

TEAM Malawi (Technology-Education-Advocacy-Medicine Malawi): A Multidisciplinary Global Health Experience

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Program/Project Purpose: Among faculty and students, there is increasing demand for global engagement experiences. In 2013, one physician from the Virginia Tech Carilion School of Medicine (VTCSoM) and two students from Virginia Tech (VT) engineering conducted a community based participatory research (CBPR) project in water, sanitation and hygiene (WASH) and a needs assessment for medical devices in Malawi. In 2014, two physicians and three students returned to Malawi to share prototypes of seven devices with 100 healthcare providers at eight hospitals. Over the next two years, multiple projects were launched regarding medical device and WASH solutions, while collaborations blossomed with the local global health community.

Structure/Method/Design: In 2015, faculty and students from VT, Radford University (RU), and VTCSoM formed the multidisciplinary **TEAM Malawi** with a Community Wellness model of healthcare as its central theme. Three groups went to Malawi in 2016, each with a distinct focus. *Teaching and Learning in Malawi* was a combination of education, engineering, and medical students and faculty. *Experience WASH* permitted students to participate in applied research, field trips, small group activities, and classroom lectures. *Service-Learning Through Engineering Design* engaged VT students through community-based participatory design of WASH and medical technology.

Outcome & Evaluation: Four faculty and six students participated in *Teaching and Learning*, resulting in collaborations with hospitals and schools in Zomba, with the ministry of health, and NGOs for research, education, and service. Four medical devices were introduced via CBPR. *Experience WASH* involved 15 US and 8 Malawian students, and 2 US and 1 Malawian faculty for a course at Mzuzu University. Three tracks were completed, including Fish Contamination in the Market Supply Chain, Hygiene and Sanitation Assessment of Public Sites, and Mapping WASH Services in a Community. The *Service-Learning* group consisted of one undergraduate, one graduate student, and one faculty from VT. They introduced a pit latrine desludging system, a water well digging system, and a medical device to colleagues at the University of Malawi-Polytechnic.

Going Forward: This multi-institutional, multidisciplinary approach, coupled with CBPR centered about a community wellness model, has resulted in a growing program with the potential to produce sustainable TEAM change in Malawi.

Source of Funding: Virginia Tech College of Engineering; Virginia Tech Carilion School of Medicine; Pediatric Medical Device Institute.

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Palm Oil in Myanmar: A Spatiotemporal Study of How Industrial Farming Affects Biodiversity Loss and the Sustainable Diet

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Background: Palm oil consumption is not only potentially deleterious to human health, but its production has resulted in 11 million hectares of deforestation globally. Palm oil development and consumption in Myanmar is a burgeoning and under-researched phenomenon. Importing roughly 394,000 metric tons of palm oil in 2012 alone, the Burmese government has recently pushed for intensive palm oil development to sate domestic demand for consumption and become international market players. Given well-studied linkages between biodiversity loss and ecosystem instability, this study aims to characterize the nature of deforestation for palm oil production in Myanmar, its effects on the 'sustainable diet', and what factors influence it.

Methods: First, a GIS land suitability analysis overlaying spatial data on rainfall, elevation, and slope was conducted in order to identify areas of Myanmar best suited to palm oil tree growth. Second, after narrowing the geographic range, vegetation indices using varying spectral band models in ENVI (specifically, bands 3, 2, 1; 4, 5, 1; and 5, 4, 3) allowed a more granular examination of vegetation phenology over the past 30 years. Lastly, ground-truthing permitted an in-person verification of GIS and ENVI results and provided contextual understanding of palm oil development in Myanmar.

Findings: GIS analysis reveals that the Tanintharyi region, one of the most biodiverse regions in Myanmar, proves best suited to palm oil growth. Next, Vegetation indices reveal a rapid shift from small-holder farming to what appears to be industrial palm oil plantations all throughout Tanintharyi. Ground-truthing suggests that plantations are indeed becoming fully industrial, encourage construction of massive processing plants like the Yuzana plant 15km north of Maliwan, and accompany an apparent local embracing of the industrial activity.

Interpretation: If these trends of palm oil intensification continue, then four key outcomes may follow: (1) even higher levels of biodiversity loss, (2) increased access and affordability of edible palm oil, (3) decreased importing of palm oil, and (4) large profits made from selling excess palm oil on the international market. Although the first two may most affect low-income Burmese populations, the latter two may bode well for the domestic economy and international trade partners, thus encouraging competing interests.

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What has Changed as a Result of Having Access to Water in Rural Communities in Gaza, Mozambique?

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Program/Project Purpose: About half of the populations without access to improved drinking water are in Sub-Saharan Africa (319 million).[1] Mozambique, as part of this statistic, is also ranked as one of the most poverty-stricken countries in the world (180 out of 188 in the UN Human Development Index).[2] In an effort to provide every person with the human right to water and sanitation, World Vision Mozambique has implemented the WASH (Water Sanitation and Hygiene) Project. However, has this project been successful and ultimately benefited the country? In an effort to understand the impact that introducing a reliable source of water has in a Mozambican community, we conducted a field study to assess the aftermath of WASH.

Structure/Method/Design: Two local districts, Chibuto and Guija, were selected; from each, a community with an old water borehole and a new borehole was identified. In a span of six weeks, participants were chosen and surveyed based on their role in the community: adult community member, secondary student, and health care provider or professor.

Outcome & Evaluation: Results show that communities are utilizing the water bore holes to maximize their everyday chores; however, they are not correlating the serious health implications that are related to lack of potable water or poor sanitation methods. Based on the results of the study, we recommend that World Vision initiate a continuous follow up after water borehole implementation in a community. An evaluation of this action could help increase health sustainability and an understanding of the importance of water in Mozambican communities.

Going Forward: Further evaluation methods within communities would assess sustainability measures in water, hygiene and sanitation. A better understanding of the importance of water among community members would improve the overall health and infrastructure in Mozambican.

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Seasonal Variations in Fetal Growth Patterns in Ulaanbaatar City, Mongolia

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Background: Ulaanbaatar, the capital city of Mongolia sees some of the world's most extreme seasonal variability in climate and air pollution levels. In the winter months, temperatures can drop to -40°C and particulate matter and gaseous pollutant concentrations at this time can exceed over 20 times WHO standards. In the summer months, air pollution levels are low and temperature

extremes can reach up to $+33^{\circ}\text{C}$. This cross-sectional study examines whether there are seasonal variations in fetal growth patterns on prenatal ultrasound evaluations given these extreme environmental fluctuations.

Methods: We collected measurements from 4373 fetal ultrasounds from three antenatal care clinics in Ulaanbaatar, Mongolia from March to July 2016. Biparietal diameter (BPD), abdominal circumference (AC), and femur length (FL) growth parameters were estimated from each sonographic evaluation. Z-scores were calculated for each measurement using published norms by weeks gestation. Season of conception was grouped in tertiles: Winter (November to February), Spring (March to June), Summer (July to October). The impact of season of conception on second and third trimester ultrasound Z-score measurements was assessed with two-way ANOVA with interaction at a 0.05 significance level.

Findings: There were significant differences in FL, BPD and AC by season of conception. FL Z-score ($p=0.033$, Winter > Spring), BPD Z-score ($p=0.011$, Winter < Summer), and AC Z-score ($p=0.014$, Winter < Summer). BPD Z-score also differed by trimester of pregnancy ($p=0.0002$, Tr2 > Tr3). AC Z-score did not differ by season of conception, but did differ by trimester ($p=0.0003$ Tr2 > Tr3).

Interpretation: Our preliminary findings suggest that there are seasonal patterns in fetal growth in Ulaanbaatar, Mongolia. To our knowledge, this is the first study on seasonal variations in fetal growth patterns in Mongolia. These findings will help to better understand environmental changes on fetal growth, and to develop interventions to reduce adverse fetal and birth outcomes.

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The Effects of Early Childhood Development Centers on Child Development and Nutritional Outcomes in Estancia, El Salvador

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Background: In El Salvador, it is estimated that 35% of households live in multidimensional poverty with limited access to education, adequate nutrition, and economic opportunities. Poverty is known to affect child development and educational outcomes. An estimated 25% of three and four-year children in El Salvador have a low Early Childhood Development Index (ECDI) score. Doctors for Global Health partnered with a local non-governmental organization, *La Asociación de Campesinos para el Desarrollo Humano* (Peasant Association for Human Development, CDH), and facilitated the creation of Centers for Integrated Child Development (CICD) for children two – six years of age; children receive a curriculum that includes motor, language, and socio-emotional activities