

## Abstract of Master's Thesis

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| Course  | Master of Public Health  | Name | Masanobu Ono |
| Thesis Title  | Associations of Livestock, Wildlife, and Environmental Factors with Risk and Severity of Human Tungiasis in Kwale, Kenya |      |              |
| <p><b>Background</b></p> <p>Tungiasis is a painful parasitic skin disease caused by the female sand flea (<i>Tunga penetrans</i>) which is common in resource-poor areas of sub-Saharan African countries. A prior study in Kwale County showed that proximity to a nearby wildlife reserve was positively associated with risk of tungiasis. As tungiasis is thought to be a zoonotic disease and animals are known to exit the park often and graze in areas of human habitation, it was speculated that wild animals and contact between wildlife and domesticated animals might play a significant role in determining tungiasis risk. (Larson et al. under review, 2017). This study tested the hypotheses that livestock and contact of wildlife with livestock contribute to risk in humans.</p> <p><b>Objectives</b></p> <p>This study aimed to 1) assess the prevalence of tungiasis in humans at the household level 2) assess the presence and prevalence of tungiasis in livestock and 3) test for and identify risk factors of human tungiasis related to domestic animals, presence of wild animals, livestock management, and environmental factors.</p> <p><b>Methods</b></p> <p>A cross-sectional epidemiological field study was conducted. Households were sampled from the NUITM-KEMRI Health Demographic Surveillance System (HDSS) using a two-stage complex sampling strategy. Investigators selected three regions of the HDSS, then randomly selected 15 grid cells (census tracts) within each region, then seven randomly selected households within each grid cell. Survey staff visually examined all family members to confirm the presence of tungiasis. At the same time, a full account of domestic animals was performed and animals were chosen at random for inspection for signs of tungiasis. A questionnaire was administered to collect information on livestock management behaviors and observed presence of wildlife species around the compound. GPS (global positioning system) coordinates derived from the HDSS along with remote sensing data were used to assess associations of tungiasis with ecological factors such as proximity to the wildlife park, elevation and normalized digital vegetation index (NDVI.) Logistic regression methods were used to test for the associations.</p> |  |      |              |

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| <p><b>Results</b></p> <p>This study found that the prevalence of human tungiasis to be 12.9% of households. Of 319 households, 87.8% had at least one species of domesticated animal (31.4% out of all households had cows, 61.8% had goats, 9.4% had sheep, 18.5% had dogs, 42.3% had cats, and 77.4% had poultry). Prevalence of tungiasis in domestic animals belonging to surveyed households level was 79.6% (65.7% in cows, 52.8% in goats, 53.3% in sheep, 55.9% in dogs, 26.7% in cats, and 60.3% in poultry). The risk for tungiasis in livestock was significantly higher in the households which reported using a public dam (OR 3.44 (1.44, 9.59) or river (OR 4.11 (2.13, 8.52) as a water source for livestock compared with household boreholes or taps. However, the study found no association between human tungiasis and livestock ownership (OR 1.33 (0.50, 4.65)) or possession of infected livestock (OR 1.24 (0.62, 2.58)). The odds of tungiasis in human was associated with the presence of stray dogs around compounds (OR 2.37 (1.20, 4.64)), the distance (km) to the national wildlife reserve (OR 0.90 (0.81, 0.99)), and elevation (m) of the dwelling location (OR 1.04 (1.00, 1.08)). The patterns between distance to the park and tungiasis held for households which reported the presence of stray dogs (OR 0.78 (0.65, 0.91)), but did not hold for households which did not report seeing stray dogs (OR 0.97 (0.84, 1.10)). A multivariate model indicated that the associates held even in the presence of the other factors for reports including the presence of stray dogs (adjusted OR 2.74 (1.29, 5.76)).</p> <p><b>Conclusion</b></p> <p>It was concluded that stray dogs could be a potential reservoir of <i>T. penetrans</i> within a transmission chain leading to human contract of tungiasis. It is theorized that dogs may become infected in the park and bring the parasite into areas of human habitation, potentially explaining the link found in the previous study. Though there was evidence to suggest that livestock being infected at common watering points, there was no evidence of transmission between domesticated livestock and humans, calling this link into question. It is as yet unknown if stray dogs carry tungiasis and what conditions may be contributing to its prevalence of tungiasis in dogs. It is possible that other wildlife species or environmental factors may be contributing to its prevalence in dogs and humans. Further research in partnership with wildlife groups and local communities is required.</p> |                         |      |              |