KATHERINE A. IZENOUR, MPH

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OBJECTIVE: To work as an on international and global health efforts through program management, data collection and analysis, community education and program evaluation to decrease disease burden and improve public health.

EDUCATION:

Doctoral Student- Auburn University College of Veterinary Medicine
Matriculated May 2018, Auburn, AL

Master of Public Health in Epidemiology- Tulane University School of Public Health
Completed December 2009, New Orleans, LA

Bachelor of Science in Biomedical Science- University of South Florida
Completed August 2007, Tampa, FL

EMPLOYMENT:

ICF, Washington, D.C.
Senior Associate November 2015- May 2018

- Centers for Disease Control and Prevention-
  - Data analyst at the President's Emergency Plan for AIDS Relief's (PEPFAR) Interagency Collaborative for Program Improvement (ICPI) creating standardized data access and utilization processes country teams.
  - Preparation and execution of data requests for COP, POART, and Quarterly reviews by populating excel dashboards with data from the PEPFAR countries for easy visualization.
  - Supported the Voluntary Medical Male Circumcision and DREAMS Programs

Booz Allen Hamilton, multiple cities and multiple clients
Staff Technologist, Healthcare Data Analyst January 2014-September 2015
Consultant, Healthcare Data Analyst November 2010-December 2013

- Navy Marine Corps Public Health Center- Portsmouth, VA, May 2014-September 2015
  - Recipient of the Peer Recognition Performance Prize for outstanding teamwork and client service, May 13, 2015
  - Utilized the Military Health System's Electronic Medical Records to conduct epidemiologic investigation and research in support of the Navy's efforts to improve clinical outcomes, patient access, and quality of care.
  - Served as lead epidemiologist on a variety of projects, from internal investigations to analyses requiring IRB approval.
  - Provided programming support and design expertise for Microsoft Access database tool design.
- United States Air Force- Atlanta, GA & Rockville, MD, January 2013-March 2014
  - Earned a promotion from Consultant to Staff Technologist.

- Analytical task lead for a SAS based retrospective cross-sectional study through the development of a statistical analysis plan, identification and recruitment of staff with necessary skills, engage in regular communication with the client to understand the data and validate findings.

❖ Centers for Disease Control and Prevention (CDC)- Atlanta, GA, March 2011-July, 2013

- Created Microsoft Access database inventory control system for the Tobacco Laboratory. Utilizing an interface that allowed the laboratory personnel to track incoming inventory, designate the use of the inventory and catalog the disposition of the product, as well as upload and store purchase order receipts.
- Supported the Laboratory Science, Policy and Practice Program's (LSPPPO) efforts to gather information on the use of Laboratory Developed Tests (LDTs) at the CDC through the creation of a Microsoft Access survey tool. Solely responsible for quality control and quality assurance of the survey data, its extraction and analysis, and composition of a final comprehensive report.
- The National University of Rwanda (NUR) School of Medicine required a complex Access Database to track financial information of their partners as well as student enrollment and faculty demographics. Supported a team in the US and in Rwanda to create an Access Database that would automatically communicate with a supplemental Microsoft Excel Dashboard to not only house this information but also generate reports, charts, graphs, and queries.

Alabama Department of Public Health, Montgomery, Alabama
Epidemiologist December 2009- October 2010

- Constructed the first asthma surveillance system in the State of Alabama as part of the Healthy Communities Branch of the Bureau of Health Promotion and Chronic Disease through identifying and executing MOUs with stakeholders.
- Established a comprehensive analysis plan to ensure sound methodology and appropriate reporting.

Partnership for an Active Community Environment, New Orleans, Louisiana
Physical Activity Observer September 2008- May 2009

- Collected physical activity data following a strict study protocol by driving through three distinct neighborhoods in New Orleans.

TECHNICAL REPORTS:

- **Air Force Aerospace Medicine Enterprise Ambulatory Medical Care Survey,** March 2014 **http://www.dtic.mil/dtic/tr/fulltext/u2/a600225.pdf**

- **Alabama State Plan for Tobacco Use Prevention, and Control,** 2010-2015 http://adph.org/tobacco/assets/TobaccoStatePlan2010.pdf

EXPERIENCE:

Mano River Union Lassa Fever Network, Kenema, Sierra Leone, West Africa
Field Researcher June 2008-July 2008

- Participated in field research conducting KAP study, environmental observations, and drawing blood from residents of Kenema District in Sierra Leone as part of a team of other Tulane Graduate students and local Sierra Leonean researchers.

Animal Shelter Volunteer, Cairo Egypt and Agra India October 2016-December 2016

- I spent two months in Cairo volunteering at a small animal shelter that also provided care and support for the working animals at the pyramids. I helped with cleaning and daily animal care as well as helped with conference planning
- I spent 2 weeks in Agra India volunteering at a wildlife sanctuary for bears and elephants. I helped with feeding, cleaning, and enrichment building for the animals as well as observing veterinary care.

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COMMUNITY SUPPORT:

Equi-kids, Virginia Beach, Virginia
Volunteer December 2014-August 2015

- Recipient of the Blue Ribbon Volunteer Award for dedication to service, April 25, 2015
- Serve as a side-walker or horse leader for the Equi-kids riding program for children with disabilities buy tacking-up horses for lessons, performing chores in the barn and spotting the riders during their lessons.

Medical Reserve Corps of Chesapeake
Volunteer March 2015-August 2015

- Deploy as requested for anything from natural disasters, terrorism events, outbreaks, to handing out first aid kits at local homeless shelters.

Introduction

Around the world, humans, domestic animals, peri-domestic animals and wild animals experience a variety of interactions with each other for a variety of reasons and with varying frequency. From the domestic housecat who sleeps on someone's bed, to the dog wandering loose along a country road, to a sheep being raised for milk and food and a cow or water buffalo used to plow a field; all of these situations provide opportunity for zoonotic disease transmission. A Zoonotic disease is any disease that can be passed from animals to humans through direct contact, through mutual contact with an infected surface or object, or through indirect contact with something like aerosolized particles from a cough. Bacteria, viruses, protozoa, fungi, and helminths all have instances of zoonotic transmission [1].

Zoonoses occur world-wide, from the most developed to the most under developed countries every day, what does vary from one country to another is the degree to which data is available to quantify and articulate the burden of these diseases. There is not much information available from Egypt describing the prevalence or distribution of *Bartonella spp*. or *Rickettsia spp*. among humans, vectors or animal reservoirs [2-5]. Bartonella and Rickettsia have overlapping vectors, fleas and ticks depending on the species, this opens the door to so many questions about how often these diseases occur together, if at all [6]? Are the vectors co-infected with something else entirely if they are already infected with *Bartonella* or *Rickettsia*? Quantifying and describing the species of fleas, ticks and even lice that are found in and around Giza as well as what strains of bacteria they are carrying will provide the first comprehensive landscape of vectors and the prevalence of some of the germs they carry in Egypt.

Background

Bartonella

The gram-negative bacterial genus *Bartonella* is comprised of multiple species, not all of them are zoonotic, this study is concerned specifically with *B. henselae* and *B. quintana* which are vectored by fleas and lice respectively. *B. henselae* is commonly referred to as Cat-scratch Fever and *B. quintana* is commonly referred to as Trench Fever. Cat-scratch fever can cause illness in both cats and humans whereas Trench Fever, is currently only known to cause symptoms in humans. In severe cases, *Bartonella spp*. can cause endocarditis in humans. The burden, distribution, and impact of *B. henselae* or *B. quintana* in Egypt is not well documented. Available literature is limited and documents the existence of this organism in Egypt, but a comprehensive profile of the disease and it's vector(s) is not available [2]. How prevalent is it? Are domestic animals other than cats contracting it? How often is it passed to humans?

Cats are the reservoir of *B. henselae* [7] humans and several species of Macaques are reservoirs for *B. quintana*. Transmission occurs when a flea or louse carrying the *Bartonella* bacteria bites and successfully passes the bacteria to another animal.

Rickettsia

The gram-negative bacterial genus *Rickettsia* is comprised of multiple species, commonly grouped by the disease(s) they cause. For example, the Typhus Fever group encompasses *R. prowazekii* and *R. typhi.* Some of the more well-known diseases caused by *Rickettsia* bacteria are Rocky Mountain Spotted Fever and Typhus. Fleas and ticks vector bacteria of the Rickettsia genus, depending on the species and geographic location. When humans become infected with these bacteria, illness can range from mild malaise to death.

The pathogen lifecycle of Rickettsia varies depending on the species, and the vector. Rocky Mountain Spotted Fever for example can be vectored by three different ticks, *Dermacentor variabillis*, *Dermacentor andersoni*, and *Rhipicephalus sanguineus*. These ticks become infected either by feeding on an infected mammalian host – transstadial transmission. Or if an infected male tick mates with an uninfected female tick, the bacteria can be passed to the offspring, transovarian transmission [8].

Bartonella and Rickettsia in Egypt

Both of the above mentioned bacteria have similarities that make studying them together a logical union. Egypt is a country in Northern Africa bordered by Libya, Sudan, Jordan, and Israel by land as well as the Mediterranean Sea, the Red Sea, the Gulfs of Suez and Aqaba by land. The Nile River runs north-south through the length of the country, emptying at the Nile River Delta into the Mediterranean Sea. Egypt is the most populous country in the Arab World and the third most populous country in Africa, population 97 million [9]. 43% of the population resides in urban areas. Cairo and Alexandria are the two major urban areas, about ¼ of the country's population is in these two cities.

In addition to the humans in Egypt, there are also many non-human animals. Quantifying the number of dogs, cats, cows, camels, water buffalo, and so forth in the country is difficult, but they are there. Domestic animals plow fields, pull carts, carry tourists, roam the streets, live in houses. Wild animals live there too! Where there are humans and non-human mammals there is a ripe opportunity for vector-borne zoonotic diseases. Bartonella and Rickettsia are high priority infectious diseases, the lack of quality data on them in Egypt and their similarities in vectors and reservoirs make them ideal companion study subjects.

Research Proposal

Answering the questions of who, what, where, when and why in the Egyptian context where these zoonotic diseases are concerned as well as answering the same questions for their corresponding vectors will fill an enormous knowledge gap. No one is looking at these diseases, no one is measuring their impact and without that information prevention and control measures cannot be taken to mitigate these diseases.

To obtain this information, the following steps would need to be undertaken:

1) Permission and research permits from Cairo University animal ethics committee (permission number), and Auburn University IACUC
2) Obtain consent of the animalowner
3) <u>Animal sampling</u>
   a) Both diseases share common reservoirs and vectors, this means samples from one animal could be used to test for multiple diseases. Horses, dogs, cats, sheep, goats, and water buffalo would have the following samples taken
      - Fur combing for ectoparasites
      - Blood
      - Saliva
      - Swab from any lesions present
   b) If a deceased animal is available, internal organs will be observed for evidence of infestation or myocarditis
   c) Sample size to be determined
   d) Demographics of the animal will be maintained – approximate age, sex, health status at time of sampling, use of the animal, herd size, living conditions of the animal if known, etc…

4) <u>Vector sampling</u>
   a) MOSQUITOES – sampling around the areas where animals included in the study reside will be optimal. Samples will be collected using backpack aspirators. Additional sampling in/around urban areas will also be desirable.
   b) FLEAS/LICE/TICKS – combing the animals included in the study for presence of fleas/lice/ticks
   c) Identification of each collected vector will be made using microscopy and if necessary genetic sequencing.

5) <u>Sampling locations</u>
   a) Location-
      i. shelters around Cairo and Giza
      ii. animals coming to the Cairo University vet medicine teaching hospital
      iii. trapping stray animals, work with animal shelters in Cairo to collect samples from animals trapped for TNR activities
6) <u>Molecular Methods</u>

a) PCR is appropriate for identification of bacteria present in gut microbiome.
b) Bacterial metagenomics
c) If necessary and resources permit, genetic sequencing of a limited number of samples will be performed to determine strain etiology.

7) Geographic coordinates
   a) Collection of GPS coordinates of the location where the animal(s) reside or wherethe animal is at the time samples are collected
   b) Collection of GPS coordinates of the location where vectors are collected.
8) Analysis of collected data

Citations

1. Centers for Disease Control and Prevention. *Zoonotic Diseases*. 2018 2018 14 June [cited 2018 02 September]; Available from: https://www.cdc.gov/onehealth/basics/zoonotic- diseases.html.
2. Loftis, A.D., et al., *Surveillance of Egyptian fleas for agents of public health significance: Anaplasma, Bartonella, Coxiella, Ehrlichia, Rickettsia, and Yersinia pestis.* Am J Trop Med Hyg, 2006. **75**(1): p. 41-8.
3. Loftis, A.D., et al., *Rickettsial agents in Egyptian ticks collected from domestic animals.* Exp Appl Acarol, 2006. **40**(1): p. 67-81.
4. Youssef, A.I. and S. Uga, *Review of Parasitic Zoonoses in Egypt.* Tropical Medicine and Health, 2014. **42**(1): p. 3-14.
5. Abdullah, H.H., et al., *Morphological and molecular identification of the brown dog tick Rhipicephalus sanguineus and the camel tick Hyalomma dromedarii (Acari: Ixodidae) vectors of Rickettsioses in Egypt.* Vet World, 2016. **9**(10): p. 1087-1101.
6. Columbia University Irving Medical Center Lyme and Tick-Borne Diseases Research Center. *Bartonellosis*. 2018 [cited 2018 02Sept]; Available from: https://www.columbia- lyme.org/bartonellosis.
7. Al-Majali, A.M. and K.M. Al-Qudah, *Seroprevalence of Bartonella henselae and Bartonella quintana infections in children from Central and Northern Jordan.* Saudi Med J, 2004. **25**(11): p. 1664-9.
8. Saraiva, D.G., et al., *Feeding period required by Amblyomma aureolatum ticks for transmission of Rickettsia rickettsii to vertebrate hosts.* Emerg Infect Dis, 2014. **20**(9): p. 1504-10.
9. The Central Intelligence Agency. *The World Factbook*. Africa: Egypt 2018 23 Aug [cited 2018 02 Sept]; Available from: https://www.cia.gov/library/publications/the-world-factbook/geos/eg.html.

Statement of Interest

I am interested in attending the Ecological and Epidemiological Modeling in Madagascar training to learn first hand about ecological modeling as well as R. I just started my Doctoral Studies at Auburn University's School of Veterinary Medicine under the mentorship of Dr. Sarah Zohdy. I'm planning to take my thesis in a One Health direction, looking first at flea and tick-borne diseases on dogs and cats in Egypt, as a first step. Funding permitting I hope to expand this to other domestic and peri-domestic animals and humans to get the most thorough understanding of zoonotic disease transmission and burden in Egypt.

I have chosen to work in Egypt because the Middle East in general is extremely underserved by public health programs and I hope to highlight the importance of working in this region. The lack of resources being directed towards the Middle East will make leveraging a free platform like R essential to this setting. Attending this training would be my second trip to Madagascar, I was able to visit for a few days as a tourist and I have seen first hand the beauty of Madagascar as well as the impact of humans on the island.