

**UMSAEP UM-UWC Linkage Report**  
**Visit to Cape Town June 2 – Sept. 11, 2017**  
**Toward Building a New MS&T-UWC-Wits Collaboration to Develop Mathematical Models to Describe the Complex Transmission and Exposure of Infectious Diseases and its Effect on Child Malnutrition**

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University of the Western Cape Host: Dr. Julian May  
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## **1. Overview**

Thanks to support from the UMSAEP Linkage program, the time spent with colleagues in South Africa (SA) was very productive and our outputs will continue to provide opportunities for a long-term collaboration. I spent three months working in the Developmental Pathways for Health Research Unit at the Baragwanath Hospital in Johannesburg and one month working at the Centre for Excellence of Food Security at the University of the Western Cape in Cape Town. The primary focus was on supporting work in the township of Soweto, a low-income urban environment, along with a field visit to northeast South Africa to engage in a rural, low-income environment. Furthermore, I worked in Cape Town on an analysis of SA's national data, I conducted a seminar, and met other faculty from over seven universities and ten departments. The overarching aim was to support work on developing a framework for an external exposure model and internal mechanistic effects model for infectious diseases on child growth. Specific outputs included research contacts, a seminar, two grant proposals, a poster, and a manuscript in preparation.

## **2. Proposed Objectives (*abbreviated*)**

Child stunting, or low height-for-age, has been identified as a global priority with the ratification of the Sustainable Development Goals by the UN General Assembly in 2015. Child stunting increases the probability of morbidity and mortality as a child and non-communicable diseases and premature mortality as an adult. The World Health Organization (WHO) has identified the nexus of food security and infectious diseases as a key point in the system surrounding child stunting. This Linkage Program proposal aims to connect researchers from the University of Western Cape's Center of Excellence in Food Security (UWC CoE) and Missouri University of Science and Technology's (Missouri S&T) Department of Environmental Engineering to synthesize work on infectious disease sensitive food insecurity research initiatives in Southern Africa to further the scholarly literature on child stunting. Specifically, objectives include;

1. Send one researcher from Missouri S&T to UWC's CoE to advise on incorporating infectious disease foci with existing and pipelined food security research programs at the CoE.
2. Identify new sources of funding that supports research aimed to breakdown silos between food security (nutrition and calories) and infectious diseases (environmental enteric dysfunction) on child stunting
3. Develop new proposals with UM-UWC collaboration and other partners for short and

medium-term research projects in Southern Africa

Additional objectives completed beyond the originally stated goal;

- Hold a seminar to present ongoing work at Missouri S&T and identify other potential partners and collaborators.
- Prepare and present a poster at an international conference on the topic of relating infectious disease transmission and exposure to child development.
- Conduct an analysis on national data provided by the South African colleagues utilizing the novel statistical approach provided by the Missouri S&T colleagues. Draft and submit manuscript to peer-reviewed journal.

### **3. Status of Proposed Objectives**

During my time in South Africa (Johannesburg and Cape Town) we were very successful in our objectives, even adding three additional objectives. An update on the proposed and added objectives are presented below;

#### **3.1 Objective #1 – Advise on Infectious Disease Incorporation in Study Design**

On arrival, I learned there were two primary projects in development supported by the CoE. This included an observational, one-year study in Soweto (near Johannesburg) and an analysis of a unique national dataset to study environmental and household exposures on diarrhea and systemic inflammation. During my first month in Johannesburg, I worked with the Developmental Pathways for Health Research Unit at the Baragwanath Hospital under the University of the Witwatersrand. We worked diligently on specifying and critiquing the use of several methodologies and theories in the development of the observational study (to be implemented in January 2018). Several round tables and informal literature reviews were conducted among several staff members at the research unit to edit and validate the data sensors and hypotheses to be tested in the observational study. Currently, all data sensors and hypotheses are established and ready for implementation to begin in January 2018. Additionally, the research unit now has a case study and materials to continue to integrate infectious disease research methods into future studies.

After several trips and other projects, I traveled to Cape Town from August 7<sup>th</sup> to September 6<sup>th</sup> to work with several researchers at the CoE. These researchers had been utilizing a unique national dataset to analyze food security issues for households in low-income settings. I provided technical and topical support to analyze this data to test the hypotheses of sources of infectious diseases (water, sanitation, and hygiene) and their associations with diarrheal occurrences and systemic inflammation among children in South Africa. Currently, we have completed this analysis and are looking to expand the scope of this study to child development.

#### **3.2 Objective #2 – Identification of New Funding Sources**

Three new sources of potential funding were identified including one from the African Union, European Union, and South African Research Council. These grants are geared for specific health problems (i.e. child growth and development) and therefore allow for unique transdisciplinary proposals. Additionally, we have identified specific points in the currently planned observational study to leverage small amounts of funding to obtain significant, connective pieces across disciplines. Specific proposals were developed and are discussed next.

#### **3.3 Objective #3 – Develop New Research Proposals**

Three specific ideas were vetted and proposals drafted to leverage this unique partnership between

UM-UWC. First, utilizing the observational study as a pilot study, an intervention study was designed and planned for the year following the observational study. We are currently waiting for application periods of the above listed grants. Second, a discussion and project outline was developed for the scaling of the potential intervention study. Finally, a longer-term research timeline was also developed to ensure the trajectory of these projects make sense for both the hypotheses under testing and the policies aimed to be impacted.

Additionally, several smaller studies are being discussed with folks in Cape Town in regards to national level data to see where policy is uncertain in regards to water, sanitation, and hygiene.

### 3.4 Additional Objectives – Seminar, Poster, and Manuscript

Lastly, several other objectives were completed during this time and included a seminar, poster, and manuscript. First, a half day seminar was run at the University of the Witwatersrand School of Public Health where I presented our work from Missouri S&T and had a lively discussion on these issues in the South African context.

Second, from the early work around developing a framework for infectious disease transmission and impact, a poster was submitted, accepted, and presented at the 3<sup>rd</sup> International Conference on Global Food Security in Cape Town (see here; <http://www.globalfoodsecurityconference.com/>). This included researchers from three different universities including Missouri S&T, UWC, and Wits.

Finally, the analysis conducted in collaboration with colleagues at UWC in Cape Town on the national data was turned into a manuscript and is currently going through final edits. We plan to submit this manuscript to the Journal of World Development or something similar.

## 4. Timeline of Activities and Meetings

Here, I provide a summative timeline of key activities and meetings described above.

June 2<sup>nd</sup>, 2017 – Arrive and begin work at the Developmental Pathways for Health Research Unit at the University of the Witwatersrand at the Baragwanath Hospital in Johannesburg.

June 3<sup>rd</sup> – 16<sup>th</sup>, 2017 – Worked to edit, validate and test materials regarding infectious disease monitoring to be deployed in an observational study beginning in January 2018.

June 20<sup>th</sup> – 22<sup>nd</sup>, 2017 – Attended the American Association of Environmental Engineers and Science Professors in Ann Arbor, MI to present work on infectious disease and food security.

June 26<sup>th</sup> – July 14<sup>th</sup>, 2017 – Held multiple round tables, discussion, and literature reviews to develop our framework on infectious disease transmission and effects in child development.

July 8<sup>th</sup> – 10<sup>th</sup>, 2017 – While most of our work was focused on low-income settings in urban environments, we visited the rural field site run by collaborators at Wits to better understand several projects with unique study designs/methodologies for environmental exposure monitoring.

July 12<sup>th</sup> – 14<sup>th</sup>, 2017 – Completed a brief trip with researchers from Wits to visit our colleagues at UWC in Cape Town. Discussions were held on the specifics and timeline of the observational study. Additionally, I planned by longer stay in Cape Town and the project we would work on.

July 17<sup>th</sup> – 28<sup>th</sup>, 2017 – During these two weeks we began to develop an intervention study which would build off the observational study with the aim of reducing exposure to infectious diseases and improving child growth rates.

August 7<sup>th</sup> – September 6<sup>th</sup>, 2017 – Visited Cape Town to work with researchers at UWC and the CoE on applying structural equation modeling to national data on environmental exposures, diarrheal occurrences, and systemic inflammation.

September 7<sup>th</sup> – 12<sup>th</sup>, 2017 – Returned to Johannesburg and participated in several planning meetings for next steps in our collaborations.

September 13<sup>th</sup>, 2017 – Returned to the US.

I am very grateful for the support provided by UMSAEP UM-UWC Linkage program and believe the outputs of this trip are of high quality and will allow for a sustainable collaboration. The poster output is attached to this report and the manuscript will be provided when completed.

Kind regards,

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