIROBI CITY COUNTY, KENYA

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Development of oral language skills is a precursor to writing and reading acquisition. Oral skill is a means of communication through which people express their desires, ideas, excitements, amusements, disappointments and exchange information. In addition, oral skills have been found to be an important tool for thinking and concept development in children. Research carried out in industrialised countries have identified some appropriate teaching strategies used to enhance acquisition of oral language skills such as repetition, substitution, explanation, contrast, exemplification and code-switching. However, these studies' geographical locations do not reflect the diversity of the Kenyan society. In addition, studies conducted in Kenya in the past have not established why pre-primary school teachers are not using appropriate teaching strategies. The purpose of this study was to find out whether teachers' experience, academic qualification and type of training influences their choice of teaching strategies in development of oral language skills inside and out of classroom in selected preschools in Kibra Sub-County, Nairobi County. In addition, this study aimed at finding out the strategies used by teaches in Kibra Sub-County to promote oral skills development among pre-primary school children. The study was guided by Holdaway's theory of language acquisition by Donald Holdaway (1997). Descriptive survey design was employed during this study. Questionnaires and observation schedules were used to collect data. Eighty-three (83) preschool teachers were sampled using multistage sampling methods for observation. Data was analysed using SPSS version 20. The researcher carried out content analysis on the qualitative data. The main descriptive methods used were tabulation of frequencies and percentages. Chi squire test was the inferential statistic used to test the relationship between variables. The main findings of the study indicate that teaching strategies that were mostly used by pre-primary school teachers

were code-switching, examples, repetition, substitution and explanation. While questions, direction, expansion of children words and contrast were the least used teaching strategies when teaching oral language skills. The study revealed that the there is a slight correlation between the type of training of teachers and the teaching strategies as most of DICECE trained teachers used more teaching strategies when teaching oral skills compared to other teachers. The findings also revealed that there was a partial significant correlation between teacher's academic qualifications and a few teaching strategies. Similar correlation was also observed between teaching experience and a few teaching strategies. Since the strategies used by pre-primary school teachers under the study were less than half of the recommended teaching strategies to promote oral skills, the study recommends that teachers should be encouraged to use more in structural strategies to improve children's oral language skills.

STRATEGIES FOR ENHANCING PERFORMANCE IN MATHEMATICSFOR LEARNERS WITH HEARING IMPAIRMENT IN PRIMARYSCHOOLS.A CASE OF MAKONGO SCHOOL FOR THE DEAF MAKUENI COUNTY, KENYA

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The primary purpose of the study was to establish strategies of enhancing of Mathematics performance among class 5- 8 learners with hearing impairment in Makongo School for the Deaf in Makueni County. A case study design was employed. The target population comprised of the 9 teachers and all the 28 learners with hearing impairment from class 1-8 making a total of 37 respondents. The researcher purposively sampled Mathematics teachers and classes 5-8 learners who were mature enough to be interviewed to give the needed information. Two research instruments namely: Questionnaire and interview schedule were constructed to collect data from Mathematics teachers and learners with hearing impairment respectively. Data collected was analyzed using both Quantitative and Qualitative techniques using the Statistical Package for Social Sciences (SPSS) to get descriptive statistics such as percentage, frequencies and tabulations. The study found out that gestures were used by teachers in teaching Mathematics to class 5-8 learners with hearing impairment instead of using multiple methods which are core to improving learners' holistic understanding of Mathematical concepts and eventually enhancing their performance in the subject. It

was also found that most of the Mathematics teachers had difficulties in translating Mathematics into sign language despite their qualification in Special Needs Education. Similarly, learners with hearing impairment found it difficult to understand Mathematical sign language due to limited Mathematical vocabulary. The study recommends that teaching methods should be interesting to stimulate learners' interest in Mathematics and there should also be organized regular in-service trainings for Mathematics teachers for class 5-8 learners with Hearing Impairment. It also recommends measures to increase teacher's motivation as well as undertaking proper follow-ups on teaching methods and resources.

MITAZAMO YA WALIMU KUHUSU TEKNOLOJIA YA MAWASILIANO KATIKA UFUNZAJI NA UJIFUNZAJI WA KISWAHILI KATIKA KAUNTI NDOGO YA KASIPUL, KENYA

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Utafiti huu ulinuia kuchunguza mitazamo ya walimu katika kushirikisha matumizi ya Teknolojia ya Mawasiliano katika ufundishaji wa Kiswahili katika shule za upili za Kaunti Ndogo ya Kasipul, Kaunti ya Homabay, Kenya. Utafiti wenyewe ulizingatia teknolojia mpya kama vile teknolojia za kompyuta pamoja na mtandao. Idadi iliyofanyiwa utafiti ilijumuisha walimu 52 wa Kiswahili, walimu wakuu 24 wa shule za upili na wanafunzi 2140. Utafiti huu ulichunguza misingi ya mitazamo ya walimu kuhusu ushirikishaji wa teknolojia ya mawasiliano katika ufundishaji wa Kiswahili katika kaunti ndogo ya Kasipul. Madhumuni ya utafiti huu ulikuwa; kutathmini mitazamo ya walimu kuhusu matumizi ya teknolojia ya mawasiliano katika ufunzaji na ujifunzaji wa Kiswahili, kubainisha viwango vya walimu vya matumizi ya teknolojia ya habari na mawasiliano katika ufundishaji wa Kiswahili na kuchunguza changamoto zinazowakumba walimu katika kuitumia teknolojia ya mawasiliano darasani. Kwa kuzingatia misingi ya nadharia ya Ubunaji, misingi ya mitazamo ya walimu kuhusu kushirikisha teknoloji katika ufundishaji wa Kiswahili ulitathminiwa. Muundo wa kimaelezo ulitumika katika utafiti huu. Vifaa ambavyo vilitumiwa katika utafiti huu ni hojaji, uchunzaji pamoja na mahojiano. Maswali yaliyotumiwa katika hojaji yalikuwa maswali wazi, maswali funge na maswali ya viwango. Walimu wakuu, walimu wa Kiswahili na wanafunzi walihojiwa ili kupambanua mitazamo yao katika ushirikishaji wa teknolojia ya mawasiliano katika ufundishaji wa Kiswahili. Data ilichanganuliwa kwa kutumia majedwali ya frikwenzi pamoja na vielelezo. Matokeo ya utafiti yalinuiwa kusababisha kuimarika kwa utekelezaji na ujumuishaji wa teknolojia ya mawasiliano katika somo la Kiswahili kwa kutambua

changamoto za utekelezaji na ujumuishaji katika msingi wa mitazamo kuhusu matumizi ya teknolojia ya mawasiliano. Hali kadhalika, yalinuiwa kuimarisha mtaala wa Kiswahili ili uweze kukidhi zaidi mahitaji ya walimu na wanafunzi kwa kuwawezesha kukabili vizuizi pamoja na kuwa msingi wa utafiti zaidi. Matokeo ya utafiti yalionyesha kuwa mitazamo ya walimu kuhusu teknolojia ya mawasiliano ilikuwa chanya. Kwa kiwango fulani, mitazamo ya walimu katika ufundishaji wa Kiswahili kwa kutumia teknolojia ya mawasiliano kuliathiriwa na vigezo kama umri, jinsia na kiwango cha kielimu. Kufuatia matokeo haya,ilipendekezwa kuwa walimu wa Kiswahili na hata wale walio kwenye vyuo mbalimbali wapewe mafunzo zaidi kuhusu matumizi ya teknolojia ya mawasiliano katika ufundishaji. Matokeo ya utafiti yananuiwa kujaza pengo katika utoaji wa mafunzo ya Kiswahili na vile vile kuwasaidia wakuza mitaala kufanikisha zoezi la ufunzaji na ujifunzaji wa Kiswahili.

CHALLENGES FACING THE IMPLEMENTATION OF NEPAD PILOT E-SCHOOLS' INITIATIVE IN KENYA

MUMALI KENNEDY WAFULA – M.Ed

Department: Educational Communication and Technology
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Prof. Henry Okello Ayot

The New Partnership for Africa's Development (NEPAD) e-school project aims at imparting ICT skills to Primary and Secondary schools' children, and harnessing ICT technologies to improve access to education in Africa. Sixteen countries acceded to the memorandum of understanding of NEPAD peer review mechanism and the pilot phase was launched in Algeria, Burkina Faso, Cameroon, Congo, Egypt, Gabon, Kenya, Lesotho, Mali, Mauritius, Mozambique, Niger, Rwanda, Senegal, South Africa and Uganda. In Kenya, the pilot phase was initiated in six secondary schools in the year 2004, namely Mumbi Girls, Isiolo Girls, Menengai High School, Chavakali Boys, Wajir Girls, and Maranda Boys. During the pilot phase, the program has registered challenges that this study has addressed. This study was conducted to evaluate the challenges of the pilot phase of NEPAD e-School project in Kenya. The study explored and reviewed the extent to which the teachers were trained and qualified to handle the e-School facilities, to explore the level of expertise and skills possessed by teachers and students to utilize e-school ICT facilities and to find out the extent to which the e-School facilities are being accessed and used for classroom instruction during lessons. It was found out that majority of the teachers have not undergone the in-service training in the field of ICT and therefore do not integrate the ICTs in the classroom lessons. The study also revealed that most students and teachers do not access the e-materials since they are only restricted to a few individuals in the schools. Finally it was revealed that most teachers and students lack the expertise and skills to handle both hardware and software of the e-materials especially computers, word processing, power point and spreadsheet, this hampered the use of these equipment during teaching and therefore teachers couldn't impart the same skills to students. All the six NEPAD e-Schools in Kenya were included in the study and the teachers and students in these schools formed

the study population. The study employed survey research methodology. A representative sample of the population was selected using probabilistic techniques. Data was collected using survey questionnaires whose validity was tested, then data analyzed using Statistical Package for Social Sciences (SPSS) which led to the suggestions that the teachers need to be in-serviced on the use of ICTs in the teaching and learning in order to develop the expertise in ICT integration. The ministry of education should provide enough e-materials for all teachers and students to access and therefore develop the ICT skills. This paper recommends that further research be done in other schools in which such ICT programs are being implemented to curb the loop holes in its implementation and to establish the quality of the software and hardware suitable for educative purposes in schools. These recommendations are to individuals and institutions wishing to fund future ICT program for schools in Kenya and in Africa and continue investing in the NEPAD e-School project.

TEACHERS' READINESS FOR INTEGRATION OF INFORMATION COMMUNICATION AND TECHNOLOGY IN THE TEACHING OF BIOLOGY IN SECONDARY SCHOOLS OF BAUCHI STATE, NIGERIA
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Supervisors: **DR. David Wanyonyi Khatete**

Prof. Samson Rosana Ondigi

The aim of this study was to investigate teacher's readiness for ICT integration in the teaching of biology in Bauchi state Nigeria. Readiness was consideredat two levels, namely internal (skills and attitudes) and external (resources and administration's support).Teacher's readiness was measured regarding availability of facilities, teachers ICT skills, teacher's attitudes and administration support.(i) there is very little integration especially in science subjects in Bauchi state. (ii) teachers do not have sufficient ICT resources in their schools, necessary to integrate ICT in teaching of biology.(iii) teachers do not have positive attitude towards ICT integration in teaching and learning.(iv) the administrative support of learning institutions do not provide ICT resources for the necessary support. The objectives of this study involves the following.(i) to investigate the level of biology teachers ICT integration skills in Bauchi state, (ii) to explore the availability of ICT resources necessary for the integration of ICT in the teaching of biology.(iii) to establish the attitude of biology teachers towards the integration of ICT in the process of teaching and learning and (iv) lastly to investigate the administration support towards ICT integration in the teaching of biology. The study is guided by technology acceptance model theory. The study employed a descriptive survey design. The target population was 363 public secondary schools from the three zones of Bauchi state 133 secondary schools from South Zone, 110 from Central zone and 120 from North zone). The method employed was stratified random sampling, the sample size include 68 students, 36 head teachers, and 36 school heads of institutions. A mixed boarding school was sampled for piloting the instruments. The respondents of the study were all the biology teachers, the form three biology students, and all the heads of

institutions in the sampled secondary schools. Data was collected using checklists, observation schedule, questionnaires and interview schedule. The questionnaires were administered to biology teachers and biology students while the interview schedules were conducted on the heads of the institution. The data collected was analysed using statistical package for social sciences (SPSS). The findings revealed that for ICT to be effectively adopted in public secondary schools, more emphasis should be put in developing the competence of teachers. Teachers' perception in terms of using ICT were found to be positive but   hampered by other aspects such as unavailability of adequate equipment. The study recommends that teachers' ICT development should be stepped up with corresponding supply of necessary equipment and training. Further continuous and consistent technical assistance should always be available for the teachers whenever required.

Ph.D

AN ASSESSMENT OF THE PERFORMANCE OF PUBLIC RECORD CENTRES

IN FACILITATING PROPER RECORDS MANAGEMENT PRACTICES IN

PUBLIC OFFICES IN KENYA

HARRIET W. G. KAMAU – Ph.D

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Supervisors: Dr. Daniel. W. Muthee

Dr. Peter. G Mwathi

Dr. Charles K. Maina

Public record centres in Kenya are charged with ensuring proper record management practices by advising public offices on records creation, maintenance, use, appraisal and disposal, in order to achieve efficient, transparent and accountable governance in the public sector. The study was motivated by public outcry in the mass media about delays in information provision and 'loss' of records in some public offices in Kenya, A delay in record retrieval can negatively impact on decision making on the part of the organization, frustrations on the part of clients and violation of the provisions of the "Right to Information Act" in the Bill of Rights, Chapter Four of the Constitution of Kenya, 2010, which includes the right of access to information. The study objectives were to: find out the extent to which the policies and procedures in public record centres help in the achievement of public record centres' goals; assess the effectiveness of the Public Archives(Amendment) Act,(1990) on the mandate of the public record centres, examine the levels of facilitations in relation to equipment, funds and personnel and their effect on service delivery, find out how far awareness creation with their clients could be a factor in the

achievement of public record centre goals and, finally determine the constraints that could be hindering public record centres from fulfilling their mandate and suggest solutions. The Theory of Constraints by Eliyahu (1984) and Information Society Theory were used in the study. The research design was descriptive survey design, found suitable for the collection of both quantitative and qualitative data as was on the ground. The target population of the study was the staff and management of the public record centres in Kenya and the Director, Kenya National Archives and Documentation Service (KNA&DS).The study used the whole targeted population because it was small and therefore manageable. The tools of research were questionnaires for the record centre staff, interviews for the record Centre management staff and the KNA&DS Director and an observation schedule. The tools were piloted at Nairobi record centre, selected through

simple random sampling using raffle papers. The data collected was analyzed using Microsoft Excel (2013) and Google Drive Spreadsheet software. Quantitative data were interpreted, discussed and presented using tables, graphs and percentages while qualitative data was presented using textual narratives and voices. The key findings were that, public record centres did not have an official National Records management policy, operated under an outdated and incomprehensive legislation and was poorly facilitated in respect to staff, funds, equipment and other facilities. Awareness creation was, also, inadequate due to low levels of funding and staff. The main conclusion was that none of the public centres could adequately perform well enough to fulfill their mandate due to poor facilitation especially in staffing. Main recommendations were that the draft records management policy be officially ratified for proper implementation, the amended Archives legislation Act (1990)be updated to incorporate omissions and emerging issues and also, funding be improved in order to adequately meet the requirements for the expected performance of the public record centres. Included also, is a 'Performance Improvement Model for Public Record Centres' and recommendations for further research.

HOME LITERACY ENVIRONMENT AND DEVELOPMENT OF EARLY LITERACY ABILITIES OF 3-4 YEAR-OLD CHILDREN IN KAKAMEGA CENTRAL SUB COUNTY, KENYA

Rose Atieno Opiyo – Ph.D

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Literacy development is a multiplex process that begins at birth, continues throughout life and is fostered through stimulating interactions within two instructional environments. Home is the first primary literacy resource that affords a child the best opportunities for literacy practice. A parent is the first primary educator and a potent force in shaping a child's literacy. By creating literacy-rich homes, parents provide a head start and thrust forward into a child's literacy journey, academic and life success. In Kenya, school related factors contributing to literacy development are well documented. However, how the home context stimulates literacy development has not received sufficient research attention. Guided by the belief that developmental antecedents underlying literacy development are found prior to onset of formal schooling and, that deficiencies become monumental as they accumulate exponentially over time, this study examined the influence of Home Literacy Environment on development of early literacy abilities among 3-4-year-olds in Kakamega Sub-county Kenya. Specifically, the study sought to establish the relationship between Parents' Demographic Characteristics, Parental Literacy Beliefs, Parent Child Literacy Practices and Home Educational Resources on development of early literacy abilities of 3-4-year-old children in Kakamega Central Sub County. Anchored on bio-ecological systems theory by Bronfenbrenner and the Emergent Literacy theory by Clay, the study employed Mixed Method Research approach. Specifically, cross sectional and corelational research designs. Respondents were 3-4-year-old children (average age=45months) and their caregivers. Based on stratified, purposive and simple random sampling techniques, 72 children, 72 parents/guardians and 24 preschool teachers from 12 public attached and 12 privately owned preschools within the urban, sub-urban and rural locations of Kakamega Central Sub County were selected and responded to the study. Qualitative data was obtained by means of questionnaire and Focus Group Discussion guides. Quantitative data was generated from indices, scales and checklists of Parent Literacy Beliefs, Parent- Child Literacy Practices and Home Educational Resource. An adapted assessment tool, Dynamic Indicators of Basic Early Literacy Skills estimated early literacy abilities of 3-4-year-old children. Piloting was done in three preschools and inter-rater reliability of qualitative data was established using Cronbach's alpha statistics. Qualitative data was coded to create thematic categories and presented using descriptive statistics. Pearson's Moment Correlation Co-efficient established relationship between variables, ANOVA determined mean differences among study variables and Multiple regression measured the quality of the prediction of the early literacy skills attainment. Results revealed that age, gender, family size, parental education level and income are not only key facilitative factors for parental involvement but also significant predictors of early literacy outcome. Parental belief system, literacy practices and availability of home literacy resources were more powerful predictors of ELSs of young children. Developmentally appropriate settings, language enriched communication environment that comprised of printed materials and social support from caregivers were identified as special ingredients that encouraged early forms of reading and writing to flourish and develop into conventional literacy. These were provided at varying levels within the three stratified locations of Kakamega Central Sub-county. High SES households provided stimulating home literacy environment than low SES households. Pre-kindergarteners from high SES households had superior early literacy skills. The study

recommends that families be incorporated more explicitly within development and educational agenda of young children. Family literacy programs should be designed with adequate attention to PLBs, HERs and PCLAs for a strong literacy foundation before formal literacy instruction in Kenya.

INFLUENCE OF TEACHING STRATEGIES ON STUDENTS' PERFORMANCE IN ACADEMIC ACHIEVEMENT AND CO-CURRICULAR ACTIVITIES IN PUBLIC SECONDARY SCHOOLS IN NANDI COUNTY, KENYA

ANNAH JEPKETER – Ph.D

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Supervisors: Prof. Kisilu Kombo

Dr. Ndunge D. Kyalo

The current teaching practices in public secondary schools are not inculcating the critical skills and competences to the students to prepare them for the world of work and sustainable future. This raises great concern to school administrators, teachers, students, parents and policy makers. The purpose of this study was to investigate the influence of teaching strategies on students' performance in academic achievement and co curricular activities in public secondary schools in Nandi County. Four specific objectives of the study sought to investigate the influence of the independent variables (student centered instruction strategy, teacher centered instruction strategy, assessment strategy and resource-based instruction strategy) on students' performance. The study tested six hypotheses and employed mixed methods research design. The theory of instruction guided the study. To determine the sample size, a stratified random sampling technique and simple random sampling was used to select the public secondary schools to participate in the study. Purposive sampling was used in selecting the County Director of Education, principals, teachers and the students. The sample of the study was 30 public secondary schools with 481 respondents consisting of 30 principals', 85 teachers', 365 Form Three Students' and 1 County Director of Education. The study used questionnaires, interview and observation schedule as instruments to collect quantitative and qualitative data and were pre-tested for validity and reliability. Cronbach Coefficient Alpha value was 0.826 indicating high reliability of the instruments used during the study. The descriptive data was analysed using descriptive statistics, correlation and regression analysis and presented using tables and figures. Qualitative data collected was analysed thematically. The findings of the study showed that teachers encounter challenges in implementing quality instructional strategies to realize optimal improvement of students' performance. The F value was significant at 0.05 confidence level and resulted in rejection of null hypothesis. The correlation and regression analysis revealed that there was significant and positive relationship between the teaching strategies and students' performance. The multiple regression analysis revealed that student centered instruction strategy was significant, followed by assessment strategy, resource-based instruction strategy and teacher centered instruction strategy. Regression analysis results showed that in a situation of scarce resources, resource-based instruction would be appropriate. The findings revealed that government policy had mediating influence on the relationship between teaching strategies and students' performance. The findings further show that the Gagne theory of instruction was relevant as it emphasizes arrangement of conditions of learning to attain instructional goals. The conclusion of the study showed that it is not only the teacher who influences the students' performance, but also school management, students, resources and government policy. The conclusion further indicates that poor students' performance results from student indiscipline,

use of theoretical teaching, assessments not being administered frequently and inadequate teaching and learning resources, which hinders provision of quality education. The recommendation is that teachers should be retooled to improve their teaching pedagogies. Further research need to be undertaken to replicate the study in tertiary training institutions in Kenya and investigate the extent to which students' self-concept, and discipline development influences their performance in public secondary schools in Kenya.

TUTORS' PERCEPTIONS AND USE OF MULTIMEDIA COMPUTER LABORATORIES IN SELECTED PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN KENYA

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Supervisors: Prof. Grace Bunyi

Dr. Charity Limboro

Teacher training has over the years used chalk and talk as the main delivery method but in the recent past, it has attempted to integrate new approaches such as the use of Computer Technology (CT). Towards this end, the Kenya government with assistance from Belgian Government has equipped public primary teacher training colleges (PPTTCs) with Multimedia Computer Laboratories (MCLs). Research has shown that availability of CT infrastructure without considering the perceptions and capacity of the user cannot yield the desired results. It is in this context that this study was done in a bid to find out how tutors perceived and used the MCLs. The study objectives were: 1.to examine tutors" perceptions of MCLs, 2.to investigate tutors" use of MCLs, 3. to assess factors related to tutors" perceptions and use of MCLs, 4.to examine tutors" views about benefits of MCLs and 5.to identify challenges tutors encounter when using the MCLs. The study was guided by Rogers" Diffusion of Innovations Theory which explains why one teacher embraces the use of computers for instruction while another one resists. The study adopted a descriptive survey design. The target population consisted of 845 tutors from PPTTCs selected from diverse geographical regions. Purposive sampling was used to select a total of 108 tutors of Education, Science and Mathematics subjects. Research instruments included a questionnaire for tutors and an interview guide for deans of curriculum. A pilot study was done to determine and enhance the validity and reliability of the instruments. Test-retest technique determined consistency by calculating Spearman"s correlation coefficient which was 0.74. Validation was done by the supervisors and lecturers in CT. Quantitative data was then coded and analyzed by the use of Microsoft office excel package and the statistical package for social sciences which generated percentages, means and frequencies. Qualitative data was organized in themes according to the research objectives. The study revealed that tutors had positive perceptions of the MCLs. Actual use of the MCLs was found to be minimal. The study found challenges facing use of MCLs to be: inadequate supply of CT

resources, lack of adequate CT pedagogical training and inadequate administrative and technical support. The benefits of using the MCLs for instruction were found to be: access to online literature, increasing students" motivation and interest for learning, making work easier, and enhancing learning. The implication was that if MCLs are used adequately, they could improve the quality of instruction. The study recommended decentralisation of computers and their accessories from the MCLs to the classrooms. In addition, tutors in all subject areas should be adequately in serviced with the necessary skills for effective use of CT in teaching and learning. For further research, the researcher recommended a survey of tutors" perceptions and use of MCLs in other subject areas that have not been included in this study. A study of the extent to which use of CT has contributed to better quality of education is also recommended

RELATIONSHIP BETWEEN PRINCIPALS' INSTRUCTIONAL LEADERSHIP AND STUDENTS ACADEMIC ACHIEVEMENT IN KENYA CERTIFICATE OF SECONDARY EDUCATION IN MERU AND THARAKA-NITHI COUNTIES

MUTHONI PURITY NKOROI – Ph.D

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Dr. Nobert Ogeta

The purpose of this study was to establish the relationship between principals" instructional leadership and students" achievement in KCSE in Meru and Tharaka-Nithi Counties. The main objectives of this study were to; establish the relationship between principals" instructional supervision approaches and students" academic achievement; determine the relationship between principals" support of staff professional development and students" academic achievement; examine the relationship between principals" acquisition and allocation of teaching and learning resources and students" academic achievement and investigate the relationship between principals monitoring of students" progress and academic achievement. This study was based on Carrier"s Instructional Leadership Model. The study adopted a correlation research design. The study involved principals, teachers and Quality Assurance and Standards Officers. The target population was 3955 subjects which included; 445 principals, 3501 teachers and nine QASOs. A sample of 404 respondents was selected to participate in the study. The researcher used stratified sampling to select schools while simple random sampling to get a sample of 45 principals was used, simple random sampling was also used to select 350 teachers while all the nine Quality Assurance and Standards Officers took part in the study. The data for this study were collected using questionnaires for principals and teachers and interview guides for Quality Assurance and

Standards Officers. Research instruments were pre-tested during a pilot study on one principal, four teachers and one QASO not participating in the study since principals in those schools were instructional leaders and the schools were in relatively similar categories in terms of students „achievement as those in the main study. Pearson Moment Correlation Coefficient was used to analyze quantitative data. Qualitative data was analyzed using content analysis. Validity of the research instruments was ensured through the expertise of University supervisors while reliability was estimated using Cronbach‟s alpha formula. The study established that there was no significant relationship between principals‟ supervision approaches of instructional programmes, while in a significant relationship between staff professional development and students‟ academic achievement was established. A significant relationship between acquisition and allocation of teaching and learning resources and students‟ academic achievement was also established. However, there was no significant relationship between principals‟ monitoring of learners‟ progress and academic achievement established. Based on the study findings, the researcher recommends that principals should repeatedly engage in instructional leadership with emphasis on staff professional development and acquisition and allocation of both teaching and learning resources. The study will contribute to instructional leadership literature with prospects aimed at improving teaching and learning for better students‟ academic achievement in Kenya.

SCHOOL OF HOSPITALITY

Masters

EFFICACY OF COMMUNITY BASED TOURISM INITIATIVES IN SUSTAINABLE TOURISM DEVELOPMENT: A CASE OF MWALUGANJE ELEPHANT SANCTUARY IN KWALE COUNTY

KENYA

MUSILA PAUL MAKAU – M.Sc

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Dr. Boniface O. Kihima

Community based tourism is among the several alternatives to mass tourism that are considered to be more sustainable. The genesis and growth of Community Based Tourism Initiatives (CBTI) in the 1990s was based on their prospective ability to augment community support for wildlife conservation, while ensuring that local community participate and benefit from tourism development. However, a number of CBTIs in Kenya have failed to produce benefits substantial enough to meet community expectations. Hence, the need to interrogate if CBTIs have been effective in realising sustainable tourism. The purpose of this study was to determine the efficacy of CBTIs in sustainable tourism development with particular interest in Mwaluganje Elephant Sanctuary, Kwale County. The specific objectives were; to establish the level of community participation in tourism, investigate constraints to community participation and to determine community‟s attitude towards economic, social and environmental impacts of tourism development. The study adopted a descriptive survey design that allowed qualitative and quantitative methods of data analysis. All (282) landowners of MES were targeted, while the ex-officio (5) and staff (19) were used as key informants. Stratified random sampling was used to establish the study sample (157) of the landowners, while all key informants were used in the study. The findings showed that community participation was from a low to a moderate extent (0.160=V=0.571; 0.000=P=0.038). Their major roles were to give consent on land utilization, share benefits, and provide views and opinions on nature of tourism development to be undertaken. However, they had no power to ensure that whatever had been agreed upon was implemented. Lack of coordination among stakeholders, financial resources, skills/knowledge, and low level of awareness on tourism issues were major constraints to participation. These constraints hindered community participation from a moderate to high extent (0.365=V=0.822; 0.017=P=0.042). Social cultural impacts were positively perceived, while economic and environmental impacts were negatively perceived. Key concerns were minimum economic benefits from tourism, crop raids by wildlife and environmental degradation. A positive significant relationship between socio-economic benefits and community participation was noted (R=0.575, P=0.000). Respondents had a negative attitude towards tourism due to its inability to provide the anticipated economic impacts; however, they had a positive attitude towards conservation and tourism development as a land use. A positive significant relationship was observed between landowners‟ attitudes and their involvement in tourism development(R=0.887, P=0.010). The study concludes that MES is maintaining an unsustainable status quo, hence tending towards "minimalistic sustainable tourism model". The current model of CBTI is therefore not sustainable and needs to be reviewed. It is recommended that an alternative tourism development strategy be adopted which integrates the principles of sustainable tourism development particularly; participation, and more favourable socioeconomic and

environmental outcomes, with emphasis on roles of stakeholders, funding, conservation and tourism product development in light of the emerging issues.

INFLUENCE OF OCCUPATIONAL HAZARDS ON EMPLOYEES' JOB PERFORMANCE IN HOUSEKEEPING DEPARTMENT OF BUDGET HOTELS IN KADUNA METROPOLIS, NIGERIA

RAKIYALADIDIABUBAKAR – MS.c

Department: Hospitality Management

Supervisors: Dr. Moses Miricho
              Dr. RahabMugambi

Evidence has accumulated to suggest that occupational injuries are on upsurge in developing countries such as Nigeria and little or no consideration has been paid to this trend by the authorities. In this study, influence of occupational hazards on job performance of employees of housekeeping department was studied in budget hotels in Kaduna metropolis Nigeria. The study specifically investigated the prevalent of occupational hazards peculiar to housekeeping jobs in budget hotels, identified the preventive measures available to reduce occupational hazards and evaluated the rehabilitation measures for injured housekeepers investigated the level of employees' job performance and determined the relationship between occupational hazards and job performance. It also allows for a better understanding of working conditions of service and level of compliance of existing occupational hazards rules and regulations by both the employers and employees. Relevant and related literature was reviewed based on the objectives of the study. Cross-sectional survey design was used for the study. A sample of 217 employees was used. The employees comprised of guestroom attendants, laundry staff, public area cleaners, supervisorsand executive head housekeepers. Purposive sampling technique was used to select sample from managers and supervisors. Stratified random sampling technique was used to select guestroom attendants, public area cleaners, and laundry staff under the study area. Structured and unstructured questionnaires were used to collect the data from the guestroom attendants, laundry staff, public area cleaners and supervisors while interview schedules was used for executive head housekeepers. Descriptive statistics were used to analyze data collected through opened-ended questions, prevalence of occupational hazards peculiar to

housekeeping jobs in budget hotels, preventive measures available to reduce occupational hazards and rehabilitative measures on injured housekeepers.While multiple regressionswere used to determine the influence of the independent variables on the dependent variable and Pearson correlation was used to test the hypotheses. The study revealed that employees job performance and the variables affecting it are significantly correlated with the coefficient R= 0.567. It also showed that there is inadequate safety training to prevent injuries as well as good rehabilitation measures for injured housekeepers.The study concludes that it is apparent that hotel housekeepers sustain injuries at work due to the nature of the tasks assigned and appropriately, designed and diligently practiced preventive measures will reduce the frequency of occupational injuries among hotel housekeepers.The study recommends that incapacitated employees should be reinstated at work by employers, government should compensate injured hotel employees particularly hotel housekeepers. The study recommends that safety training should be organized for housekeepers, protective equipment should be provided and employee's safety act should be strictly followed.

THE EFFICACY OF INFORMATION AND COMMUNICATION TECHNOLOGY IN CREATING COMPETITIVE ADVANTAGE IN 3-5 STAR-RATED HOTELS IN NAIROBI, KENYA

ESTHER LAMBERT ODAWA – MS.c

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Dr. Shem Wambugu Maingi

Dr. Rayviscic Mutinda Ndivo

Despite the many feasible benefits of ICT in the organizational competitiveness, the extent to which ICT has been applied to carve a niche in the hospitality industry still remains unclear. Various studies have demonstrated that companies which leverage Information and Communication Technology and product differentiation create an environment where ICT has a great impact in the business arena. While there exists some studies on ICT, none has focused on the efficacy of ICT in creating competitive advantage within the selected hotels in Nairobi, and how to innovativetly and strategically use it. Various scholars have found that the use of ICT per se does not create competitive advantage. The main purpose of this study was to examine the efficacy of Information and Communication Technology (ICT) in creating competitive advantage in selected hotels in Nairobi County.The research was carried out in 3-5 star hotels which forms about 80% of the total income of the star-rated hotels in the country. The study used a total sample size of twenty four (24), 3 to 5 star-rated hotels in the country and was designed to include the cross-sectional descriptive survey research design. A sample size of two hundred and seventy four (n=274) respondents were targeted from the 24 hotels. Two hundred and thirty four (234) questionnaires inclusive of twelve (12) interview guides were filled and returned, which formed about 85% response rate. The structured questionnaires were both open and closed ended. Both proportionate and purposive sampling techniques were used to

sample the respondents for the study. The study used the split-half technique to determine the reliability of the research instruments. The collected data was then analyzed using the linear and multiple regression, the Pearson Correlation and the Analysis of Variance (ANOVA) and the related test of significance was applied appropriately. The study found out that the use of ICT in Service Delivery and Competitive Advantage were positively and significantly correlated. The results also revealed that the use of ICT in Employee Empowerment and Competitive Advantage were positively and significantly correlated. Further, results revealed that the use of ICT in Marketing and Competitive Advantage were also positively and significantly correlated. Based on these findings, the study concluded that the use of ICT in service delivery, employee empowerment and marketing had a positive and significant influence on competitive advantage. Finally, the study recommended that all the hotels should innovatively and strategically integrate their websites with Property Management Systems (PMS) to promote efficiency within the organizations. This would lead to quality service delivery which easily translates to customer loyalty and retention.

THE RELATIONSHIP BETWEEN LEVEL OF PROFESSIONAL SKILLS AND WORK ALLOCATION AMONG STAFF IN RATED HOTELS IN KIGALI, RWANDA

KAMANZI MARIE ROSE – MS.c

Department: Hospitality Management

Supervisors: Dr. Esther Munyiri

Dr. Charles Murungi

The hotel industry is growing fast and need to allocate the work to professional employees who will meet the customer satisfaction. The purpose of this study was to assess the relationship between the level of professional skills and work allocation among staff in rated hotels in Kigali, Rwanda. The study specifically sought to determine the effect of academic qualification on work allocation in hotels in Kigali, Rwanda, to establish the extent to which work allocation in hotels in Kigali is influenced by work experience, to establish the generic, technical and professional skills set among the staff in the hotels, and to describe the nature of the work environment in the hotels. The target population included all the 17 rated hotels in Kigali city. The respondents comprised of the staff who worked in those hotels. Cochran's (1977) sampling formula was applied to get 246 respondents. A structured questionnaire was used to collect the data required. Data was analysed to process the frequencies and percentages, descriptive and inferential statistics were used to discuss the findings. It was established that there was a significant variation in the education level of staff between the four departments of the hotel industry in Kigali. Graduates were allocated front office duties while national diploma holders were allocated food and beverage service and front office operations. The secondary school certificate holders were evenly distributed across the four departments where they worked as subordinates, under the supervision of the degree and national diploma holders. Hotels in Kigali hire ordinary graduates into front office operations while national diploma holders are hired into front office or into food and

beverage service. Most of the staff working in the food production and housekeeping are ordinary level and primary level certificate holders. Work allocation in the hotel industry is not determined by work experience of the staff. Both hotel guests and staff are satisfactorily safe in their environment, and it was recommended that the Department of Tourism and Conservation establishes a specialized training institute that addresses the skill sets required by the tourism and hospitality industry in Rwanda; establishes Minimum qualifications for hotel staff in key departments within the hotels and especially those dealing with handling of food, and ensures all the food handlers in the hotels are regularly inspected to ascertain that they remain hygienically acceptable to handle food production and service. Further research was suggested on the factors that influence the hiring of hotel staff in Kigali, and on the effectiveness and professionalism of staff between the rated hotels and unrated hotels in Kigali.

PERFORMANCE OF GENEXPERT TEST IN DETECTING PULMONARY TUBERCULOSIS AND RIFAMPICIN RESISTANCE IN PATIENTS ATTENDING KITUI COUNTY HOSPITAL, KENYA

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Supervisors: Dr. David Mburu

   Dr. Mathew Ngugi

Tuberculosis (TB) is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs. In humans the disease is caused by *Mycobacterium tuberculosis* (MTB) which is an acid fast bacillus. Kenya is a high burden TB country and in 2012 there were 120, 000 new cases and 9,500 deaths. This makes TB the fourth leading cause of mortality in the country from pneumonia, cancer and HIV following in that order. Accurate, rapid detection of TB is critical for improving patient care and decreasing disease transmission. To combat the challenges of TB epidemic in Kenya there has been massive scale up of both treatment and diagnostic facilities. The challenge encountered in these centres is failure to accurately detect tubercle bacilli and its drug resistant forms. The aim of this study was to evaluate the performance of GeneXpert MTB/RIF assay in detection of pulmonary TB and drug resistant testing. This was a cross sectional descriptive study involving 400 adult patients that visited Kitui County referral hospital. Three sputum samples were collected from each patient and were tested for presence of *Mycobacterium tuberculosis* using smear microscopy, niacin test, culture and

GeneXpert MTB/RIF assay. Drug susceptibility testing was done using the culture method and GeneXpert MTB/RIF assay. Data was analysed using SPSS version 21.0 software. The mean age of the study population was 42+15.9 years and 46% were male. Out of the 400 samples analysed 37.5% were smear positive. For smear positive respondents 60% ($p < 0.05$) were male. The culture method showed that 33% of the samples were bacilli positive. While with GeneXpert assay, 32.25 % were *Mycobacterium tuberculosis* positive. These findings were statistically significant (p<0.05). For microscopic bacilli identification, the sensitivity, specificity, positive predictive value and negative predictive values for smear microscopy were 81.8%, 84.3%, 72% and 90.4% while for GeneXpert they were 97.7%, 100%, 100% and 98.9%, respectively. This implies that GeneXpert was a better method. Drug susceptibility testing using the culture method showed that 23 isolates were rifampicin resistant and with GeneXpert they were 26. The three extra isolates picked by GeneXpert were false positives. This was confirmed by a repeat test for drug sensitivity testing using culture method where they were found to be susceptible with rifampicin. The sensitivity, specificity, positive predictive value and negative predictive value for GeneXpert assay in drug susceptibility testing was 100%, 97%, 89% and 100%. False positivity in GeneXpert can be arrested by the manufacturer improving bead reconstitution, changing the software and adjusting probe β to increase robustness. The cost of testing samples with GeneXpert assay was higher than culture but it offers rapid detection in that on average it took between 1.5-2 hours against 2-8 weeks for culture method. Overall, GeneXpert MTB/RIF assay offers high potential for rapid diagnosis of TB and drug susceptibility testing. The test should therefore be considered for routine screening of clinical samples.

SCHOOL OF PUBLIC HEALTH

Masters

ASSESSMENT OF UTILIZATION OF POSTPARTUM CARE SERVICES AMONG WOMEN IN WEBUYE WEST, BUNGOMA COUNTY, KENYA

CLAIRE LUSENO OTUNGA – M.Sc

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Dr. Francisca A.O. Ongecha

Postpartum care is an important link in the continuum of care for maternal health. The postpartum period is critical because most maternal deaths occur during this time, yet this is the most neglected period for quality care provision. Postpartum Care (PPC) services are essential in the first six weeks extending to six months. When not offered they lead to complications, poor outcomes like morbidity and mortality. The aim of this study was to assess utilization and factors influencing utilization of PPC services among women in Webuye West, Bungoma County, Kenya. The study adopted a descriptive cross sectional design. The study population was all women of reproductive age with living children aged 6-9 months. Six Health Care Workers (HCWs) were key informants. The study composed of a sample of 384 women. The sampling techniques were purposive and simple random sampling. Data collection tools were a semi structured questionnaire, focus group discussions and interview guide. Data was analyzed using Statistical Package of Social Sciences (SPSS) version 20.Statistical analysis was done using Pearson's Chi-Square test.On proportion of women utilizing postpartum care services only 33.6% utilized in the required timings and the attendance of mandatory visits was less than 40% which was below the recommended. All the four PPC visits were statistically significant to utilization. On socio cultural factors majority 85.8% of the women reported staying indoors during this period. Majority 55.7% of them had cultural beliefs and practices performed, both being statistically significant to PPC utilization. Religious beliefs and practices too were dependent on use of PPC (X^2 p<0.011).On knowledge factors majority 70.6% of the women first knew the services during ANC from HCWs, awareness of first and fourth visits were statistically significant to PPC service use .On health facility factors majority 74.8% of the women reported availability of the basic services and majority 75.9% of HCWs were friendly and helpful. These influenced service utilization. Majority 51.0% paid for services and waited for 31-60 minutes.HCWs availability, friendliness, waiting time and service charges were statistically significant ($p \leq 0.005$) thereby influencing PPC utilization .In conclusion the proportion of women utilizing PPC service was low. Utilization of PPC services being statistically significant and dependent on various factors including , staying indoors, religious beliefs and practices , knowledge during ANC , availability of

HCW,waiting time, HCWs helpfulness and friendliness and service charge ($p \leq 0.005$). The study therefore rejected the null hypothesis. The study recommends that there is need to increase more awareness on PPC service utilization by HCWs and community volunteers. Community involvement and collaboration of teams to mitigate socio cultural beliefs and practices. The County MOH and facility managers to implement policies on PPC and continuous capacity building that emphasize PPC service utilization and maternal, neonatal, child health (MNCH) integration.

EVALUATION OF LIVE *ARTEMISIA ANNUA* L. PLANTS AS MOSQUITO REPELLENTS IN BOARDING SCHOOLS AND HOUSEHOLDS OF MWEA IRRIGATION SCHEME, KIRINYAGA COUNTY, KENYA

MBULO THOMAS MUTUA – M.P.H

Department: Community Health

Supervisors:Prof. Nicholas K. Gikonyo

Prof. Ephantus K. Kabiru

Mosquitoes have attained public health concern than any other arthropod. The bloodfeeding females transmit the protozoa causing malaria, filarial worms causing elephantiasis, and viral diseases. Malaria is a serious public health issue in sub-Saharan Africa, infecting between 300 and 500 million people annually, and it's the leading cause of infant and child morbidity and mortality. Approximately 70 *Anopheles* species have been shown to be competent vectors of human malaria. Methods used for malaria control include killing mosquitoes at larval and adult stages and prevention of biting. Mechanical barriers for example, impregnated mosquito bed nets are commonly used to provide protection from mosquito bites. Despite the use of these conventional methods to prevent mosquito bites, there continues to have cases of malarial deaths. The main objective of this study was to evaluate the mosquito repellence effect of live potted *Artemisia annua* L. plants hung at doors and windows of dormitories in boarding secondary schools of Mwea Rice Irrigation Scheme (MRIS), Kirinyaga County, Kenya. Cross-sectional and experimental ecological study designs were used in this study. Four boarding schools in the MRIS were purposively selected. A total of 340 students were randomly selected from the four schools and a structured questionnaire was administered to the students to gather quantitative data. Also four villages neighbouring the boarding schools were purposively selected and 340 households were systematically sampled for this study. A structured questionnaire was administered to the 340 selected households to gather both qualitative and quantitative data. Baseline mosquito density measurement was done before introducing *Artemisia annua* in the schools by collecting mosquitoes in selected dormitories. Potted live *A. annua* plants were hung at the doors and windows of the selected dormitories. Mosquitoes were collected from the selected dormitories after introducing *A. annua* using suction tube method. The level of knowledge on mosquito control strategy amongst students was high at 97%. Mosquito control methods at household level were use of mosquito bed net (75.8%), use of firewood and mosquito coil (17%), use of insecticide (24%), and environmental management practice (70%). Mean ($\pm$ SEM) baseline mosquito density in boarding schools were 47.62$\pm$2.20, 48.00 $\pm$1.93 for girls treatment and control dormitories respectively, 38.50$\pm$2.82, 42.50$\pm$2.01 for boys treatment and control dormitories

respectively, and 50.37±2.78, 61.50±3.29 for girls and boys blanks dormitories respectively. Live *Artemisia annua* introduction resulted in decreases of mean mosquito catches in both the treatments and controls. Differences in the mean mosquito catches in
both the control and treatment dormitories were significant at p = 0.001 for the months of March-June respectively. The study concluded that live *A. annua* reduced the mosquito density in dormitories of boarding schools even when they were separated by 50 metres. The study recommends that *A. annua* should be planted near dormitories and other buildings to repel mosquitoes.

USE OF ROUTINE HEALTH INFORMATION FOR DECISION MAKING AMONG HEALTH WORKERS AT COAST GENERAL HOSPITAL, MOMBASA COUNTY, KENYA

GILBERT NZOMO MBORO – M.P.H

Department: Health Management and Informatics

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Dr. Daniel W. Muthee

Health workers collect and report data routinely on all their activities. Studies show that very little of this vast amount of information is used by those who are collecting the data and by local health management at health facility or County levels. Ideally, local data should be collected, analyzed and used in order to support local health management, health promotion and prevention and to improve local health service delivery. Significant resources have been invested on HMIS but we are unsure whether the available routine health information is used for decision making. This study aimed at assessing technical, organizational and behavioural factors that influenced information use among health workers at Coast General Hospital (CGH), Mombasa County, Kenya. The Study design utilized was descriptive cross sectional.. Probability, simple random sampling was used as this avoided bias. Self-administered questionnaire, key informant interview guide and focus group discussion guide were tools used to collect data. A total of 236 health workers participated in the study. Quantitative data was analyzed using Statistical Package for Social Science (SPSS) version 20 and qualitative using QSR international NVivo11. Descriptive statistics and chi-square test to determine significant association was done and results presented in tables, graphs and charts. The results showed 69.6% use of routine health information for decision making with 30.0%% reporting having received minimal training on information management areas. Highest education level attained by health worker, professional training and accessibility to

resources like computer had statistical significant association to information use for decision making (p < 0.05). Inadequate support from the immediate supervisor 124 (52.5%) compounded by unclear roles and responsibilities 107 (45.4%) were reported as hindrance to information use. In conclusion the study demonstrates partial use of routine health information for decision making with interplay of technical, organizational, and behavioral determinants. In the view of the findings, this study recommends need for County HMT in conjunction with the national level to provide training to improve health workers' skills with specific focus on information use through on- job trainings mentorship and enhance organizational context by providing resources that supports information use with targeted regular review meetings, feedback coupled with support supervision are also recommended.

WOMEN'S PERSISTENT UTILIZATION OF UNSKILLED BIRTH ATTENDANCE: A STUDY OF MOTHERS IN KAKAMEGA COUNTY, KENYA

NAMUSONGE, LUCY NATECHO – M.P.H

Department: COMMUNITY HEALTH NURSING

Supervisors: Dr. Priscilla Kabue

Dr. Rekha R Sharma

Minority of births in Sub-Saharan Africa are conducted by Skilled Birth Attendants (SBAs). Having the highest world maternal mortality ratios and most deaths being associated with lack of trained supervision at delivery, changing delivery practices is a major priority in this region. Utilization of Skilled Birth Attendants (SBAs) may contribute to reducing Maternal Mortality Rate (MMR). While approximately 95.5% of women giving birth receive some antenatal care, 39% of Kenyan women deliver at home especially in rural areas. Kakamega County has low facility deliveries at 48.6% compared to the national average of 61%, this magnitude present a key challenge to improvement in maternal survival. Pregnant women in Kakamega County have varied reasons for delivering at home where deliveries are conducted by unskilled birth attendants. The study was motivated by the poor maternal indicators and low utilization of skilled birth attendance in Kakamega County despite interventions to address the problem. This study attempted to identify reasons to persistent utilization of unskilled birth attendance by women in Kakamega County. It was a descriptive cross-sectional study utilizing quantitative and qualitative approaches targeting postnatal mothers with children aged less than six months who delivered without skilled attendance. Quantitative data was collected through household interviews of eligible women using structured questionnaire and qualitative data collected using Focused Group Discussions (FGDs). All the analysis was done using Statistical Package for Social Sciences (SPSS v. 20.0). Chi square (X^2) was used to assess if there was significant

relationship or association between independent variables and utilization of Unskilled Birth Attendance (UBA). Pearson product-moment correlation coefficient was used to measure the strength of the linear relationship between the dependent and independent variables under study. The results showed antenatal attendance rate of 92.7%. Low knowledge, socio-cultural factors and health system factors favoured utilization of UBA. Knowledge factors found to enhance utilization of UBAs in the study area were: knowledge on danger signs during labour and delivery (r= 0.430 X^2=36.104, P= 0.0001), knowledge on danger signs during post natal period (r=0.466, X^2=37.403, P=0.0001) and knowledge on individual birth plan (r=0.374, X^2=23.67, P=0.0001). Socio-cultural factors on uptake of unskilled birth attendance were influenced by receipt of support from partner or significant others (r= 0.964, X^2=23.210, P=0.00), marital status (r= 0.720, X^2=36.104, P=0.00), education level (r=0.562, X^2=28.360, P=0.003) and decision maker on choice of place of delivery (r=0.504, X^2=29.42, P=0.0001). Health system factors influencing utilization of unskilled birth attendance were perception towards health facility staff (r=0.287, X^2=20.46, P=0.000), availability of service (r=0.341, X^2=18.13, P=0.006) and availability of 24 hour service (r=-0.249, X^2=8.764, P=0.005). There is need to equip women with knowledge on pregnancy, labour and delivery and postnatal periods and ensuring that health care providers are kind and culturally sensitive to the needs of clients hence scaling up utilization of skilled birth attendance. Birth preparedness should be advocated for every pregnant woman. The information generated from this study will be utilized by policy makers leading to appropriate interventions or strategies which can reduce the number of home deliveries and maternal deaths.

THE EFFECTS OF COMMUNITY HEALTH STRATEGY ON SANITATION INDICATORS IN THARAKA NITHI COUNTY, KENYA

CORNELLIUS MUSEMBI MUENDO – M.P.H

Department: Community Health

Supervisors: Dr. Isaac Mwanzo

Prof. Mohamed Karama

In 2006, Kenya developed and adopted Community Health Strategy as a means of enhancing community access to Healthcare services. Although there has been scientific evidence that community based health approaches are effective in delivering specific health services, there has been little effort to examine the performance of the Kenya's Community Health Strategy against sanitation indicators. This analytical cross-sectional study was therefore designed to evaluate the effects of Community Health Strategy on sanitation indicators within Tharaka Nithi County. A total of 394 primary respondents, including 196 respondents from the Community Health Strategy implementing sites and 198 respondents from the non-Community Health Strategy implementing sites were randomly selected for household interviews. The study also gathered information through

focused group discussions and key informant interviews. A p value of less or equal to 0.05 ($p \leq 0.05$) was considered to be statistically significant. The study revealed statistically significant differences between Community Health Strategy implementing sites and the non-implementing sites. For instance, the study found out that 58.6% of households in the Community Health Strategy implementing sites owned improved sanitation facilities compared to 40.6% households in the non-implementing sites, $\chi_2 = 10.994$, df=1, $p<0.001$. Likewise, 43.9% of households in the Community Health Strategy implementing sites had handwashing facilities compared to 12.1% of the households in the non-implementing sites, $\chi_2 = 49.359$, df=1, $p<0.001$. The Community Health Strategy implementing sites also recorded a low diarrhoeal prevalence (15.1%) compared to 25% of households in the non-implementing sites $\chi_2 = 8.542$, df=1, $p=0.003$.

The significant differences of sanitation indicators in favour of Community Health Strategy implementing sites demonstrates that Community Health Strategy is a suitable approach in delivering sanitation related indicators. The study therefore underscores the need for the Tharaka Nithi County Government and implementing partners to provide all

the community based sanitation services through the existing framework of Community Health Strategy.

Ph.D

EFFECTS OF HIV AND INTESTINAL PARASITES CO-INFECTION ON HEMATOLOGICAL PARAMETERS AMONG PREGNANT WOMEN ATTENDING SELECTED HEALTH FACILITIES IN NYERI COUNTY, KENYA

ANTHONY WANJOHI NYAMBURA – Ph.D

Department: Community Health

Supervisors: Prof. Ephantus K. Kabiru

Prof. Micheal M. Gicheru

Pregnancy is associated with higher demand for haemoglobin; intestinal parasitic infections and HIV infection have also independently been associated with anaemia. A woman with the three conditions together is likely to face a challenge. Prevalence of HIV among women in Nyeri County has increased from 2.5% in 2007 to 5.5 % in 2009 and 6.3% in 2013. In Nyeri County, there is limited data on prevalence of co-infection of HIV and intestinal parasites among pregnant women and the effects of the co-infection on haematological parameters. Therefore, the aim objective of this study was to determine the effects of the co-infection of HIV and intestinal parasites on selected haematological parameters among pregnant women attending selected health facilities in Nyeri County. A comparative cross sectional and analytical study was conducted where 130 pregnant women participated. Questionnaire was used to collect data. Stool and blood samples were collected and processed in the laboratory using standard procedures. Data was analysed using SPSS software. Results show that among 130 respondents, 34% were infected with intestinal protozoa. Among 65 HIV positive respondents, 25% were infected with *Entamoeba coli* and 2% were infected with *Iodamoeba butschlii.* Among 65 HIV negative respondents, 38% were infected with *Entamoeba coli*, and 6% *Iodamoeba butschlii*. One HIV negative respondent was infected with *Hymenolepis nana.* Practices such as eating soil, walking barefoot, treating drinking water and use of latrine were not significantly different between HIV positive and HIV negative pregnant women ($p > 0.05$). Factors associated with infection with intestinal protozoans were education (OR= 2.379, 95% CI 1.07-5.288, p= 0.031), employment (OR = 0.4, 95 % CI 0.187 – 0.855, p = 0.017) and access to latrine (OR = 0.033, 95% CI 0.009 – 0.12, p= 0.0001). Access to a latrine was a predictor of intestinal protozoan infection in pregnancy (AOR = 0.037, 95% CI 0.01- 0.136 < 0.05). Co-infection of HIV and intestinal parasites lowered WBC ($F_{0.95} (3, 11) = 5.56$, $p < 0.05$), RBC ($F_{0.95} (3, 11) = 43$, $p < 0.05$), Haemoglobin ($F_{0.95} (3, 11) = 11.62$, $p < 0.05$) and haematocrit ($F_{0.95} (3, 11) = 15.23$, $p < 0.05$). Though not statistically significant, co-infection increased platelets count. The researcher concluded that (i) there is high infection with intestinal protozoan parasites among pregnant women and low prevalence of helminths infection (ii) majority of pregnant women used latrine for defecation and did not eat soil or walk barefoot while almost a half drunk untreated water (iii) low education, unemployment and sharing latrine were associated with intestinal parasite infection among pregnant women and (iv) co-infection of HIV and intestinal protozoan parasites decreased white blood cells, red blood cells, haemoglobin and haematocrit in pregnant women. The researcher recommends that in antenatal care, in addition to HIV treatment, management of intestinal parasite should be considered to minimize co-infection that impact negatively by reducing haematological parameters and possibly growth of foetus.

SCHOOL OF AGRICULTURE

Masters

EFFECTS OF NITROGEN FORMS ON GROWTH, YIELD AND NUTRITIONAL QUALITY OF AMARANTH (*Amaranthus species*) IN KIAMBU AND KIRINYAGA COUNTIES, KENYA

ROSEPIAH MUNENE – M.Sc

Department: Agricultural Science and Technology

Supervisors: **Dr. Joseph P. Onyango Gweyi**

Dr. Nicholas Korir

Amaranthus spp is amongst the most preferred African leafy vegetables in the tropics. It contains numerous vitamins, minerals and bioactive phytochemical compounds for nutritional and health benefits. Nitrogen is a vital mineral element for plant growth which affects not only the biomass accumulation but also the nutritional quality of higher plants. This study was carried out to evaluatethe effect of different N forms on growth, mineral elements, anti-nutrient and phytochemicals accumulation in *Amaranthus species*. In order to select the most preferred African leafy vegetables (ALVs) by farmers, field survey was done in Kiambu and Kirinyaga counties. Semi-structured questionnaires were administered on 67 respondents by purposive sampling technique. The survey revealed that*Amaranthus spp* was the most preferred with 84% and 93% in Kiambu and Kirinyaga respectively. Thus, amaranth was chosen for the greenhouse and field experiments. The field experiment was laid in a split plot arrangement in a randomized complete block design, with three amaranth varieties (AB5, AB6 and AB7) being the main plots and three N forms; sole ammonium (NH_4^+) stabilized with Piadin® as nitrification inhibitor, sole nitrate (NO_3^-), ammonium/nitrate mixture (NH_4NO_3) and control (where no N form was applied) constituted the subplots. While greenhouse was a completely Random Design (CRD). The treatments were replicated three times. Field survey data was analyzed by use of SPSS software while growth, biochemical and phytochemical data were subjected to analysis of variance (ANOVA) using SAS software. Separation of means was done using least significance difference (LSD). About 59% and 66.7% respondents in Kiambu and Kirinyaga respectively grew ALVs for nutrition or health benefits. Field and greenhouse experiments revealed that growth of three amaranth varieties were significantly ($P \leq 0.05$) affected by different N forms. Compared to control, nitrate treatment increased plant height by 54.3%, ammonium nitrate by 46.4% and sole ammonium by 29.2%. Nitrate treatment enhanced shoot dry weight 8 folds and leaf area 3 folds while ammonium treatment was 3 folds in relation to the control.This trend was also observed with leaf area in relation to the control. Root dry weight increased by 72.3% under nitrate provision and 36% underammonium treatment in thegreenhouse experiment. Amaranths treated with sole nitrate notably increased plant tissue calcium (Ca) and zinc (Zn) compared to ammonium-treated plants while iron (Fe) content was not significantly different. Compared to the control, nitrate elevated oxalate accumulation unlike ammonium treatment which on the contrary inhibited oxalate buildup. Under ammonium treatment, total flavonoids contents increased by 17.3% while total phenolics content increased by about 37.3% in greenhouse experiment. Likewise, NH_4^+ - N form had higher antioxidant DPPH scavenging activity. Similar trends were observed in the field experiments. Ammonium induced rhizosphere acidification

while nitrate treatment resulted to rise in rhizosphere pH. This affected concentration of mineral elements, anti-nutrients (oxalates) and phytochemical constituents as well as anti-oxidant inhibiting capacity of amaranth plants. It is therefore recommended that ammonium nitrate be used on vegetable amaranth for optimal growth and nutritional benefits.

SOCIO-ECONOMIC FACTORS AFFECTING TECHNICAL EFFICIENCY OF
SMALL HOLDERS MAIZE PRODUCTION IN RWANDA

MULINGA Narcisse – MS.c

Department: Agribusiness Management and Trade

Supervisors: Dr. Newton Nyairo

Dr. Nigat Bekele

Maize is still largely a subsistence food crop under promotion as a food security crop and source
of income for smallholders. In a bid to attain self-sufficiency, Rwanda made remarkable efforts
to develop the subsector. These were mainly directed towards the expansion of the area under
maize, organisation of farmers' cooperatives and easy access to inputs. In improving maize
productivity and marketing of maize several both public and private interventions were added in
Musanze and Bugesera districts those interventions include breeding, distributions of improved
seed that are pest and diseases resistant and promotion good agricultural practices. Despite
efforts put up by the Government of Rwanda and other stakeholders, maize still faces low
productivity compared to the expected potential yields and the actual yield. The objectives of this
study were to estimate the technical efficiency level in maize production in both Musanze and
Bugesera districts and to determine some socio-economic factors affecting technical efficiency
of maize producers in Rwanda. Primary data was used. Stochastic Frontier Analysis (SFA) with
the Cobb-Douglas functions on a random sample of 276 maize farmers. The findings indicated
that the mean technical efficiency for maize production in both districts is 23% which means that
farmers can increase their output through efficient use of available resources and existing
technology if they are to be technically efficient. The study concluded that age, educational level,

fertilizers, labor, land size, seeds, visit of agent of extensions and access to credit were
significant variables leading to technical inefficiency in Rwanda. On the other hand,
family size,
type of seeds, and experience, had no significant impact on farmers' inefficiency. To
increase
technical efficiency for maize production in the Rwanda, the study recommended
improvement
in education level of the farmers and availability of funds in the optimum time.

MEMBERSHIP DECISION AND INTENSITY OF PARTICIPATION IN AVOCADO PRODUCER AND MARKETING GROUPS IN KANDARA SUB COUNTY, MURANG'A COUNTY

MAINDI NYAMBUNE CATHERINE – MS.c

Department: Agribusiness Management and Trade

Supervisors: Dr. Daniel Kyalo Willy

Dr. Lucy Ngare

Collective action through formation of Avocado producer and marketing groups (APMGs) is one of the interventions adopted by Murang"a County government to enable smallholders mitigate the market imperfections and contend with the recent transformations in agri-product markets. Despite this, most of the APMGs are dysfunctional due to free riding and lack of member commitment regarding participation in the group and its operations. Participation in group operations is critical to enable the members leverage their input and output resources in order to achieve economies of scale, enforce democracy, transparency and accountability of group leadership besides fostering member solidarity, trust and cohesion. This study therefore, analyzed the determinants of decision to join APMGs, participation and intensity of participation in APMG activities, in Kandara Sub County, Murang"a County. Probit model was applied to analyze the decision to APMG membership and double hurdle model for participation and intensity of participation in the APMG activities. Participation and intensity of participation in group sales, annual contributions and group meeting attendance were used as proxies of member commitment

to the APMGs. The data was collected using a structured questionnaire to interview 138 households who were sampled randomly (110 group members selected proportionately to the group size and 28 nonmembers) from Kandara Sub county in Murang"a County. The data was then analyzed in STATA 13. The probit results indicate that avocado quantity, gender, farm experience, assets, off-farm income and information access had a positive effect on the probability of joining APMGs. The double hurdle model results revealed that avocado quantity, education level, household size and credit access emerge as key determinants of participation in the APMG activities. Finally, farm size, membership density, group age, trust index, group size, homogeneity index, decision making index, fine existence and provision of free inputs had a significant effect on the intensity of participation. Policy implications drawn by this study encourage strategies that enhance member registration and commitment to the APMGs. First, strategies to foster inclusivity in decision making in group matters as well as offering incentives such as free inputs and imposing fines to non-compliant members should be encouraged. Also, the group size should constitute of group sizes 14 to 19 members. In addition, polices to facilitate accessibility of credit markets to smallholders and market information can enhance production and better quality avocadoes thus heighten participation in the producer and marketing groups. Finally, there is need to foster trust among the group members and other actors involved such as the extension providers, export agents and NGOs to win the members confidence to the APMGs.

SCHOOL OF ENVIRONMENTAL STUDIES

Masters

ASSESSMENT OF ECONOMIC IMPACTS OF CLIMATE CHANGE ON LIVESTOCK AND CROP RETURNS IN THE COASTAL REGION OF KENYA

PHYLLIS WAMBUI WACHIRA – M.ENV

Department: Environmental Sciences

Supervisors: DR EZEKIEL NDUNDA

PROF. NOAH SITATI

The overall objective of this study was to assess the economic impacts of climate change on agriculture in Kenya's coastal region. To achieve this, specific objectives were used: to assess which impact climate change has on crop net revenue; to evaluate the impact of climate change on livestock net revenue; and to estimate the impact of climate change on combined net revenue. The study was conducted in all the six counties in the coastal Kenya: Kwale, Mombasa, Kilifi, Lamu, Tana River and Taita Taveta. A total of 631 respondents were interviewed to obtain the cross-sectional survey data. The secondary data on temperature, precipitation and evaporation for 40 years was obtained from Kenya Meteorological Department. Using the Ricardian model to analyze the data, both the linear and quadratic effects of change of climate on crops, livestock net revenue and the combination were calculated. Results from the study show that climate change significantly (p<0.05) affects net revenues from crops, livestock and a combination of both livestock and crops. The other socioeconomic variable that were found to also significantly (p<0.05) affect net revenue from crops, livestock and a combination of crops and livestock were, access to media, credit services access, farmer to farmer extension services, size of land owned, climate change awareness, education level, age and gender of household head. According to the results, a nonlinear relationship exists between climate variables and net revenues from crop, livestock and agriculture as a whole. This study concludes that a unit increase in precipitation increases crop revenues while a unit increase in mean annual temperature significantly reduces crop and total farm income. Marginal effect of a unit increase in precipitation is a reduction of livestock net revenue. An increase in livestock production revenue from a unit increase of temperature (linear) can be attributed to the livestock breeds in Coastal region that are inherent to dry weather. However, results show that an increase in quadratic temperature would reduce livestock net revenue. This study recommends enhancement of awareness on climate change and adaptation strategies for crop, livestock and combined agriculture. Also important is the access of credit facilities. This can greatly help farmers to acquire the necessary inputs in time for crop production. Further, training of groups of farmers would be appropriate in the study area since the trained farmers are likely to transfer the learned technologies to others through farmer-to-farmer extension services. Access to media should be enhanced whereby information on appropriate livestock and crop production technologies may be communicated to farmers.

<u>**Ph.D**</u>

SCHOOL OF VISUAL AND PERFORMING ARTS

Masters

Ph.D

NEXUS BETWEEN LITERARY TEXTS AND CORRESPONDING FILM ADAPTATIONS: A READING ON INTERTEXTUALITY

ROBERT O. WESONGA – Ph.D

Department: Film and Theatre Arts

Supervisors: Dr. John Mugubi

Prof. Oluoch Obura

This research makes a comparative study of antecedent literary texts and their corresponding adapted films. The study is occasioned by the aim of putting to scrutiny the reflections and divergences between the two media. This is necessitated by the argument as to whether the adapted film increased or reduced the value of the antecedent literary text (Cartmell et al. (2008). The study interrogates **Things Fall Apart** (1958) by Chinua Achebe (adapted into a TV mini-series **Things Fall Apart** directed by David Orere [1987]); **The Man-Eaters of Tsavo** (1907) by John Patterson (adapted into **The Ghost and the Darkness** in 1996 by Stephen Hopkins) and **Out of Africa** (1937) by Karen Blixen (adapted into a film, **Out of Africa** in 1985 by Sydney Pollack. By nature, this is an exploratory research grounded in the concept of intertextuality, guided by the understanding that different texts (in this case, the literary text and the film as a text) can contribute to the understanding and interpretation of each other. Besides, one of the points of interest in this study is an investigation of the elements that characterize the transformation from literary text to film. Hence, the study discusses the cinematic techniques used by film producers to compensate for what is not exactly transferable (or transformable) from the source literary text to the adapted film. In terms of methodology, this is a qualitative study rooted in textual analysis of the selected literary texts and films. The researcher read the source/antecedent literary texts and viewed the corresponding adapted films with the aim of collecting data from both to meet the objectives set at the beginning of the study. Further, other relevant reference materials were sourced and read from both the library and online sources. Theoretically, this research was guided by Adaptation Theories namely the Transformation and Pluralist film adaptation critical paradigms. The researcher argues that this study makes a contribution to scholarship first,

in affirmation of the reality that studies of intertextuality within the realm of film adaptation need more scholarly attention than hitherto, and secondly, due to the fact that

the selected texts (though important contributions to literature and film in Africa) had – at

the time of this research – not been subjected to an intertextual study to see the interconnection

between the literary text and the adapted film. The objectives set at the

beginning of this study were met, hence the conclusion that the literary antecedent and corresponding adapted film complement each other in the creation of meaning for the benefit of either. Furthermore, the study finds that in the endeavour to re-vision the world

of the literary antecedent, the filmmaker exploits creative license to result in divergences between text and film. Finally, this study acknowledges that literary text and adapted film

are different media, and therefore either form has techniques within its province that are used to tell the same story similarly or differently.

SCHOOL OF APPLIED HUMAN SCIENCE

Masters

ATTITUDE AND PRACTICE OF PRIMARY SCHOOL PUPILS, TEACHERS AND HEAD TEACHERS IN PHYSICAL EDUCATION IN KIAMBU COUNTY, KENYA

MAINGI PATRICK KARIUKI – M.Sc

Department: Recreation Management and Exercise Science

Supervisors: Dr. Francis Mundia Mwangi,

Dr. Rintaugu E. Gitonga

Physical Education provides pupils with necessary attitude, knowledge and skills so as to perform a variety of physical activities and maintain physical fitness. This study aimed at assessing the attitude (Cognitive and Affective domains) and practice of primary school pupils, teachers and head teachers in Physical Education (PE) in Kiambu County. Independent variables for the study were: teachers, pupils, private and public primary schools while the dependent variable was attitude (cognitive and affective). The study hypothesized that there is no significant difference between primary school boys and girls on cognitive and affective domains of attitude towards learning of physical education in Kiambu County. It further hypothesized that there is no significant difference between pupils, teachers and head teachers in public and private schools on cognitive and affective domains of attitude towards learning physical education in Kiambu County. A Multi-stage sampling technique was used to select the respondents. Stratified sampling was used to get 12 sub-counties, class 7 and 8 pupils of the sampled schools, each class 16 pupils; of 8 boys and 8 girls from private and public schools making a total of 384 pupils as respondents. A

similar procedure was used to pick 48 teachers, two school; a male and a female where it was possible while purposive sampling was used to get 24 head teachers, a total of 456 respondents. Questionnaires from Wear's Attitude for Teachers and Adam's Attitude for Pupils were used to collect data. Data was coded and analyzed using SPSS version 20. Mann Whitney U test was used to analyze attitude of boys and girls, male and female teachers and head teachers while Kruskal- Wallis test was used to analyze attitude of pupils, teachers and head teachers towards PE at a significant difference of 0.05. Kruskal Wallis and Man Whitney U Tests were used to find the relationship of pupils, teachers and head teachers and their attitude towards Physical Education. Descriptive findings showed that physical education is taught in very few schools with very low percentages in public schools. The attitude of pupils and teachers towards physical education were also established to be very low. Hypotheses testing showed no significant difference on cognitive and affective domains of attitude between boys and girls in private and public schools towards learning of physical education. Also, teachers and head teachers in both private and public schools showed no significant difference on cognitive and affective domains of attitude towards learning of physical education in primary schools in Kiambu County. Based on the findings, the study recommended that the Quality Assurance and Standards office ensure PE lessons are taught as recommended by the Ministry of Education, Science and Technology (MOEST).The study recommended further study on quality assurance officers in physical education, benefits of physical education to the learners and a study on attitude of lower primary school pupils towards physical education

FEMALE TEACHERS' PARTICIPATION IN THE MANAGEMENT OF COMPETITIVE SPORTS PROGRAMMES IN SECONDARY SCHOOLS IN TAITA-TAVETA COUNTY, KENYA

ROBERT NDAMBO NGETI – M.Sc

Department: PHYSICAL EDUCATION

Supervisors: Dr. Peter Wisiuba Bukhala

Dr. Mugala Bulinda Hannington

The purpose of the study was to assess the female teachers' participation in the management of competitive sports programmes in secondary schools in Taita Taveta County, Kenya. The specific factors that were investigated included; type of school, age, education level, marital status, facility availability and psychosocial factors. The study adopted descriptive survey research design. The study target population was 175 female teachers from 61 public secondary schools selected through stratified random sampling procedure. The schools were divided into single sex (boys and girls only) and mixed schools. The questionnaire was used as the main instrument for data collection. Using Alpha Cronbach, its reliability was obtained to be $\alpha=0.732$. A total number of 108 questionnaires were administered to the Secondary school teachers in the County as the selected sample. 90 teachers responded giving a response rate of 83.3%. The data was coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics frequencies and percentages were used to analyze the characteristics of the respondents, while hypotheses were tested using chi-square and ANOVA. The

ANOVA results revealed that there is no statistically significant difference between participation of the female teacher in sports and the type of school they teach. Age yielded $\chi2 = 2.443$; df = 4; p =0.295, an indication that age had no influence on the frequency of female teachers' participation in competitive sports management in Taita Taveta County. Marital status of female teachers in Taita Taveta County did not significantly influence their frequency of participation in the management of competitive sports programmes. Level of education and Type of school did not have significant influence on competitive sports management. Moreover, adequacy of sports facilities and equipment yielded $\chi2 = 1.00$, df = 4 and P value 0.262, an indication that facilities did not significantly influence the female teachers' participation in competitive sports management in Taita Taveta County. It was, therefore concluded that Age, Marital status and Education level of the female teachers did not affect their participation in sports management. The type of school did not affect participation in the management of sports among female teachers in Taita Taveta County. Availability of facilities and equipment had an impact on female teachers' participation in sports management in Taita Taveta County. The study recommends that the school administrations and managements ensure that schools have basic sporting facilities which are well maintained to encourage the female teachers to get involved. A need for equal chances in the sports programmes management by female teachers since demographic characteristics do not affect sport participation. The ministry of education should also formulate policies that will ensure that female athletes, teams and competitions are managed by female managers. Further research on motivation and measures to improve women participation in sports and a comparative study on male and female teachers should be conducted in the county.

PHYSICAL ACTIVITY, DIETARY PRACTICES AND NUTRITION STATUS OF HYPERTENSIVE PATIENTS ATTENDING KIAMBU DISTRICT HOSPITAL, KIAMBU COUNTY, KENYA

MBIJIWE JANE GATWIRI – MS.c

Department: Food, Nutrition and Dietetics

Supervisors: Dr. Peter Chege

Dr. Munyaka Ann

Globally, uncontrolled hypertension is a health priority since it raises the risk forthe onset of renal failure, heart disease and diabetes. Hypertension complications contribute to high rates of morbidity and mortality. Optimal blood pressure can be achieved by putting in place strategies that encourage routine physical activity engagement andintake of health diets among hypertensive patients.Patient related factors which include unhealthy dietary practices, poor nutrition status and physical inactivity have been identified to be main hindrances in hypertension management. Minimal information exists on the relationship between dietary practices, physical activity and nutrition status among hypertensive patients. These causes are researched and documented in developed countries but not in developing countries. This research aimed at determining the dietary practices, physical activity level and nutrition status of hypertensive patients in a developing country set up to fill this research gap. Cross-sectional

analytical research design was adopted; the respondents were selected using systematic random sampling method. The study was conducted on a sample of 134 hypertensive patients attending Kiambu District Hospital in Kiambu County. Dietary practices were established by use of a24-hour dietary recall and a seven day food frequency questionnaire. The World Health Organisation global physical activity questionnaire was used to measure the physical activity level. Anthropometric parameters were used to assess the nutrition status. A pretested questionnaire was used to collect demographic and socio-economic status data. Data analysis was done by use of statistical package for the social science. The respondent's dietary practices, physical activity level, nutrition status, demographic and socio-economic characteristics of the study population were describedby use of descriptive statistics. Chi-square test was used to determine the association between categorical variables likedemographic, socioeconomic status and dietary practices and nutrition status. The relationship between non-categorical variables including physical activity level, dietary practices and nutrition status was determined by use of Pearson correlation test. A p-value of <0.05 was used as a criterion for statistical significance. The results were presented in the form of graphsand frequency tables. The study population had poor nutrition status as revealed by the high prevalence of overweight and obesity at 82.1%. Majority of the study participants had unhealthy dietary practices with intake of diets high in sugar, cholesterol, energy dense snacks and low in vitamins and minerals. Of the 134 respondent 79.1% had uncontrolled blood pressure. Low physical activity level was reported by most (63.0%) participants. Dietary practices were significantly associated with nutrition status.A positive significant relationship was found between dietary intake of carbohydrate (r=0.683, p<0.001) and cereals (r=0.229, p=0.008), and nutrition status. On the other hand a negative significant relationship was found between dietary intake of dark green vegetables (r=-0.210, p=0.015) and nutrition status. The predictors of being overweight or obese were determined to be dietary intake of carbohydrates, protein, meat, dark green vegetables and physical inactivity. Physical activity was significantlyrelated with nutrition status at (p<0.001). The odds of being physical inactivity and obese in women was found to be 0.28 times while in men it was 3.50 times compared to physically active individuals. Based on these findings measures that would lead to better dietary practices and increased physical activity among hypertensive patients should be put in place for better hypertension management. The Ministry of Health and other agencies working in the sector for the control and management of hypertension may find the information collected in this study useful.

GASTROINTESTINAL PARASITES INFESTING GREVY'S ZEBRA (*EQUUS GREVYI*) IN THE SAMBURU LANDSCAPE IN SAMBURU COUNTY

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Dr. Paul K. Muoria

The Grevy zebra (*Equus grevy's*), also known as the imperial zebra is the largest wild equid of the three species of zebras. The other two are the plain zebras *(Equus quagga)* and the mountain zebras *(Equus zebra harmannae)*. It belongs to the class mammalia, order perissodactyla and its family is Equidae. Among the three, it is also rated as the most threatened species. Grevy zebras have narrow black and white striping patterns. A mature one stands between 1.5 to 1.6 metres in height and weighs between 350 to 450 kilograms. The population size of Grevy's zebra has been declining drastically despite conservation efforts, such as the hunting ban by the Kenyan government in 1977. However, the role of disease causing parasites has not been adequately addressed. This study was conducted with the aim of identifying the various types of gastro-intestinal (GIT) parasites in Grevy's Zebras in the Samburu landscape of the Samburu County in the Northern Kenya. It also targeted to determine parasitic infestation levels within the different age categories and sex of the animals. Age determination was done through observation of their height, body coloration and mane length at their back. This study was conducted between July and December 2010. Fresh dung samples were collected from the field and observed for parasites in the laboratory using a light microscope. Parasites were identified by use of qualitative methods including direct saline preparation, formol-ether sedimentation technique and Haranda Mori Culture techniques. Quantitative method that uses Cornell-McMaster dilution egg counting technique was used to determine the parasite infestation level in each faecal sample. In total, nine (9) types of parasites were identified from a total of 207 faecal samples that were analyzed. This included both the helminnthic and the protozoan type. The protozoan type recovered included, the *Eimeria leuckarti* (15%), *Entamoeba equi* (13%), *Balantidium coli* (1.0%) and *Giardia intestinalis.* (1.0%) while the helminthic type included *Strongylus vulgaris* (98.1%), *Strongyloide westeri* (55.6%), *Trichonema sp* (5.8%), *Parascaris equorium* (5.3%), and *Trichuris trichiura* (0.5%). All the samples (100%) were found to harbour single or mixed type of helminthes and protozoan parasites. *Strongylus vulgaris* had the highest occurrence while the lowest was recorded by *Trichuris trichiura* in the helminthic group while in the protozoan type, the highest was *Eimeria leuckarti* while the lowest was *Giardia intestinalis*. KruskalWallis Test was used to compare infestation levels within the three zebra age categories. The age categories included the foals, the juveniles and the adult. The test revealed that there was a significant difference in the number of parasites in the three age categories (H = 6.522, P < 0.05). The parasitic infestation level was higher in adult grevy zebras than in foals and juveniles. Analysis using Mann-Whitney test was used to determine infestation levels between males and females. This test showed that there was no significant difference in infections between males and females ($U_{(16)}$ = 40, P > 0.05). In order to prevent the spread of gastro-intestinal parasites, the contamination of pasture land should be prevented by treating the hosts with antihelminthics. In this regard, the Samburu pastoralists should be encouraged to use antihelminthics to treat their animals since they share similar habitat with the Grevy zebras and this will reduce cases of cross transmission of the parasites. The government or non-profitable development agencies should include Grevy zebras in their priority lists of research and develop sustainable integrated diseases prevention and control programs that are practical for developing communities.

EVALUATION OF AVAILABLE FOOTBALL RESOURCES AND THEIR INFLUENCE ON PERFORMANCE OF KENYA FOOTBALL PREMIER LEAGUE TEAMS

PHYLLIS KIRAING'WA MWANGI – MS.c

Department: Recreation Management and Exercise Science

Supervisors: Dr. Andanje Mwisukha

Dr. Elijah G. Rintaugu

The purpose of this study was to evaluate the extent to which available football resources influence the performance of Kenya premier league football teams. The main objective of the study was to determine the extent to which the available facilities, funding, calibre and number of managerial and technical personnel affect the performance of Kenya Premier League Football teams. The study employed the analytical survey research design targeting the 16 managers and 16 coaches of football clubs in the Kenya Premier League. Stratified random sampling was used to select 8 (50%) of the teams according to type, either corporate or community clubs. The study employed purposive sampling to select 8 team managers and 8 team coaches from the sampled teams. Further, simple random sampling was used to select 221players as respondents representing 50.0% of the total population. Questionnaires designed for the team players and managers/coaches were used for data collection. Data was analysed through descriptive statistics (frequencies and percentages). The relationship between current football resources and performance was determined using Spearman's Rank Correlation Coefficient, at 0.05 level of significance. The study established that the major source of funds for most clubs was corporate sponsors and most of these funds had a significant ($rs=0.011$, $p<.05$) influence in the teams' performance. The study also found over 50.0% of the respondents reported that team managers/coaches were not effective in their roles in terms of their managerial and technical roles, that is, they were not available when needed, not approachable and were not adequately equipped with the training needs of the clubs. Further analysis also revealed that there was a significant ($rs=0.021$, $p<.05$) relationship between personnel managerial competencies and the performance of the teams in the premier league. However, Spearman's rank correlation coefficient revealed that there was no significant ($rs=0.126$, $p>.05$) relationship between

available football facilities and equipment and the performance in the premier league. From these findings, the study recommends that management of the Premier League clubs need to diversify their sources of funding so as to avail adequate financial resources to meet their needs. The study also suggests that Ministry of Sports, Culture and Arts should establish training programmes and facilitate the training of personnel for football clubs so as to enhance their performance in Kenya Premier League.

PATTERNMAKERS' PROFESSIONAL QUALIFICATION AND PATTERN MAKING PRACTICES IN NAIROBI FASHION HOUSES, KENYA

OTIENO VERAH ACHIENG – MS.c

Department: Fashion Design AND Marketing

Supervisors: Dr. Diana W. Tumuti

Dr. Bosibori Oigo

Patternmakers are the technical backbone to the clothing manufacturing process and as such require a solid mastery of the technique. This can be ensured with proper training and experience, yet in Kenya little has been done to ascertain the levels of qualification of patternmakers in the fashion industry and whether these have any relationship with actual practices. This study adopted a descriptive research design to assess the relationship between the patternmakers' professional qualifications and pattern making practices within fashion houses in Nairobi. Specific objectives of the study were to: describe the patternmakers' demographic profile, describe the categories of clothes produced in the fashion houses, determine types of pattern making practices, assess patternmakers' professional qualification, and to establish the relationship between patternmakers' professional qualification and patternmaking practices. The study was based on a conceptual framework of education and training with labour market outcomes contextualized within fashion design. The target population was all patternmakers in the fashion houses within Nairobi. Sampling unit was one patternmaker per fashion house using criterion based sampling to reach a total of 44 patternmakers. Structured questionnaires were used to collect the data from each patternmaker. Statistical Package for Social Sciences aided in data analysis. Descriptive statistics were used to summarize variables related to demographic characteristics, categories of clothes, patternmaking practices and levels of professional qualification. Chi-square (χ^2) with an alpha level set at 0.05 was used to establish the relationship between professional qualification and the patternmaking practices. The results revealed that the majority of the patternmakers (90.9%) were below 45 years, and had tertiary education and above. Most were female (76%) and more than half of them (69.7%) were earning below 40,000 Kenya shillings per month. All of the fashion houses made dresses; pattern drafting was the most frequently used method of patternmaking, followed by freehand cutting while CADD was the least used. Majority of these patternmakers had at least a diploma or a degree. More than half of the respondents had less than 10 years of experience in patternmaking. There appeared to be a significant relationship between patternmakers' training background and use of pattern drafting method (χ^2 (8, n = 33) = 20.573, $p < 0.008$). Patternmakers with higher levels of training tended to frequently use pattern drafting. Also, there was a statistically significant relationship between patternmakers' years of experience and use of pattern drafting as a method

(χ^2 (6, n = 33) = 13.265, p = 0.039). Majority of the patternmakers (90.9%) with less than 5 years experience frequently used pattern drafting. It was however clear that besides the training undertaken, experience had contributed more to the improvement of skills. This study therefore recommends that, men should be sensitized to take up pattern making jobs, patternmakers should be versatile enough to make a wide range of clothing, patternmakers should upgrade their knowledge in patternmaking so as to be at par with technological development, curricula developed for fashion design courses should include all pattern making methods and training opportunities should be availed to those already in the job market. For further research, it was recommended that a research should be conducted on those with several years of working experience in order to gain deeper insight into the profession, research should be conducted on patternmakers in the garment industry, the Micro and Small enterprises sector to establish their qualification and methods of patternmaking used and a similar study should be conducted in other towns outside Nairobi to provide better picture of the fashion industry in terms of patternmaking across Kenya

<u>Ph.D</u>

EFFECTS OF RELAXATION EXERCISE AND SLEEP ENVIRONMENT MODIFICATION ON STRESS, BLOOD PRESSURE AND SLEEP AMONG INSTITUTIONALIZED ELDERLY IN NAIROBI CITY, KENYA

JULIAH WAMBUI GITHANG'A – Ph.D

Department: Physical and Health Education

Supervisors: Dr. Gitahi Theuri

Dr. Hannington Bulinda Mugala

Dr. Robert Muniu Kang'ethe

Stress is a key factor in reducing the efficacy of the treatment of high blood pressure and poor sleep quality in the elderly. Yet, high blood pressure and poor sleep quality are important preventable contributors to disease and death. Inadequate sleep is one of the most common side effects of stress resulting in reduced sleep quality. To effectively manage stress, the ability to relax and create a sleep inducing environment is paramount. Given the negative impact of stress on human health, many types of stress management therapies have been put forward for the elderly in order to decrease stress and promote well-being. The purpose of this study was to assess the effectiveness of Progressive Muscle Relaxation (PMR) exercise and sleep environment modification on stress, blood pressure and sleep quality of residents 60 years and above in Mji wa Huruma home for the aged in Nairobi County, Kenya. The study aimed at highlighting the benefits of PMR together with the modification of the sleep environment by use of sleep masks in management of stress, normalizing blood pressure and enhancing sleep quality of both male and female elderly citizens. The study adopted an experimental pre-test post-test control group design. A total of 46 participants were randomly selected from the home to create experimental and control groups with 23 participants in each group. After ethical clearance and research permit approval, data was collected using Perceived Stress Scale (PSS), Pittsburgh Sleep Questionnaire Index (PSQI) questionnaires and a sleep diary. Systolic and diastolic blood pressure data collected using a digital automatic blood pressure upper arm monitor was recorded. The physiological and psychological variables were assessed on both experimental and control groups at pre-test, mid-test and post-test. A total of 43 (93.5%) participants successfully completed the two months intervention programme. In the experimental group, PMR exercise was performed in 45 minutes sessions, three times weekly for two consecutive months and the participants used sleep masks during the entire intervention period. The control group, however, continued with their normal routine activities throughout the intervention period. For the purposes of comparison, data was collected in both experimental and control group. The data was coded and analyzed using Statistical Package for Social Sciences (SPSS) version 20. The results of repeated measures ANOVA and Post Hoc tests between experimental and control groups showed that there were statistically significant differences at $p \leq 0.05$ between the pre-test, mid-test and post-test scores on stress level and sleep quality, $F = 18.969$, $p = 0.001$; $F= 10.902$, $p=.002$ respectively. Multiple linear regression showed a significant regression equation, $F= 7.321$, $p <0.002$ for stress level and $F=27.408$, $p < 0.001$ for sleep quality. The repeated measures ANOVA and Post Hoc tests on systolic and diastolic blood pressure showed that there

were no statistically significant differences at $p \leq 0.05$ between the pre-test, mid-test and post-test scores, $F = .371, p = .546$; $F=1.744, p=.194$ respectively. Multiple linear regression on blood pressure showed a significant regression equation, $F= 85.52, p <0.001$. It was concluded that PMR and use of sleep masks were effective intervention measures in the elderly with high stress level, high blood pressure and poor sleep quality. The study recommended that PMR and sleep masks programmes should be expanded in the community areas with larger population of the elderly.

SCHOOL OF ECONOMICS

Masters

Ph.D

ECONOMIC CONVERGENCE, POLITICAL INTEGRATION AND PROSPECTS OF A MONETARY UNION IN THE EAST AFRICAN COMMUNITY

SIMON GITHUKU NYOKABI – Ph.D

Department: Applied Economics

Supervisors: Dr. Jacob Omolo

Professor Germano Mwabu

The East African Community partner states are in the process of forming a monetary union and it is expected to be complete by the year 2023. The idea of a monetary union is not new in East Africa, this is because, Kenya, Uganda and Tanzania already had a monetary union during the British colonial administration under East African Currency Board. These countries had the East African shilling as a common currency. However, the East African countries have been unable to form a monetary union in the absence of a political federation. The main objective of this study was to determine the levels of real economic convergence and political integration necessary for the establishment of a monetary in the East African Community. This overall objective was achieved by assessing income convergence, business cycle synchronization, political integration and its influencing factors in the East African Community. In the case of income convergence, panel unit root tests of variables was undertaken to determine the order of integration. Variables indicated that they were integrated of order zero I (0) and one I (1) suggesting that autoregressive distributed model had to be applied in regression analysis. Empirical findings supported the presence of conditional convergence and that per capita gross domestic product growth was positively influenced by physical capital and nominal exchange rate depreciation and

negatively affected by human capital and inflation rate. Business cycle synchronization was examined using three stage least square regressions and revealed that it is positively affected by trade integration and negatively affected by sectoral specialization. Graphical and correlation matrix was used to analyze political integration and factors influencing it. Study findings indicated that the level of political integration was low and was weakly related to institutional distance, social integration and economic interconnectedness. From the foregoing, it can be concluded that reduction of income differences among the partner states can be fostered through increased investments in physical capital, maintenance of a competitive exchange rate regime and a low inflation rate regime. Increased trade among partner states and promotion of sectoral homogeneity of the partner states should promote synchronization of business cycles among the partner states. Finally, low political integration can be enhanced through reduction of institutional distance, increased social integration and increased intra-EAC trade as captured by economic interconnectedness variable.

SCHOOL OF ENGINEERING

SCHOOL OF MEDICINE

Masters

PLATELET FUNCTION IN ADULT HUMAN IMMUNO-DEFICIENCY VIRUS-1 INFECTED HAART NAÏVE PATIENTS AT KENYATTA NATIONAL HOSPITAL, KENYA

ONJULA RAEL AWUOR – MS.c

Department: Medical Laboratory Science

Supervisors: Dr. Margaret Muturi

Dr. Gordon Ogweno

Occurrence of cardiovascular diseases (CVDs) in adult human immuno-deficiency virus-1 (HIV-1) infected patients is associated with 18% of HIV-1 deaths. Availability of highly active antiretroviral therapy (HAART) has prolonged and improved quality of life in HIV patients. However it has led to the appearance of pre-mature cardiovascular events (CVEs) of athero-thrombotic origin with its continued use. It is still unclear whether thrombotic risks associated with increased platelet function are as a consequence of HIV-1 infection alone or of the long-term use of these antiretroviral drugs. This study aimed at determining platelet function in adult HIV-1infected patients not on HAART. In a case-control study design, using convenient and consecutive sampling method a total of 28 participants were recruited. Fourteen adult HIV-1positive HAART naive patients and fourteen HIV negative participants attending Kenyatta National Hospital, comprehensive care clinic (CCC) were enrolled to the study after

consenting. Blood samples were collected and platelet concentrates prepared from each sample. Platelet aggregation was determined by measuring time dependent light transmission in response to known agonists (adenosine tri-phosphate (ADP), collagen and arachidonic acid (A.A) on chrono-log 100 aggregometer. Platelet activation was done by measuring P-selectin expression using flow cytometry. In both groups, participants were of similar age and sex. The results show that median Platelet % PSelectin expression levels in HIV positive group was 1.5 times that of the control group (34.5 (IQ) 10.3-63.3 vs 21.1 (IQ) 2.7-46.2),and had a positive correlation with viral load (r=0.634, P= 0.019) but not with CD4 count (r= -0.532, P= 0.7229). Among the three agonists platelet aggregation showed a significant higher response to collagen compared to arachidonic acid and ADP (P=0.00087, P=0.00056 and P=0.019) respectively. Importantly, less percentage maximum platelet aggregation was observed in HIV positive group compared to HIV negative group for all the agonists (Collagen:75±4.8% cases vs 80.4±6.7% controls at 10µg/ml; AA 64±8.1% cases vs 88.4±6.2% controls at 10µg/ml; ADP 60.7±6.7% cases, 71.1±8.1% controls at 5µmol/l). Furthermore, % maximum platelet aggregation correlated inversely with viral load (ADP r=-0.286, P=0.0424; Collagen r=-0.4663, P=0.0177 and A.A r=-0.3, P=0.259) and directly with CD4 counts ADP r= 0.614, P=0.0528; collagen r=0.384, P=0.0273 and A.A r=0.850, P=0.002).This study was able to demonstrate that platelet function in HIV-infected patients is altered. This offered insights into the complex mechanisms underlying occurrences of thrombotic events in HIV positive patients.

SEROPREVALENCE OF CYTOMEGALOVIRUS INFECTION AND ASSOCIATED RISK FACTORS AMONG HUMAN IMMUNODEFICIENCY VIRUS INFECTED PATIENTS ATTENDING THIKA LEVEL 5 HOSPITAL, KENYA

NCHAGWA EDWARD MANGARE – MS.C

Department: Medical Laboratory Science

Supervisors: Dr. Margaret Muturi

Dr. George Gachara

Cytomegalovirus (CMV) is an important pathogen in immunocompromised individuals. In Human Immunodeficiency Virus (HIV) patients, it causes end organ diseases leading to increased morbidity and mortality in the population due to down-regulation of the immune system of the affected individuals. The prevalence of Cytomegalovirus infection is high in the general population. Its prevalence in Kenya has been found to be above 93% (CMV-IgG) in HIV infected children. Despite, a high Cytomegalovirus seroprevalence found in children few studies have documented CMV among adults. This study was done to determine the seroprevalence of CMV infection and its associated risk factors among HIV patients attending Thika level 5 Hospital in Kiambu County, Kenya. The study also evaluated the effect CMV infection on the immunity of HIV infected patients. A cross-sectional study involving 163 HIV positive

participants from different age groups were enrolled. Blood samples were collected; ELISA was used to confirm the HIV status of the participants. The CD4+ cell counts were determined immediately after blood collection using BD FACSCount and CMV IgG and IgM specific antibodies were analyzed by ELISA. Demographic and behavioural risk factors were collected by the use of a structured questionnaire. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. Chi-square test was used to assess the statistical significance of different demographic and behavioural risk factors to CMV serostatus. The seroprevalence was found to be 89% (CMV IgG) while the incidence was 10.4% (CMV IgM). The study found that CMV infection leads to more suppression of the immunity among the HIV infected patients. The study also found out that education, economic status, other sexual transmitted infections, sharing drinks, immune status and blood transfusion were associated with CMV infection (p<0.05). Adoption of CMV screening services and education on CMV risk factors are recommended as CMV infection preventive strategies.

Ph.D

CERVICAL CYTOMORPHOLOGIC PRESENTATIONS: ASSOCIATION WITH PRE-CERVICAL CANCER DETERMINANTS IN WOMEN FROM NAKURU COUNTY

MUITTA ESTHER WANJIKU – Ph.D

Department: Pathology

Supervisors: Dr. Ngethe Muhoho

Dr. Tom Were

Dr. Anthony Kebira

Cervical cancer disease is among leading global cancers in women and it causes reproductive tract ill health. The disease is preceded by pre cancer status identified by detection of abnormal cells in smears from the cervical wall. High risk genotype16 and 18 human papilloma virus is implicated. Other predisposing determinants include *Chlamydia trachomatis* infections, lifestyle and nutritional factors for example healthy diet inadequacies, and chronic reproductive tract ill health. The link between these determinants and pre cervical cancer grades has only partially been examined with no studies reported among women from Nakuru County. This descriptive cross-sectional study was conducted at Nakuru County referral hospital to examine the relationship of determined pre cervical cancer grades in regards to cervical epithelial cytomorphologic features with outcomes of select microbial STI, lifestyle and reproductive health characteristics among women participants. A total of 142 women participants, ≥ 20years of age, were purposively enrolled into the study. Manifested clinical signs, lifestyle and diet practices were collected using a questionnaire. Anthropometric physical measurements were recorded. Serum extracted from whole blood was screened for *Treponema pallidum* and HIV antibodies. In addition endocervical swabs were used for *Neisseria gonorrhea*, *Chlamydia trachomatis* antigen and HPV oncoprotein detection while endocervical scrape smears were examined for cyto-morphological profiling and categorization of enrolled subjects using the Bethesda 2014 classification into four pre cervical cancer study groups of: 1) LSIL; n=35; 2) HSIL; n=59; 3) AGC/AIS; n=8 and 4) controls; (No evidence of cellular lesion) n=40.Cytomorphologic findings indicated that in all participants,~67% subjects manifested koilocytic cells, while ~28% had high grade cellular atypia in their smears. Select STI screened indicated that ≥11% subjects were positive for HIV1/2 and at least 10% for HR HPV 16/18. Collectively at least ~6% of test subjects tested positively for *Treponema pallidum*, *Neisseria gonorrhoea* and *Chlamydia trachomatis*. Additionally, multivariate logistic modeling indicated that HPV16/18 was associated with likelihood of having LSIL, HSIL and AGC/AIS pre cancer grade ($P<0.0001$; $\beta>3.600$; OR>2.0; 95% CI). Lifestyle and nutritional assessment illustrated that anthropometric median values ≤99 cm for bust girth and ≤86cm for waist circumference were associated with higher risks of presenting with HSIL and AGC/AIS grades ($P<0.04$; $\beta>1.681$; OR>5.0; 95% CI), while history of consuming unhealthy diet was associated with higher odds of presenting with LSIL ($P=0.012$; β, -1.433; OR; 4.190; 95% CI;). Reproductive health evaluation revealed that history of lower abdominal pain and vaginal bleeding was associated with higher chance of presenting with LSIL ($P=0.003$; $\beta=1.758$; OR=5.800; 95% CI); HSIL ($P=0.001$; $\beta=2.183$; OR=8.873; 95% CI) or AGC/AIS ($P<0.0001$; $\beta=25.347$; OR=1.019; 95% CI). These results confirm that a high koilocytic atypia magnitude in examined smears is a true pointer of pre cervical cancer genesis. Moreover, HR HPV16/18 infection, upper trunk and abdominal wasting gauged from low median scopes of bust and waist, consumption of unhealthy diet and clinical history of protracted symptomatic manifestation of abdominal pain and vaginal bleeding are important predictors of the development of pre cervical cancer in women from Nakuru County. Therefore, maximum atypia detection should further be enhanced through employment of LBC. Screening of HR HPV infections, integration of anthropometric measure, adopting nutritional counseling and reproductive tract sign monitoring and care in the MCH would reduce risk of developing pre cervical cancer signs.