



Commonly called *breakbone* fever, dengue is a viral mosquito-borne disease. Symptoms include fever, headache, muscle and joint pains, and a characteristic skin rash that is similar to measles. In a small proportion of cases the disease develops into the life-threatening severe dengue syndromes, including dengue hemorrhagic fever, (resulting in bleeding, low levels of blood platelets and blood plasma leakage), and dengue shock syndrome, where dangerously low blood pressure occurs.

In 2004, SSI was incorporated in Nicaragua (Instituto de Ciencias Sostenibles, ICS) to conduct a study on the transmission and clinical manifestations of dengue in children. The six-year study, supported by the Pediatric Dengue Vaccine Initiative with funds from the Gates Foundation, helped solidify SSI's presence and mission in Nicaragua. Currently, SSI manages several studies on Dengue and Influenza in partnership with the Ministry of Health (MOH) through a long-term agreement between the two parties which was renewed in 2008 and with the support of multiple funders. Over 80 local personnel including medical doctors, nurses, laboratory technicians, field and support personnel and project coordinators are part of the dedicated and hard-working SSI Nicaragua team.

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Dengue is the most important mosquito-borne viral disease affecting humans, and dengue fever and dengue hemorrhagic fever/dengue shock syndrome have emerged as major public health problems, particularly in Southeast Asia and Latin America. Over 2.5 billion people are at risk, almost 400 million infections and 500,000 hospitalized cases are estimated globally each year.

Four serotypes of Dengue Virus (DENV 1-4) with multiple genetic variants are transmitted by the vectors *Aedes aegypti* and *Aedes albopictus*. The interplay between individual immunity to previous infections, herd immunity, and new virus introductions create a complex epidemiological picture for dengue.

An effective, tetravalent vaccine could dramatically improve the fate of millions of people who are affected by this disease and several candidate vaccines are in the pipeline. However, vector control also plays an important role in risk reduction. New integrated approaches that include community participation and mobilization and vector competence reduction are currently being tested.

CURRENT DENGUE STUDIES IN NICARAGUA

1. The PDCS, which was initiated in 2004, is the longest continuous dengue cohort study in existence and consists of a prospective cohort of ~3,500 children 2-14 years old. This cohort is conducted at the Health Center Sócrates Flores Vivas (HCSFV), one of 20 health centers run by the Municipal Health System of Managua and the primary health care facility serving the study area. Subjects were and will continue to be recruited in the territory of the HCSFV, with a population density of ~6,640 habitants/km² in 17 neighborhoods of low- to mid-socioeconomic status representative of Managua based at a municipal health center in Managua, Nicaragua. Participants are followed closely for all illnesses, and children who present with fever are screened for signs and symptoms of dengue and tested at the National Virology Laboratory of the Ministry of Health. This study, where individuals are followed for an extensive period of time, allows us to investigate epidemiological,

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virological and immunological determinants of repeat dengue virus infections.



The mission of SSI is to support scientific and public health communities in resource-poor settings to develop sustainable local research and public health systems.

2. This pediatric dengue hospital-based study has been ongoing since 1998 at the National Pediatric Reference Hospital, the Hospital Infantil Manuel de Jesús Rivera (HIMJR) in Managua. The study focuses on clinical, immunological and viral risk factors for severe dengue and complements the community-based PDCS where most dengue cases are milder. In-patients and out-patients between 6 months and 14 years of age and suspected of dengue are enrolled, given medical care and followed-up for the entire disease evolution. Additional follow-up is provided to study the long term immunological effects of dengue virus infection.

These two interrelated studies make use of state-of-the-art data management and quality control procedures based on the extensive human capacity and infrastructure built in Managua through the implementation of these and other studies.

From 2010-13, SSI supported the implementation of a randomized controlled cluster trial to reduce dengue risk in Nicaragua through evidence-based community mobilization. Read more about the *Camino Verde* project here: <http://caminoverde.ciet.org/>