**Fact Sheet**

SSI is involved in three projects that comprise the Dengue Portfolio of FIRST, which in collaboration with UC Berkeley, under the leadership of Drs. Coloma and Harris include affordable Dengue diagnosis and new assays for use in vaccine development and evaluation, and under the direction of William Avilés, SSI’s Informatics Director in Nicaragua, involve development of informatic tools for Dengue health systems.

Dengue Virus Diagnosis:

The standard diagnostic technique for Dengue relies on detection of antibodies that only appear 5-7 days post-onset of symptoms, thus delaying diagnosis and timely surveillance data by 1-2 weeks. On the other hand, molecular techniques to detect viral RNA early in the acute phase are too costly and complex for large-scale deployment in public health laboratories in many developing countries, such as in Central America. A new diagnostic approach that has become available recently is based on detection of a secreted viral antigen, NS1, that correlates with viremia in the acute phase of illness. However, commercial prices for NS1-based diagnostic kits are prohibitive for most public sector applications in Central America and elsewhere. FIRST will develop a low cost diagnosis for detection of dengue virus NS1 in infected patients. This assay will be produced at a price point that is affordable to pubic health systems in Latin America.

Immune Assays to Guide Vaccine Development and Evaluation:

Dengue vaccinology field needs more accurate immune assays that can predict disease outcome and vaccine efficiency. Current (antibody neutralization) tests performed in vitro fail to correlate with in vivo protection. The UC Berkeley FIRST tem is developing a high-throughput neutralization system with biological relevance based on current knowledge that has a high likelihood of improving the predictive value of neutralizing antibody titers and/or breadth versus DENV infection outcome.

SSI’s contribution to this new tool is based on continuing the Pediatric Dengue Cohort Study (PDCS) in Managua, Nicaragua. Samples that are banked and that continue to be collected as part of the 10-year, ongoing PDCS enable investigation of immune correlates of protection in pre-infection serum samples of subsequent secondary DENV infections. These samples permit development of immune assays that correlate with infection outcome (disease vs. no disease), which is the same outcome that is measured in vaccine efficacy trials. Therefore, potential Dengue vaccines can be developed and effectively evaluated.

Information and Communications Technology (ICT) Toolkit

The ICT tool development project focuses on the creation of three novel low-cost ICT tool prototypes to improve workflow and information flow around time-sensitive Dengue epidemic response and outbreak prevention. ICT tools to support laboratory, surveillance and clinical management practices to reduce dengue-related morbidity and mortality will include:

* Dengue ALERT: In most parts of the world, surveillance of human disease often occurs weeks or even months after the start of disease transmission due to limitations in current diagnostic methods and overburdened human resources in reporting systems. Because of this delay, reactive programs are not very effective in controlling outbreaks. The earlier virus circulation or an outbreak can be identified and a response initiated, the more effectively the outbreak can be contained. The Dengue ALERT tool is conceptualized as a new and innovative automated early warning alert system for dengue outbreak detection and response, incorporating data and information from a broad range of sources and targeting a wider range of end-users (at the local level) than currently exists in most countries.

* Dengue SPECIALIST: At present, clinical decision-support in dengue case management is cumbersome and complicated due to the size and paper volume of the medical chart system used in most countries. This is exacerbated by the rapid onset of shock during the critical phase of severe dengue and the need to act quickly. The management of dengue cases in peak epidemic periods is difficult due to the overburdening of human resources in hospitals risking health systems collapse during severe epidemics. The Dengue SPECIALIST tool will include a clinical decision-support application for hospital patient management to improve the efficiency and accuracy of clinical information analysis in hospitalized dengue cases.

* Dengue LIMS: Combined with the overall lack of stringent quality control measures in many laboratories, the complexities of dengue diagnosis itself leads to great heterogeneity in the quality and reliability of diagnostic results. The delay in or lack of feedback of diagnostic laboratory results to the originating health center, clinic, or hospital further confounds dengue management and control. With the Dengue LIMS tool, we will support a national-level information management system for integrating laboratory results and reporting to help streamline information flow around the multitude of diagnostic tests and approaches for dengue diagnosis.

In collaboration with project partners in Mexico, the existing virtual learning platform “PIEENSO” (developed by the ICSS) will include practitioner training and curriculum development modules to share best practices on dengue outbreak detection and responses, clinical case management, and laboratory information management with regional stakeholders.

The project begins with an initial two years of prototype tool development in Nicaragua, to be followed by a second phase of regional implementation and scale up. SSI’s Director of Informatics, William Avilés, and ICT for Health Program Director, Heather Zornetzer, will work with SSI’s Scientific Director, Dr. Maria Elena Peñaranda to coordinate the first 2 years of tool development and stakeholder engagement. A new ICT office and training space has been established in Managua and several high-level developers have joined our project team to direct the technical analysis and system requirements identification phase for the intelligent Dengue ICT tool kit. An initial kick-off meeting in Mexico with William and Heather and project partners at ICSS and an official project launch with the Ministry of Health in Nicaragua kick started the FIRST project. In early 2014, SSI will be running our first regional stakeholder workshops in Central America around feedback on both the tool designs and the use of the learning platform.

About the Sustainable Sciences Institute:

SSI is a 501(c)(3) non-proﬁt organization that assists developing-country public health professionals by supplying the training, funding, equipment, supplies, networking, and technical advice that they need. It also manages several scientiﬁc and public health programs in Nicaragua and Egypt. SSI is a non-proﬁt organization headquartered in San Francisco, CA with a subsidiary in Managua, Nicaragua, and Cairo, Egypt.

SSI is recognized as a leader in developing scientific research capacity. Their work has been recognized as a model for technology transfer programs to the global South by the World Health Organization, the Pan American Health Organization, the Organization of American States, the National Sciences Foundation, and the (US) National Academy of Sciences, as well as by health officials in many developing countries.

Key Facts About Dengue (from the WHO):

* Dengue is a mosquito-borne viral infection.
* The infection causes flu-like illness, and occasionally develops into a potentially lethal complication called severe dengue.
* The global incidence of dengue has grown dramatically in recent decades.
* About half of the world's population is now at risk.
* Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas.
* Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries.
* There is no specific treatment for dengue/ severe dengue, but early detection and access to proper medical care lowers fatality rates below 1%.