Engaging in ACTION-LED RESEARCH to reduce the global burden of infectious diseases

Sustainable Sciences Institute

ANNUAL REPORT 2017
SSI: Our Mission

Our unique approach supports scientific and public health communities in resource-poor settings to develop local capacity and strengthen public health systems, with positive impact.

Global health relies on biomedical scientists and public health workers who can recognize and resolve health problems at the local level.

In limited-resource settings, scientists and public health professionals face tremendous challenges, including lack of technical training, research tools, financial resources and up-to-date scientific information.

SSI works with local partners to better meet the public health needs of their communities by:

1. Promoting action-led research in response to locally identified problems
2. Identifying innovative context-relevant technologies
3. Strengthening global knowledge exchange networks
4. Training and supporting professional development
Dengue and Zika Studies

After an explosive epidemic of Zika in the Americas that tapered off at the end of 2016, our pediatric cohort study in Nicaragua was characterized this year by a record low of dengue and Zika cases. Samples from the cohort study have been invaluable for understanding the immune response to these viral diseases. The high antibody cross-reactivity among co-circulating dengue and Zika viruses has complicated the use of serological assays to differentially detect infections, accentuating the urgent need for specific and sensitive tests. The Nicaraguan National Virology Laboratory led by Dr. Angel Balmaseda (SSI's Virology Program Director), and our team co-developed, evaluated, and implemented novel serological and molecular methods for detection of current and past Zika, dengue, and chikungunya virus infections, enabling disease diagnosis and seroprevalence studies and providing key epidemiological insights for both national authorities and the international scientific community.

Zika In Pregnancy

SSI has been treading new ground with 3 studies on Zika in pregnancy, conducted in collaboration with the Nicaraguan MOH. The largest is the International Cohort Study of Zika in Infants and Pregnancy (ZIP), which began enrollment in November 2016. The Nicaraguan Zika Positives (NZP) study was initiated in January 2017 and enrolled Zika-positive women initially identified by the MOH. The Zika Pregnancy Outcomes (ZPO) study utilizes a new serological assay (Zika NS1 BOB ELISA) to identify women infected in their previous pregnancy during the massive Zika epidemic in Managua. All three focus on birth outcomes and longer-term ophthalmological, hearing, and neurodevelopmental outcomes at 12 or 24 months. The goal is to better describe the full range of outcomes of Congenital Zika Syndrome (CZS). For instance, in the NZP study, 5 of 26 women delivered babies with microcephaly, but by 6 months of age, 5 more babies had documented abnormalities consistent with CZS, including another case of microcephaly. Anna Gajewski joined SSI’s team as study coordinator.

Influenza Studies

In 2017, we launched a new study at the Health Center Sócrates Flores Vivas in Managua to determine how viral, environmental, climatic, and host factors influence influenza virus transmission in tropical developing countries. This 5-year prospective household cohort study uses an innovative design that combines health center-based surveillance of respiratory illnesses with intensive, 5-week-long monitoring of household members when an influenza case is detected. Over 2,000 persons of all ages in more than 400 households were enrolled by July 2017. Right after, the influenza season started, and ~40% of the study households were included in the intensive monitoring phase. This study is a collaboration between the University of Michigan (PI Aubree Gordon, SSI’s Influenza Program Director), the Nicaraguan Ministry of Health, and SSI, and is funded by the NIH. We also are continuing our Pediatric Influenza Cohort Study, ongoing since 2011, supported by the NIH Centers of Excellence for Influenza Research and Surveillance network through December 2018.
SSI Egypt

In 2017, SSI’s Egypt Program established linkages with local Egyptian scientists engaged in Hepatitis C Virus (HCV) studies to initiate development of collaborative projects focused on resistance to new HCV oral treatments. Our partnership with the national liver institute (NLI) and the Cancer Research Center is thriving. NLI-SSI-CRC staff continued to collect blood and tissue samples, and our bio-bank today has over 2800 liver disease and liver cancer samples. The NLI-SSI-CRC was granted additional space for new equipment and supplies and to facilitate larger-scope projects being planned. Our partners Dr. Mohamed Abdel Rahman and Dr. Sameera Ezzat, the NLI-SSI-CRC Director, continued to train NLI staff and students from other universities in Egypt in statistical analysis, pathology and manuscript-writing and oversee doctoral students. Dr. Ezzat presented at conferences in Egypt and Sweden. Recently Dr. Hesham Abdel Dayem was appointed as the Dean of NLI and he and his staff are looking forward to SSI’s assistance in advancing liver disease research skills development at NLI in Egypt and other countries in the Middle East and North African regions.

Chronic Diseases in Nicaragua

Our study team has been implementing a clinical dengue study at the Hospital Infantil Manuel de Jesús Rivera (La Mascota), the national pediatric reference hospital, since 2005. Following the worldwide transition to chronic diseases, this year, a new 2-year study called Prospective Hospital Study of Classification, Diagnosis and Management of Children with Metabolic Syndrome was initiated. Obesity is on the rise in Central America, but data is lacking. This study seeks to determine the prevalence of metabolic syndrome (a cluster of conditions - increased blood pressure, high blood sugar, excess body fat, and abnormal cholesterol or triglyceride levels - that increase risk of heart disease, stroke and diabetes), as well as obesity and diabetes, in the Nicaraguan pediatric population. It will also provide information on the major co-morbidities and identify the population at risk. Importantly, this study enables discussions on new guidelines in primary and secondary care, as well as identification of the best therapeutic options available to prevent such co-morbidities. This study is led by Dr. Federico Narváez, an endocrinologist who is part of the SSI clinical team.

Publications

There has been a flurry of activity and papers written on the Zika epidemic and serological cross-reactivity with dengue. The Nicaraguan team led a number of manuscripts, including: 1) Comparison of four serological and two molecular methods for the diagnosis and surveillance of Zika; 2) Zika Index Cluster Study, 3) Zika antibody sero-prevalence study among the pediatric cohort and the adult family cohort. They were also the lead collaborator with the Harris lab and others on 1) Zika antibody-based blockade-of-binding assay to distinguish Zika from other flavivirus infections (PNAS); 2) Zika virus targeting monocytes in human white blood cells (Nature Microbiology); 3) Zika and dengue virus cross-neutralizing antibodies; 4) Zika and dengue cross-reactivity in memory B cells; 5) Zika cohort study and effect of prior dengue virus infection; and 6) antibody-dependent enhancement of severe dengue disease (Science). Further, well-characterized samples from the Nicaraguan dengue and Zika studies provided a critical resource for numerous collaborators evaluating and publishing new assays for Zika diagnosis and surveillance. This body of work provides important and timely information about Zika epidemiology and immunology in a dengue-endemic context, with direct public health application and impact.
SSI, together with AMOS, an NGO in Nicaragua, and in partnership with the Nicaraguan Ministry of Health, is implementing a program to engage communities in the fight against Zika and other arboviroses. Dr. Josefina Coloma, SSI’s Executive Director, and Dr. Laura Chanchien Parajon, AMOS’s Medical Director, are principal investigators of the program and are working closely with Nicaraguan authorities to ensure its incorporation into the public health system (modelo de Salud familiar y comunitaria). A hybrid approach that uses Care Group methodology, a highly successful method for rapid knowledge translation and behavior promotion, combined with SSI’s expertise in evidence-based community mobilization and community-based entomology, is being deployed in two districts of Managua. One thousand community health workers are organized in brigades that promote household participation in mosquito control in 10,000 homes. Key messages and customized interventions revolve around the greatest risk factors determined in a baseline study. DengueChat/ZikaChat, the mobile app and web platform for reporting and eliminating Aedes aegypti breeding sites, which was designed by SSI in collaboration with the Social Apps lab at UC Berkeley, is being deployed as a monitoring tool. Biweekly home visits by brigadistas are critical for monitoring mosquito indices and for behavior modification. Key interventions include covering water storage barrels with simple yet effective elasticized covers and removal of tires and plastic containers that collect water. For pregnant women, personal protection and information about risks and available services are underscored. Community meetings, health fairs and school activities bring the mosquito problem to the forefront of neighborhood actions and empower residents affected by vector-borne diseases to take responsibility in their homes and to organize to demand better municipal services, such as trash collection and water distribution. The project will last three years and is funded by USAID as part of the Zika Addendum to the Integrating Community Health Annual Program Statement (APS). SSI is working with UNICEF to incorporate communication for development (C4D) strategies and has strengthened its collaboration with the government to integrate community approaches for risk communication, vector control, surveillance and access to quality services for families affected by Zika.
This year, SSI trained over 120 scientists from around the world. Maria Elena Peñaranda, our Scientific Director and training champion logged thousands of air miles to conduct workshops from China and Uganda to Central America. In fact, in Panama, SSI has been partnering with the National Secretariat for Science and Technology for well over a decade, and this year, besides conducting workshops, a 3-year agreement was signed between SENACYT and SSI to continue training local scientists in scientific writing.

Maria Elena celebrated the new year in China with a manuscript-writing workshop sponsored by CDC-China and conducted in partnership with the University of Michigan in Sichuan, Chengdu. Participants with research on topics ranging from dental health to environmental pollution, immunization programs to metabolic syndrome prepared great drafts for publication. At Makerere University in Kampala, Uganda, SSI organized a proposal-writing workshop with the Center for Emerging and Neglected Diseases (CEND) of UC Berkeley. Board member Stephen Popper participated as an instructor. His hands-on experience with writing proposals for the NIH and other international funders was very well received, and 21 participants appreciated his willingness to share his knowledge.

In Tegucigalpa, Honduras, with support from the Conservation, Food and Health Foundation (CFHF), researchers from four Central American countries trained in differential molecular diagnosis for dengue, chikungunya and Zika, caused by mosquito-borne viruses that now co-circulate in the region. Our collaborator Jesse Waggoner from Emory University and our own SSI-Nicaragua member Karla Gonzalez taught the workshop. We also returned to Quetzaltenango, Guatemala, where we have helped establish several molecular diagnosis methods in the past. We conducted a training module to improve the molecular detection of human papilloma virus (HPV) and review the standard operating procedures on HIV, tuberculosis and HPV in the laboratories of the Investigation, Development and Integral Education Center (IDEI) directed by Janet Ikeda. In partnership with Pan American Health Organization (PAHO), we conducted a manuscript-writing workshop in El Salvador with 30 participants from PAHO and the Instituto Nacional de Investigación. An advanced group worked on manuscripts on infectious diseases as well as childhood mortality and teenage pregnancy. Finally, our last workshop of the year was on manuscript writing and was organized in conjunction with the Nicaraguan Ministry of Health (MINSA); it was held in Managua in mid-November with eighteen participants from MINSA collaborating institutions. The manuscript topics ranged from infectious diseases, including sero-epidemiology of Zika virus in children and antimicrobial resistance, to treatment of ovarian cancer. We are excited about all the upcoming publications!

After almost 20 years of scientific capacity building, SSI workshops and laboratory trainings are still making a difference in local health research communities. Consider sponsoring a workshop in 2018!
Long-Term Collaboration: SSI-Nicaraguan MOH

SSI is thrilled to have renewed its long-term MOU with the Nicaraguan Ministry of Health (MOH) in September of 2017 for a period of 5 years, which allows the continuation of the fruitful collaboration. To mark this partnership, on September 22nd, the annual “Jornada Científica” was held, this year co-sponsored by SSI and the Nicaraguan MOH. Eleven scientific presentations, including one by Dr. Eva Harris, marked the one-day conference, where SSI and MOH accomplishments were shared with over 120 local public health professionals. As part of the continuing commitment to address local scientific needs, SSI conducted a manuscript-writing workshop from the 13th to 16th of November, 2017. Approximately 20 MOH and SSI researchers benefitted from the 3-day workshop, which was taught by SSI Scientific Director, Maria Elena Peñaranda.

Welcome to the Land of Lakes and Volcanos!

SSI-Nicaragua is thrilled to host from January 10th to 13th, 2018, the annual meeting of the P01 Dengue Research Consortium which is led by our president Dr. Eva Harris and funded by NIH/NIAID. Over 20 researchers from collaborating institutions, external advisors, NIH program officers and 40 local investigators from our team and the Nicaraguan Ministry of Health will gather in the colonial city of Granada to share the most recent program advances in a scientific symposium. The researchers will have the opportunity to appreciate first-hand the hard work of the over 170 study personnel on the SSI Nica team as they visit the institutions of the Ministry of Health (hospitals, health centers, and laboratories) in Managua where our studies are being implemented. Our visitors will also have occasion to enjoy the hospitality of the Nicaraguan people and visit prominent sites in the cities of Granada and Managua and environs.

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Please help us grow our individual donor base

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Dengue, 32%
Community-based, 6%
Hepatitis C, 3%
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Our 2017 annual report is dedicated to the memory of Dr. Milton Schlesinger, who was a long-term supporter of SSI and a renowned virologist.