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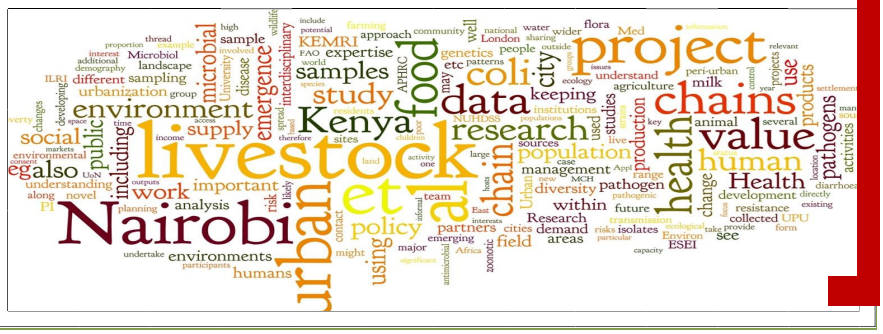
The "URBAN ZOO" Newsletter



AUGUST ,2016

Quarterly Newsletter on "Epidemiology, Ecology and Socio-Economics of Disease Emergence in Nairobi"

Co PI's Letter: Planning and Policy Thread

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Prof. Julio D. Davila

Our projects policy team aims to examine the links between social-environmental and spatial conditions and the microbial diversity that people are exposed to in urban and peri-urban areas. It also seeks to outline the institutional and planning context in which zoonotic diseases develop in Nairobi, and how this is shaped by spatial fragmentation.

In cooperation with Slums Dweller International-Kenya and APHRC, the Team previously collected data through a variety of means, including co-producing knowledge with local communities. In partnership with IIED, we have produced working papers, conference papers and policy briefs to showcase the results, with some currently being submitted to journals. Under the guidance of Prof. Muki Haklay and Dr Sohel Ahmed, UCL post-graduate student Maayan Ashkenazi wrote a fascinating MRes dissertation on the different livestock keeping strategies by women in the low-income settlement of Mathare. She found that these not only vary according to the women's economic abilities but along multi-scalar social and social characteristics arising from living in different villages within Mathare.

In our work we have also sought to build on the decade-long efforts of APHRC in gathering a rich array of primary information on health in informal settlements. We also found that not much attention has been paid in the literature to the planning, policy and structural issues that would appear to play a significant role in reproducing and entrenching endemic pathogenic environmental conditions, conditions that make disease (including zoonoses) prevalent in these settlements. Part of our work has involved outlining the institutions, actors, norms, practices, interactions, their (in) adequacy and complexities around the provision of infrastructure (water, sanitation and solid waste management) that promotes and perpetuates such pathogenic conditions in many parts of Nairobi. We have also sought to examine how legal, policy and institutional realities have influenced urban and peri-urban land use in Nairobi, and how such practices and interventions help shape livestock keeping and farming activities.

To that effect, earlier this year Dr. Sohel Ahmed conducted a series of interviews with research scholars, planners and policy makers in Nairobi. The results suggest that urban and peri-urban agriculture, including livestock keeping, are still not considered a legitimate urban land use neither in the Nairobi Master Plan and land-use maps, nor in the daily practice of local government officials. As a result of antagonistic views towards pro-poor informal farming from planners and other powerful actors, we argue that urban agriculture, particularly livestock keeping in Nairobi and its periphery, is unlikely to survive the effects of the rapid increases in land prices seen in Nairobi in recent years. This is partly the result of a lack of reliable investment alternatives, but also the result of inadequate or non-existent land-value capture mechanisms and an effective regulatory framework that guides growth and allows price increases to be re-invested in much needed infrastructure that benefits the city as a whole. Rapid urbanisation is accompanied by continued land speculation, rapid appearance of multi-storey buildings and conversion of large tracks of agricultural land to urban uses. As tracts of land become sub-divided into smaller plots, there is an observable shift to zero-grazing forms of livestock keeping (e.g. poultry). Hence, livestock and their material flows (i.e. meat, dairy and poultry) are continuously moving further away from central Nairobi.

Despite the 2010 constitutional reform allowing Nairobi County to prepare its own plan and control development under an 'integrated development planning' framework, in reality the County has little say over where new infrastructure, particularly electricity and roads, should be located. Water, roads and electricity are controlled by parastatals, thus taking away from the County government the power to decide on crucial components of its current and future growth. The County's chronic institutional and resource deficiencies mean that the city will continue to allocate resources in such a way that mostly benefits a minority of residents, thus entrenching an east-west socio-economic divide. The inadequate and unsafe provision of water, sanitation and solid waste management has severe public health consequences for residents of poorer areas. Poor infrastructure places some people and their livestock at increasing risk of communicable diseases, and helps reproduce the conditions leading to chronic exposure to higher microbial diversity.

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URBAN ZOO PROJECT

Urban Zoo is an interdisciplinary programme focused around the role of urbanization in the emergence of zoonotic pathogens. We are funded by the Environmental and Social Ecology of Human Infectious Diseases initiative (ESEI), a joint UK Research Council initiative which is part of the Living With Environmental Change Programme.

Urban Zoo Partners:

University of Liverpool · ILRI International Livestock Research Institute · Kenya Medical Research Institute KEMRI · UCL · RVC Royal Veterinary College University of London · University of Nairobi · The University of Edinburgh · iied · APHRC African Population & Health Research Center

Urban Zoo Team – Breaking the barriers

Managing a large multidisciplinary research team is a challenging task, especially when the teams are based in different organisations that are far apart from each other. This is the situation that Urban Zoonoses project is currently in. The 99 Household Study involves sampling 99 different households in different parts of Nairobi. Primary data and samples are collected by both veterinarians and medics based at ILRI, after which samples are sent to University of Nairobi, ILRI and the Kenya Medical Research Institute laboratories. Isolates from these laboratories are then sent to Universities of Edinburgh, Oxford, Liverpool for further analysis and full genomic sequencing.

The urban zoo team during a journal club presentation

Proper planning and efficient communication has been the key to ensuring that everything is well coordinated. Team leaders (management or PI's) from all the collaborating institutions hold fortnightly teleconferences to update, consult and agree on a unified way of moving forward. It is a common practice for staff to communicate through emails, phone calls, skype and one on one talks with each other. The group has a "Whatsapp group chat" that is used to share updates/progress including photos of both the labs and fieldwork. It is also the easiest and simplest way of sharing information with the entire group. Our active website www.zoonotic-diseases.org and the quarterly newsletters, publications and scientific conference presentations are some of the effective means used to ensure that the public is informed of the projects progress and findings.

Staff development and mentoring of young talents, is an area where the project has excelled with several Kenyan staff having either completed or ongoing with their Masters studies in the different collaborating Universities; University of Edinburgh, University of Liverpool, Royal Veterinary College at the University of London. In addition, five MSc students from the University of Nairobi, and six from Moi University through the Field Epidemiology Training program have been supported to undertake their research projects. The project has also attracted a number of European, American and Asian graduate fellows who joined to either gain experience or undertake research projects.

The urban zoo field team on a team building session

Team building sessions, write shops, journal clubs and support to present scientific findings in both National and International Conferences coupled with inspiration and guidance from our dedicated Project Investigators, post-doctoral fellows and management are some of the ways that have helped in forming a united and dedicated team. Looking back, we all feel like one family, really privileged to be part of this big success!

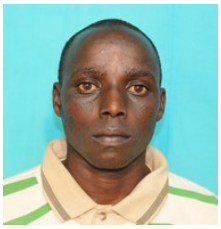
The 99 Households Study is part of the Urban Zoo Project http://www.zoonotic-diseases.org/project/urban-zoo-project/ which is a joint project between scientists from Kenya and the UK. We are interested in how diseases can be transmitted between animals and people living in close contact in a city environment.

The 99 Household study aims to collect in-depth information from 99 families from 33 different neighbourhoods stratified by socio-economic status across the whole of Nairobi. We are testing humans, animals and the home environment for bacteria that can be shared and spread between them.

Article written by James Akoko and Victoria Kyallo (Field Coordinator and Project Manager, respectively)

Urban Zoo Visitors

Erin Furmaga is pursuing an MPH in Epidemiology at Columbia University, New York. She is currently on a 6 months internship program with the Urban Zoo Project assisting in field and lab work in the 99 Household study. https://www.mailman.columbia.edu/



Emmanuel Kipchumba

Millicent Atieno Ochieng

Moses Gitau

Three Interns; Emmanuel, Millicent and Moses from the Animal Health & Industry Training Institute (AHITI), with Animal health and Production and Animal health and Range Management Certificate courses are currently attached at the Urban Zoo Project providing technical support in the 99 household study component in Nairobi.

Multi-Institutional Collaboration at its best

MSc Students, James Macharia Mercy Gichuyia and Maurine Chepkwony

The Epidemiology Ecology and Social-Economics of Disease emergence in Nairobi (ESEI) project has hosted a variety of studies each with different study designs since its conception. MSc students, Mercy Gichuyia, James Macharia and I had the opportunity to work within an aspect of this wider project which involved a cross-sectional study among livestock keeping households in Korogocho and Viwandani informal settlements of Nairobi. We sampled blood and faeces from humans and different livestock species kept in the area and from the faecal samples, identified the prevalence and antimicrobial susceptibility patterns of *Salmonella, Campylobacter* and *E.coli*. This article will focus on the interaction with the different team members and partners during our field sample collection. The science we undertook is currently being prepared for publication.

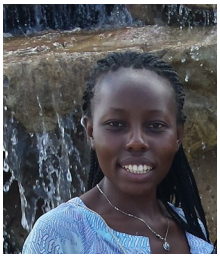
I had the opportunity to work with a large and robust multi-institutional team that was well coordinated and that gave me the best introduction anyone could hope for in how a collaborative project functions. Our typical field day began at 6am where we would be picked from the University of Nairobi, College of Agriculture and Veterinary Sciences by Fredrick Amanya, Lorren Alumasa or James Akoko (all from ILRI). Our voyage would get us to the heart of the informal settlements where we would meet with a team from the African Population and Health Research Centre (APHRC): Sophie and Jacky, as well as three residents from each area who acted as our security guides and who are known to the chief, elders and the APHRC. These two groups of people were crucial in creating rapport with the households as well as locating the randomly selected households and also acted as guides while navigating the otherwise complex neighbourhoods.

Lauren and Amanya (both Clinical officers based at ILRI) would give clinical feedback to household members whose laboratory findings required some form of clinical feedback. This acted as community feedback, one of the many community benefits from the project. After a morning of questionnaire administration, collecting human feacal samples (with the help of Fredrick and Lorren) and livestock sampling with the help of Akoko (project field coordinator), we (Mercy, Macharia and I) would then head to the University of Nairobi (UoN) for laboratory isolation and analysis of the livestock samples while the human samples were transported to the KEMRI-CMR laboratory.

The fatigue from the morning physical work notwithstanding, laboratory work was very exciting owing to the very dedicated and motivating University of Nairobi Laboratory team led by Mr. Nduhiu Gitahi and comprising of Mr. Masinde, Mrs. Mungai, Ms. Wandia, Mrs. Gateri, Mr. Wambaru among others who offered us a lot of guidance and encouragement. The KEMRI –CMR laboratory team was also a huge part of our work and from my standing, a great resource to my work. I learnt several skills from this team particularly antimicrobial susceptibility testing using the agar dilution method from Mr. Ngetich and how to run a PCR as well as analysing of sequence data from Mr. Samuel Njoroge. The two institutional laboratories have very distinct tasks in the project, but the linkages of these activities and support from the Laboratory coordinator, Dr. John Kiiru, gave me an excellent opportunity to accomplish different aspects of my project as a student since I was able to work in both laboratories with a lot of ease. The contribution of Dr. John Kiiru from KEMRI cannot be overstated especially in the facilitation of this inter-laboratory collaboration observed.

Now I understand that it takes a village to make a successful project. Even with the above mentioned activities, a lot went on in the background. The whole urban zoo team was very efficient in the coordinating of activities including field work, and laboratory equipment and reagent acquisitions. Dr. Victoria Kyallo and Mr. James Akoko were very effective, including Maurice Karani and Patrick Muinde (research technicians based at ILRI) were also instrumental in the project implementation. We were lucky to have supervisors: Prof. Kang'ethe (UoN) and Prof. Fevre (University of Liverpool/ILRI) who were always available and ready to support and guide us whenever we needed assistance in solving problems. I also interacted with Dr. Gemma Wattret from the University of Liverpool who was of great assistance in my Campylobacter research and especially so, in the molecular analysis and Laura Made of University of Liverpool in the study design. I cannot forget Dr. Annie Cook who taught us the ropes of rodent trapping and handling.

Although this article reports on a successful multi institutional interaction during my experience in the urban zoo project, it is actually an acknowledgement from Mercy, Macharia and myself to the project and, institutions and all the individuals mentioned and not mentioned in this article that were involved in making our Master of Science research projects a success. Working with the urban zoo team was without a doubt a very exciting experience as well as an opportunity for growth both personally and professionally. We are very grateful for all your input.



This article has been written by Maurine Chepkwony (An MSc student under the Urban Zoo Project, based jointly between University of Nairobi and International Livestock Research Institute (ILRI) in Kenya).

My experience as a Post Doc

With Lord Alexander Trees in London during an ESEI meeting

I joined the Urban Zoonosis Project in June 2014 as a laboratory coordinator. The Urban Zoonoses study is a collaborative project bringing together experts from various institutions in the UK (University of Liverpool, The Royal Veterinary College, University of Edinburgh etc.), and at least three institutions in Kenya (The University of Nairobi (UoN), International Livestock Research Institute (ILRI) and the Kenya Medical Research Institute (KEMRI). The Team in ILRI handles the fieldwork while the labs at KEMRI and UoN handle the lab work. My main responsibility has been to develop standard protocols for use in the two labs and to ensure that the data generated is not only robust, but accurate. The two labs have approximately 10 technicians, numerous students on attachments and a number of interns from Kenya and the UK

In order to appreciate the uniqueness of zoonoses, it is important to realize that there are approximately 600 pathogens which are known to infect humans and 61% of these cause zoonotic diseases. Zoonotic bacteria originating from food animals can reach people through direct faecal oral route, contaminated animal food products, improper food handling, and inadequate cooking. These diseases have a negative impact on travel, commerce, and economies worldwide. It has been my view that the unique dynamic interaction between the humans, animals, and pathogens, sharing the same environment should be considered within the "*One Health*" approach, which dates back to ancient times of Hippocrates. The Urban Zoo project combines mapping, sampling from humans, animals and their environment, determination of antimicrobial resistance profiles and whole genome sequencing of isolates obtained from human and environmental sources. Joining this study therefore gave me that unique opportunity to gain a lot of insights in this subject.

The very fact that this study brings so many experts with unique expertise together makes Urban Zoo project unique. Working with different labs requires substantial managerial skills and the need to consult and reach consensus on all major issues that impact on the quality of the data generated. Through my engagement in the study, I have not only gained considerable organization/leadership skills, but also better communication skills. My participation in this study has also impacted positively on my career and I have been invited as an expert in antimicrobial resistance as a trainer in international workshops by the WHO, the Welcome Trust Advanced Courses and for the drafting on a situation paper by the FAO on application of whole genome sequencing of foodborne pathogens in developing countries.

John Kiiru

This article has been written by John Kiiru (Post Doc under the 99HH Study, based jointly between the KEMRI and International Livestock Research Institute (ILRI) in Kenya).

Recent Publications

Challenges and priorities for modelling livestock health and pathogens in the context of climate change. Şeyda Özkan et al, (2016). EnvironmentalResearch151(2016)130–144

Nutritional characterisation of low-income households of Nairobi: socioeconomic, livestock and gender considerations and predictors of malnutrition from a cross-sectional survey. Dominguez-Salas, Paula, Alarcón, P., Häsler, B., Dohoo, I. R., Colverson, K., Kimani-Murage, E. W., Alonso, S., Ferguson, E., Fèvre, E. M., Rushton, J. and Grace, D. (2016). BMC Nutrition, 2(1). doi:10.1186/s40795-016-0086-2

Antibiotic resistance is the quintessential One Health issue. Robinson, T. P., Bu, D. P., Carrique-Mas, J., Fevre, E. M., Gilbert, M., Grace, D., Hay, S. I., Jiwakanon, J., Kakkar, M., Kariuki, S., Laxminarayan, R., Lubroth, J., Magnusson, U., Thi Ngoc, P., Van Boeckel, T. P. and Woolhouse, M. E. (2016).Transactions of the Royal Society of Tropical Medicine and Hygiene 2016. doi:10.1093/trstmh/trw048

Antibiotic resistance: mitigation opportunities in livestock sector development : Robinson, T.P., Bu, D.P., Carrique-Mas, J., Fèvre, E.M., Gilbert, M., Grace, D., Hay, S., Jiwakanon, J., Kakkar, M., Kariuki, S., Laxminarayan, R., Lubroth, J., Magnusson, U., Thi Ngoc, P., Van Boeckel, T.P. and M.E., Woolhouse (2016) Animal.doi:10.1017/S1751731116001828

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UPCOMING EVENTS:

- 10th Annual World Rabies Day, September 28th, 2016. Theme for World Rabies Day 2016 is Rabies: Educate. Vaccinate. Eliminate.
- Kenya Veterinary Association hosting the World Rabies Day Celebrations in Mombasa; Starting with a Rabies Scientific Conference on the 27th September at Hotel Sai Rock; Followed by World Rabies Day Celebrations on 28th September 2016 in Mombasa, Kenya.
- 1st Annual One Health Day, 3rd November, 2016. https://www.onehealthcommission.org/en/eventscalendar/one_health_day/
- The 4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology & Health 3 - 7 December 2016 Melbourne Convention and Exhibition Centre, Melbourne, Australia.

MRC Medical Research Council
BBSRC bioscience for the future
E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL
NERC
Living With Environmental Change LWEC