



**Sustainable
Sciences
Institute**

2023 Annual Report





A pediatric consult of a cohort participant (left) and reception area (right) at the Health Center Sócrates Flores Vivas in Managua, Nicaragua, where the PDCS is based.

20 years of the world's longest running pediatric dengue cohort:

The Nicaraguan Pediatric Dengue Cohort Study

The Nicaraguan Pediatric Dengue Cohort (PDCS) is a remarkable research initiative that has been dedicated to understanding the dynamics of dengue virus infection in children. Now in its 20th year, the PDCS is the longest ongoing dengue cohort study in the world, initiated in 2004 to provide insights into the epidemiology, immunology, pathogenesis, and clinical outcomes of dengue virus infections in a pediatric population in Nicaragua. By following a large cohort of children over an extended period, researchers from our Nicaraguan team together with US partner institutions have been able to track the course of dengue virus infection and disease, study transmission dynamics, and identify immunological risk factors for severe disease as well as immune correlates of protection. The data collected from this cohort has not only enriched our knowledge of dengue but has also contributed significantly to the global understanding of other mosquito-borne viral diseases, including Zika and chikungunya.

Over 150 scientific publications!
With many more to come

PDCS in numbers



>12,000 children
>2,500 diagnosed dengue cases
>85,000 serological titrations



24/7 and year-round care
>320,000 medical consults
32 nurses
16 doctors
3 clinical coordinators
1 site coordinator

Over 100 trained physicians
Capacity enhancement for the region



From the streets of Managua.....



...to our new laboratory facilities

Over the past 20 years, the PDCS has yielded numerous seminal research findings and publications and has led to development of new and improved diagnostics and research methods, implementation of innovative and state-of-the-art information systems, and creation of one of the largest biorepositories in Latin America. It has not only enhanced the understanding of the epidemiology of dengue, Zika, and chikungunya and the role of immune responses in infection and disease risk, but it has also played a critical role in the development of dengue and Zika vaccines and therapies. National and international agencies such as the Nicaraguan government, US FDA, CDC, and World Health Organization regularly take data from the PDCS carefully into consideration in their deliberations and decisions on dengue and Zika medical countermeasures. The cohort is a model for longitudinal studies in infectious diseases, offering a comprehensive perspective on their dynamics in real-world endemic settings. Further, the lessons learned from this ongoing study have implications for other viral diseases and have paved the way for future research to better combat mosquito-borne illnesses. The legacy of the Nicaraguan pediatric cohort extends far beyond its two decades, as it continues to train health professionals and scientists, inform public health strategies, guide medical interventions, and inspire further research in the field of pediatric infectious diseases.

All of this is possible because of your

**continued
support**

**Thank you!
Gracias!**



Eva Harris, PhD
President



Josefina Coloma, PhD
Executive Director

Team spotlight



Dr. Angel Balmaseda



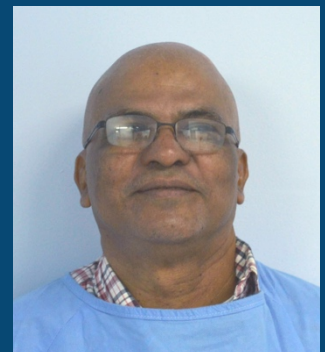
Dr. Guillermina Kuan



Dr. Sergio Ojeda



Dr. Nery Sanchez



Leonel Pérez

At the forefront of respiratory virus surveillance: Influenza Studies in Nicaragua

Aubree Gordon, PhD



Household visits and field procedures.



Brenda Lopez



Sonia Arguello



Juan Carlos Mercado



José Cisneros



Karla Gonzalez

Our dedicated team in Nicaragua has continued their pivotal research on influenza and SARS-CoV-2, and we're eager to share the latest insights gained through the studies. Despite the pandemic's initial impact on influenza circulation, infection rates have remained elevated, likely due to increased susceptibility after two years of low influenza circulation. Regrettably, our findings reveal higher attack rates in children during 2022 and 2023 compared to pre-pandemic years, with younger children facing an elevated risk of pneumonia. Our ongoing investigation into the immunological correlates of these trends aims to enhance our understanding, with implications for vaccine development.

Notably, our pediatric influenza cohort study, now in its 13th year, has provided a robust foundation for examining not only the burden of influenza but also the spectrum of illness and repeat infections. Intriguingly, our research suggests that influenza infection, even in young children, confers a high level of protection lasting several years, greatly surpassing the effectiveness of the influenza vaccine. For instance, infection with influenza A H1N1 demonstrated a remarkable 90% effectiveness against reinfection over a three-year period. Currently, we are delving deeper into the correlates of protection, comparing infection-induced immunity to vaccine-induced immunity to inform the development of next-generation influenza vaccines.

From left to right: Dr. Aubree Gordon, PhD, Director of SSI's Influenza Studies, with visiting researchers Abigail Shotwell and Lora Campedron



Introducing our new facilities for sample processing and storage: *Propelling SSI into the future!*

Our new facilities in Managua mark an exciting milestone in SSI's journey. This reality has brought together under one roof many of our operations in Nicaragua, including the central administration and finance department, our information and communication technologies group, and a state-of-the-art laboratory, altogether housing over 25 employees. In addition, we maintain our own building nearby, also in the quiet, attractive, and centrally located Los Robles neighborhood, which acts as a guest house for visiting scientists and US-based SSI employees and serves as the operations center for the entomology and community engagement department. At the Health Center, we continue to operate an outpatient clinic that serves the participants of both our arbovirus and respiratory virus cohorts. We've come a long way from working in loaned facilities at the Ministry of Health. Our own Institute is a reality! This achievement not only symbolizes our growth but also empowers us to further our mission with dedication and innovation.

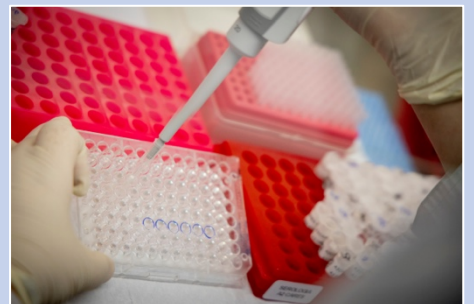


Over 10,000 samples received, processed, and stored. **in 2023!**



Top: SSI's new building in Managua has offices and laboratories

Right: Laboratory facilities include areas equipped for sample separation, cell culture, molecular biology (PCR), serology (immunoassays), and freezer rooms for our biobank.



Expanding our work in Ecuador: "BienSur"

Indigenous communities in Ecuador, like many other indigenous communities worldwide, face significant challenges in accessing adequate healthcare and mental health support. These underserved populations experience higher rates of chronic illnesses, infectious diseases, mental health disorders, and limited access to essential healthcare services. The lack of culturally sensitive and community-driven programs by governmental entities further exacerbates these problems, leading to poor health outcomes and diminished overall well-being.

Enhancing Well-being in Underserved Indigenous Communities

BienSur (Bienestar Indígena Ecuatoriano en Salud Urbano-Rural) is dedicated to enhancing the overall well-being of Ecuador's underserved indigenous communities. Focusing on both physical and mental health aspects, the initiative seeks to implement long-term sustainable solutions tailored to the unique challenges faced by these communities. Central to its mission, the program aims to deliver holistic care and support, ensuring that the multifaceted needs of these communities are met with empathy, efficiency, and cultural sensitivity. Through collaborative efforts, the program aims to create lasting positive impacts on health, well-being, and resilience among indigenous populations in Ecuador. An initial fund of \$50,000 allowed us to kick-start this program.



Azucena Munguia



Saira Saborio



Xochitl Matamoros



José Sanchez



Roger Lopez



The BienSur program is adopting a multifaceted approach to address the specific health needs of indigenous communities in Ecuador.

Please consider donating in support of BienSur.

A life devoted to training and capacity building



June 2023 training course on scientific manuscript writing in Managua.
Dr. Maria Elena Peñaranda (front row, second from right).
Dr. Willy Juarez (front row, first on right).

For over 20 years, Dr. Maria Elena Peñaranda has been the cornerstone of capacity building and scientific enhancement activities at SSI. Her unwavering commitment to training the next generation of scientists worldwide has made a profound impact on the lives of hundreds of trainees. Whether it is introducing PCR technology to remote regions or teaching the art of successful manuscript and proposal writing, even in retirement, she will remain a guiding force in our training initiatives as a content expert consultant.

Your family at SSI wishes you a joyful retirement!

Personnel Updates

José Guillermo Juarez, PhD (Willy, pictured above, right) joined SSI in early 2023 as our Scientific Coordinator, replacing **Anna Gajewski**, who moved back to the US. Willy is also our Global A2CARES Coordinator. He is a Guatemalan entomologist, trained in the UK and US with experience in field studies and interventions. We welcome Willy to SSI and thank him for his outstanding multi-tasking abilities and deep commitment to capacity enhancement.

Holvin Raudez joined SSI Nicaragua in 2015 and has now been promoted to be our Financial and Operations Director. He took over most of **Jesse Zimmerman's** responsibilities, as Jessie embarked on new adventures back in the US. We wish Jesse and Anna the best with their entrepreneurships.

Francisco Zamora has joined SSI in California as our Administrative and Financial Coordinator. He has visited Nicaragua to train on the operational aspects of SSI and works closely with the grants management team and the accounting teams in both sites.

We thank all the personnel in Nicaragua and California for their contributions!



Perfecto Sosa



Zoila Orozco



Jairo Carey



Margarita Brenes

Not pictured:

Alejandro Arroliga	Carolina Valverde
Cinthia Saborio	Dilcia Hurtado
Julia Medina	Fatima Carballo
Berman Moraga	Flora Caldera
Carla Jarquin	Freddy Suarez
Yajaira Obregon	Ivania Montalvan
Andrea Nuñez	Karla Gomez
Cristhiam Cerpas	Leila Saenz
Marvin Taleno	Marjury Ruiz
Sara Palacios	

This year's spotlight is dedicated to the original team (OG) that has been with us since the incorporation of SSI in Nicaragua in 2004. We are grateful for the hard work and commitment to our projects.

Our success is their success.

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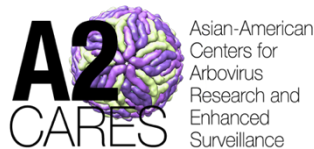
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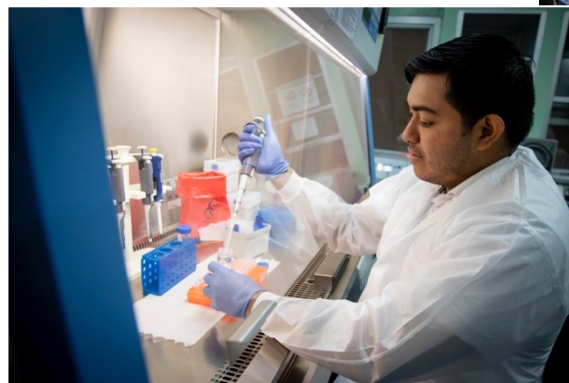
University of California, Berkeley

The genomic surveillance of dengue virus: From research to national policy

Dengue virus continues to be a major global health concern, threatening more than half of the world's population with infection. Early detection and access to prompt medical care are crucial in reducing potential fatalities. However, in economically disadvantaged areas, surveillance systems for dengue are often underfunded, necessary equipment is lacking, and there is a shortage of trained professionals, making it difficult to diagnose and identify the virus in a timely manner.



As part of our American Asian Center for Arbovirus Research and Enhanced Surveillance (A2CARES), a Research Center of the Global NIH/NIAID Centers for Research in Emerging Infectious Diseases (CREID) Network, we collaborated with a diverse group of stakeholders consisting of scientists from Ecuador, Nicaragua, and Paraguay and Ministry of Health personnel. Via virtual and in-person exchanges, Ecuadorian researchers successfully introduced the genomic surveillance of dengue using Oxford Minlon technology. This collaborative effort enabled us to establish sequencing and bioinformatic capabilities in Nicaragua in 2021. We have successfully trained five professionals in the techniques of genomic sequencing and phylogenetic analysis, and they are now passing on this knowledge to other surveillance programs within the country. These outcomes highlight the advantages of a global collaborative effort involving multiple stakeholders and demonstrate how advanced technology can be effectively implemented by local teams in low-income countries.



Yuri Villalobos is the lead of the biobank facilities in Nicaragua.



Cris Cerpas (middle) is the lead of the genomic surveillance initiative in Nicaragua.

Thank you very much to all our donors and supporters!

Our individual donors are our champions supporting our 501 (c)(3) community-funded status. Please consider SSI in your annual days of giving.

We need your continued support!

Please donate to SSI by visiting our website and giving through PayPal, or send us a check to our US address: 1212 Preservation Park Way, Suite 300, Oakland CA 94612, USA.

Consider adding SSI to your organization's matching donation program if available. You can give any amount to specific activities or programs or to our general fundraising campaign, but the capacity-building and training program needs the most support so that we can continue to advocate for science and public health in Latin America.

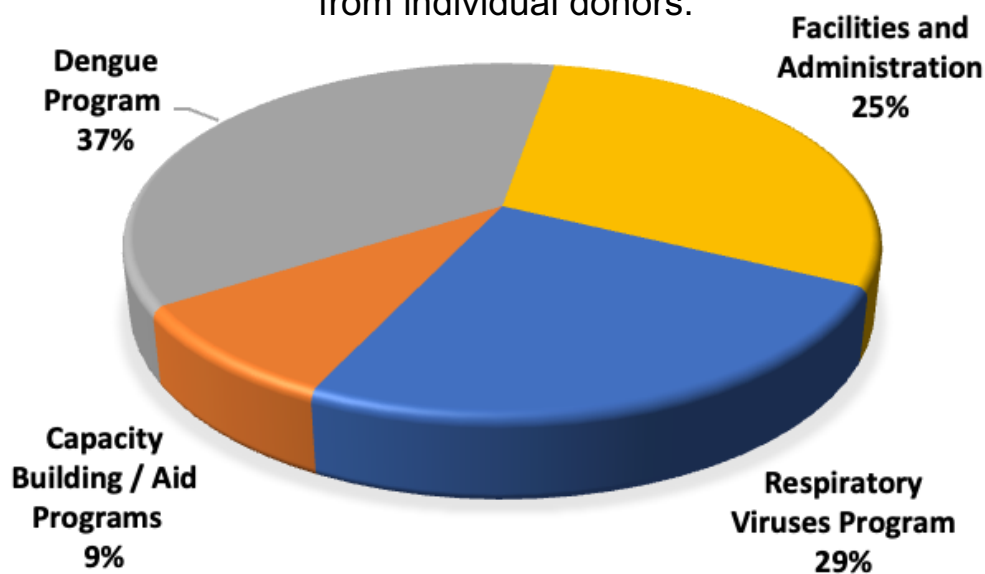
Donate via online at:

www.sustainableciences.org/donate

Donations are tax deductible.

Financial Report Annual Budget and Programs (2023)

Our programs are funded by grants from government agencies, private institutions, and generous contributions from individual donors.



Total budget for 2024 = \$3,320,000



SSI has grown, we are 225 people working on one mission!

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Josefina Coloma, Executive Director
Marlon Buitrago, Senior Accountant
Francisco Zamora, Financial and Project Manager
Mary Masland, Grants Manager
Maria Elena Peñaranda, Emeritus Scientific Director

SSI NICARAGUA

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Miguel Plazaola, Clinical Coordinator
Nery Sanchez, Clinical Quality Control
Harold Suazo Laguna, Director, Community Projects Laboratory, clinical, field, support and administrative personnel



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