# NEXLEAF ANALYTICS

# Annual Impact Report 2022

# Scaling Up

# A Message From Our CEO

A portion of the billions of dollars of aid for medical equipment and technology for low- and middle-income countries (LMICs) too frequently ends up in a literal heap of trash.

This is an old problem that the global health sector has been aware of and frustrated by for generations but has failed to find lasting solutions, in part because nobody feels that they own the problem. A 2016 NPR article covers the medical technology graveyard in Malawi pictured in this letter.[1] Ten years prior, in 2007, a similar study by Duke University found that almost all donated equipment ended up in such a trash heap due to poor electricity and training. And on and on.

As an international aid community, we have failed to solve this systemic problem for decades. In continuing to pour expensive, but unmaintainable, medical technology into LMICs, the community wastes valuable in-country time and resources, possibly doing

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1    For those interested, a study by the National Academy of Medicine and a 2013 article by Scientific American both elaborate on the problem.

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worse for countries than if they had done nothing at all. Equipment usually follows a consistent pattern: it arrives with much excitement and fanfare; it is not adopted; it breaks down and is thrown out.

We understand why this happens:

1.  Technology is built to a spec designed by outside consultants who neither use the equipment in the field nor receive enough feedback from the field to facilitate improvement. Therefore, the challenges that prevent healthcare workers from doing their jobs are never solved and the equipment ends up unused.

2.  Equipment breaks down and is not repaired, often because pre-determined purchase orders do not incentivize vendors to build equipment that is easy to maintain and service, or to purchase necessary spare parts for maintenance. Equipment and software providers sell this equipment at healthy margins and get new contracts later when the old equipment is trashed. The cycle continues.

3.  Equipment and information systems are not interoperable with a country's existing infrastructure. When a country buys from a new vendor or upgrades equipment, the new equipment and current equipment are often incompatible, and one or the other is rendered useless or requires more resources, negotiation, and engineering to allow interoperability.

4.  In the case of information systems, a country's data is often owned by the vendor—not the country—even when country stakeholders have paid for the equipment and access to the data. This rarely discussed but broadly known issue is sustained by public and

private sector agencies across Africa and Asia. A shift is happening away from this issue in some isolated sectors, and it needs to be more pervasive.

Collectively, we have to perform far better than we have over the past 30 years.

Nexleaf understands the root cause of the equipment graveyard problem, and we are dedicated to designing and deploying equipment and software that will deliver lasting impact to the Ministries of Health–our customers. We are committed entirely to our products not only working in the field for many years but to working with our Ministry customers to ensure that they can fully realize the value of the equipment.

We've spent years developing the ColdTrace **remote temperature monitoring (RTM)** system through deep learning with our Ministry partners and their employees. We build our technology to involve, support, and empower healthcare workers rather than burden them. With ColdTrace, healthcare teams can manage their vaccine cold chains end to end and protect the potency of vaccines.

We put our teams on the front lines to see and solve problems in the field that make it difficult to use and maintain RTM equipment. We hold ourselves accountable not only for the number of devices we have deployed but also the percentage of them sending useful data, how much and how effectively that data is being used, and ultimately, how well the cold chain equipment (CCE) of our customer countries is performing.

We understand we can't be the vendor for every LMIC in the world. Our mission doesn't stop with our customers. We are working directly with UNICEF, Gavi, WHO, and other international organizations to raise the bar for RTM and medical technology everywhere. **We fought for countries to own their data and use it as they wish: we won.** We are making ColdTrace fully interoperable with other vendors' RTM and CCE equipment and



**Large-Scale Deployments**
Achieved in 6 Countries

**Our goal is that in five years, the vaccines for 1 in 5 babies across the entire world will be fully protected by Ministries of Health using ColdTrace**

are part of the efforts to make interoperability a global standard. We are committed to improving cold chain performance no matter who is awarded a contract.

These commitments are necessary for RTM, and really for any medical technology or SIM-enabled device (like a tablet) that is placed in the health system, to finally succeed in the field.

I'm proud of our success to date: we have over 20,000 ColdTrace devices deployed across 33 countries to monitor vaccines for approximately 1 in 11 babies worldwide. But the vaccine cold chain in LMICs remains unreliable. There are challenges to the successful adoption and use of RTM technology. I deeply believe in the impact that we can have, but we must move much faster.

In 2023, we aim to at least double our reach to over 40,000 units deployed. We are committed to working with our customers to ensure all ColdTrace devices are installed, fully operational, and sending data consistently by the end of the year. Our goal is that in five years, the **vaccines for 1 in 5 babies across the entire world will be fully protected by Ministries of Health** using ColdTrace: that ministries have the funding, resources, tools,

and capabilities to effectively monitor vaccine temperature across every leg of their entire journey, that the fridges are reliable in that journey, and ultimately that the vaccines arrive in children's arms fully potent. Until we know that these vaccines are consistently arriving potent, we are far from done.

I believe we can break the cycle and add no further to the medical equipment graveyards. With our partners at Gavi and the UN, Nexleaf is blazing the trail to creating a human-centric, reliable healthcare equipment paradigm that creates a lasting impact for our customers and their citizens. I'm grateful for the opportunity to contribute to a future in which the Ministries have the working equipment, the data, the resources, and the processes to provide the quality healthcare that their citizens deserve, and I'm eager to work with even more partners who are inspired to contribute.

Sincerely,

Nithya Ramanathan, Ph.D.
CEO & Co-founder

99% of the children under the age of 5 who died from vaccine-preventable illnesses lived in low and middle-income countries

Vaccination is the most effective preventative measure against these diseases, which are a leading cause of death for children.
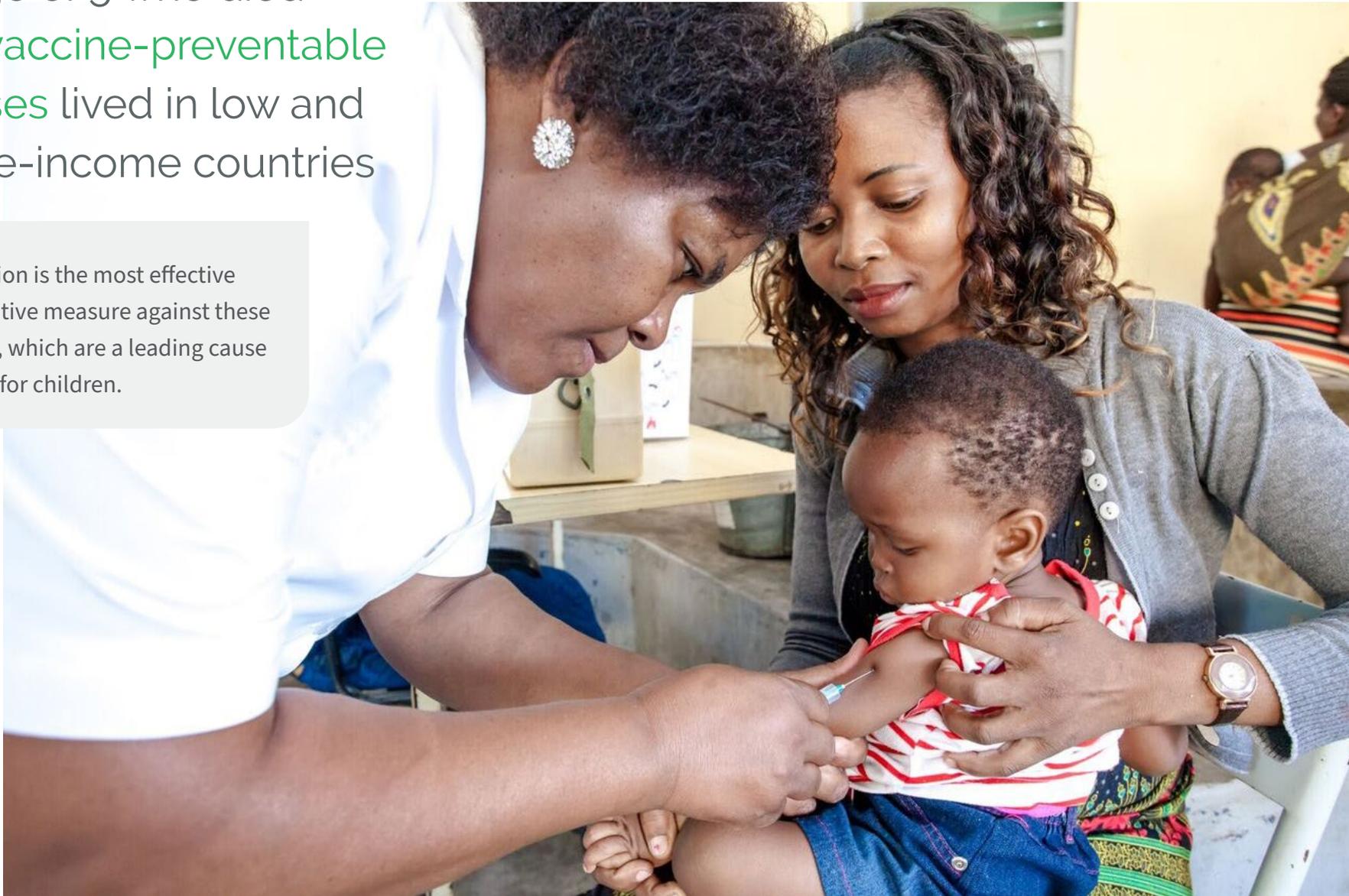
# A Deep Impact

Ministries of Health use Nexleaf technology to monitor vaccines for 1 in 11 babies born globally.

What does it mean to have ColdTrace at multiple levels of the health system? To explore how to build solutions for the challenges a vaccine faces, we have to begin with complete clarity into the entire picture of the cold chain journey. Measuring Nexleaf's impact means we must think both end-to-end and top-to-bottom.

*Population monitored by administrative level of 130,904,542 total children under 1 worldwide. (November 2022)*

**COLD TRACE INSTALLATIONS**
**NO COLD TRACE INSTALLATIONS**

| | INDIA | TANZANIA | KENYA | MALAWI |
|---|---|---|---|---|
| **NATIONAL VACCINE STORES** | 21,078,757 children under 1 | 2,259,911 children under 1 | 1,435,084 children under 1 | 643,941 children under 1 |
| **1ST ADMIN. LEVEL STORES** | 10,709,770 children under 1 | 2,147,240 children under 1 | 1,386,952 children under 1 | 263,369 children under 1 |
| **2ND ADMIN. LEVEL STORES** | 10,709,770 children under 1 | 1,732.852 children under 1 | 1,301,996 children under 1 | 643,941 children under 1 |
| **POPULATION-FACING HEALTHCARE FACILITIES** | 50% of Facilities | 60% of Facilities | 0% of Facilities | 40% of Facilities |
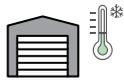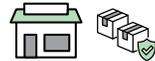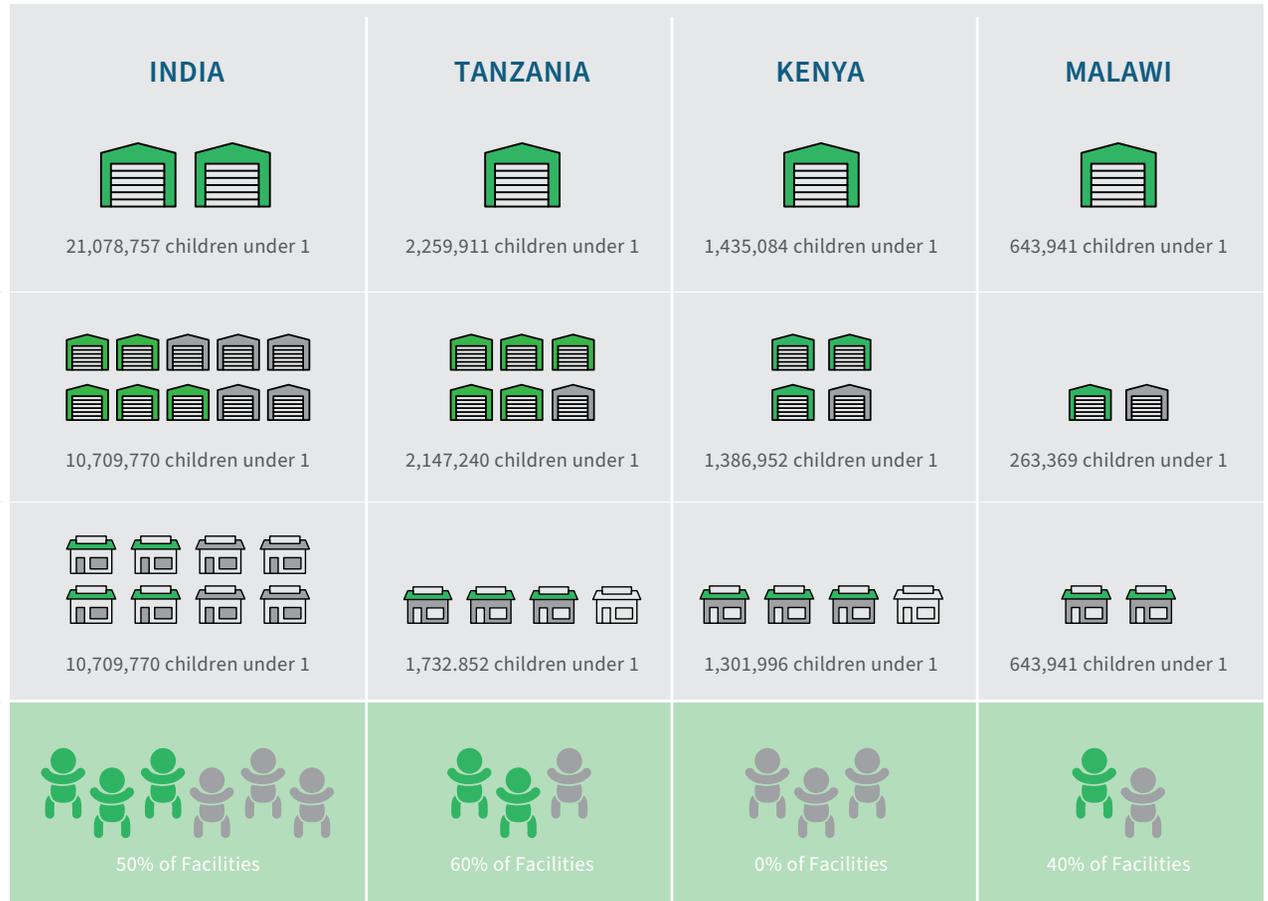
# Trek and Transport Work
## Pilot Progress in Tanzania

Since 2017, Nexleaf has worked with the Tanzania Ministry of Health to protect vaccines by implementing remote temperature monitoring of cold chain equipment in health facilities and vaccine stores across the country. Nexleaf devices monitor vaccine temperatures at all four levels of the health system.

While remote temperature monitoring has provided critical support for decision-making at health facilities throughout the country, until now, there has been no insight into what happened to vaccines as they were transported.

Yet studies show that as many as two-thirds of vaccines are exposed to damaging temperatures during transport, including the most dangerous to a vaccine—freezing incidents. A single freezing event can destroy thousands of dollars worth of vaccines in just one hour. By equipping Ministries of Health with visibility into a vaccine's journey through the entire cold chain,

*BELOW: Trek is a wireless temperature data logger which, when combined with a GPS-enabled Android smartphone app, can monitor temperatures in vaccine carriers and map out distribution routes during vaccine transportation.*



we expect new technologies to help local leaders better secure their cold chains and protect vaccine shelf-life.

Nexleaf, in partnership with the Ministry of Health and inSupply, began a pilot program measuring the temperature fluctuations vaccines experienced during their transportation utilizing a Nexleaf remote temperature monitoring device we call Trek. Ten district councils in the Mwanza and Geita Regions were selected to conduct this revolutionary pilot in preparation for a national scale-up effort. **With Trek, Tanzania will be the first with end-to-end visibility into the vaccine cold chain among low- and middle-income countries!**

Usage of Trek began in May 2022, and to date, users have captured 164 distribution trips with Trek across both regions. The early analysis found a need for temperature monitoring

during transport because **55% of trips were too warm, and 18% of trips were too cold.** The pilot has also shown that the real-time alerts of temperature excursions help frontline health workers to address problems during transport, prompting them to repack vaccines or replace cold packs. Pilot participants are starting to use Trek data to make broader decisions about vaccine transport, such as planning efficient distribution routes and allocating resources accordingly. At the same time, it's clear that introducing a new technology and process to the health system requires time, support, and expertise. The pilot will run through March 2023 to gain insight into pains and gaps during transport and ultimately resolve any issues identified. This year, using the lessons learned from the pilot, Tanzania plans to scale up the technology nationwide with support from Nexleaf.

# Bringing Real-Time Data to Transport

**PILOT**



**POST PILOT**



## Improving a Vaccine's Journey

The pilot revealed many windows of opportunity when a vaccine could experience a dangerous temperature during transportation. Without temperature monitoring, it could be inactive or even unsafe by the time a child receives the vaccine. Ensuring that communities receive effective vaccines is critical to the success of immunization programs and trust in the health system overall.

## Early Findings from Pilot in Tanzania, Africa

The use of Trek is already helping frontline health workers identify and address problems during transport. Pilot participants report that the alerts prompt them to replace cool water packs and repack vaccines. Data from ColdTrace has also helped immunization officers identify shorter and more efficient routes, as well as advocate for dedicated cars and fuel to transport vaccines.



TOO HOT

OPTIMAL

TOO COLD

**TEMPERATURE EXCURSIONS EXPERIENCED BY A VACCINE DURING TRANSPORT**
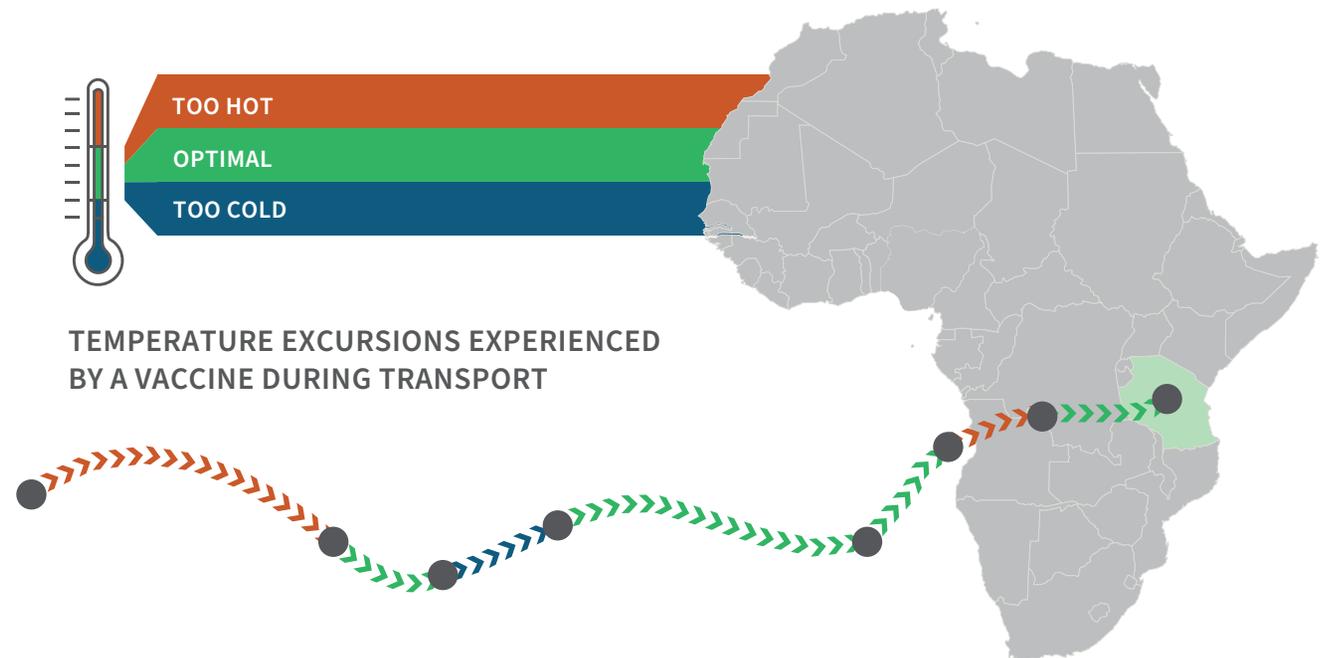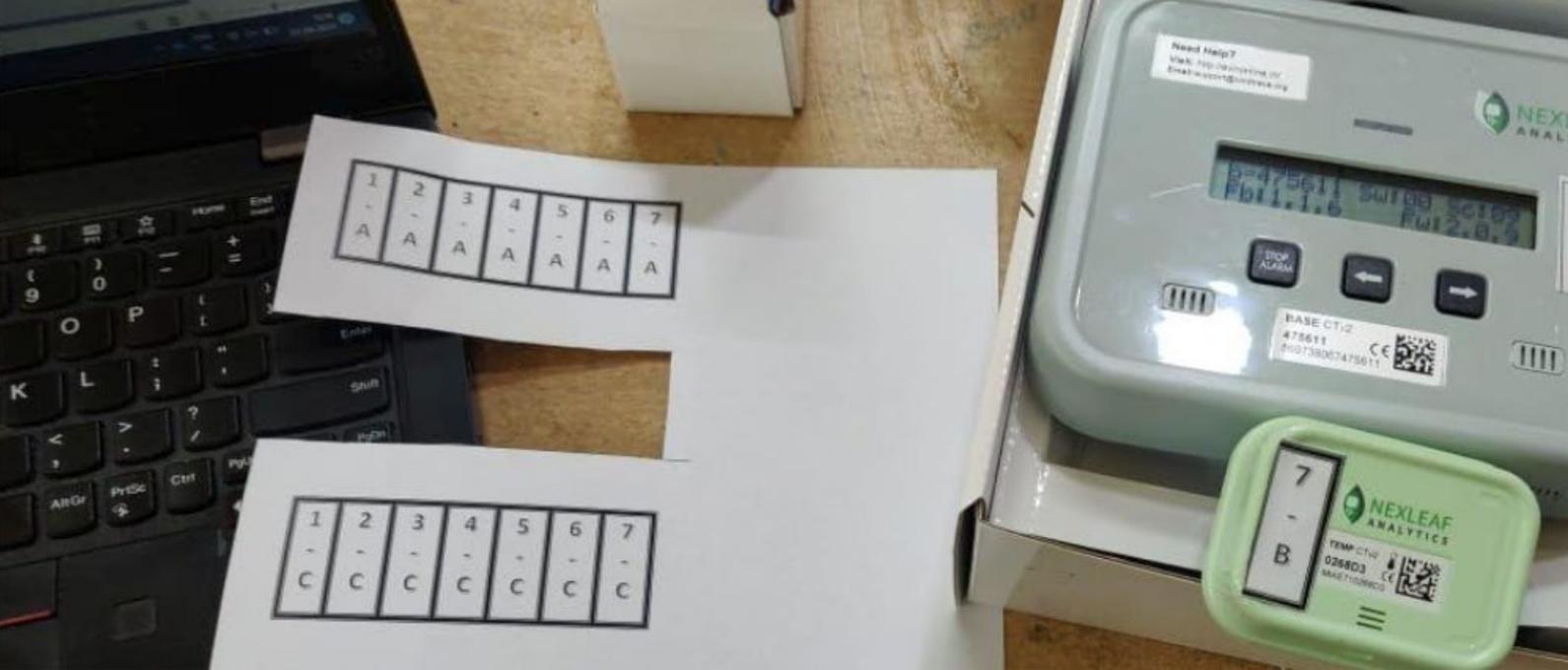
# Product Development

We are here not just to scale a product but to ensure that that product truly solves a problem. That means we had to dedicate more resources to getting everything right, including hiring a Head of Product and improving our technologies with the feedback we receive from our customers. In 2021, we saw that we needed to invest in the product as a discipline, and we now have a much more user-focused team with more regular feedback loops.

This product-focused feedback has been valuable—installing the wireless sensors is now much more straightforward than with previous versions. As a result, cold chain staff can point to multiple examples of using remote temperature monitoring capabilities to protect vaccines better. One official described our new device as a "much-needed advancement" towards strengthening their cold chain.

**Chris Mills**
Head of Product

" Given the impact we expect CTX to have in monitoring the vaccine cold chain from end-to-end, I knew we needed to get it right, and the best way to do that was to go and see how it performs in the hands of actual users. Traveling to India gave me a unique opportunity to hear from our manufacturing and logistics teams, district vaccine officers, cold chain technicians, and some of our CSR partners as well.

# Getting Connected with CTX

The strength of ColdTrace lies within its ability to communicate directly to healthcare workers, allowing them to take immediate action to ensure a vaccine's potency. All elements and products must communicate seamlessly.



**DASHBOARD**

**BASE STATION**

**DOOR SENSOR**

**TEMPERATURE SENSOR**
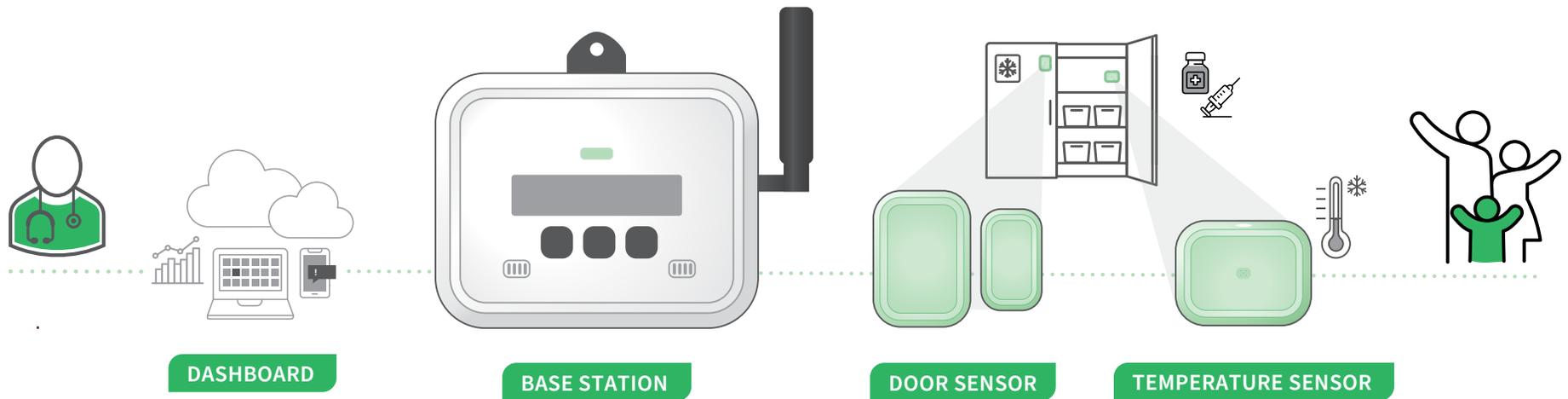
# Working Shoulder to Shoulder

One of the pillars we've leaned on during this time is the value of partnerships in collective problem-solving. It takes cultivating relationships of trust with Ministries of Health, donors, funders, and healthcare workers.

From initial logistic set-up to training healthcare workers to use the ColdTrace system, the implementation process for our devices takes the cooperative efforts of multiple parties and follow-up to maintain optimal device effectiveness and longevity. Yet, even with the perfect execution of these steps, challenges can still present themselves.

In our recent collaborative work with the Ministry of Health, we are addressing current challenges, like sim card payments and connectivity and hardware issues, bringing more devices back online. With our partnerships' support and joint analysis of these findings, the Nexleaf team drew up a roadmap to address the challenges and return the devices online to protect more vaccines.

By taking a joint approach to the analysis and generation of insights, we work hand-in-hand with the Ministry of Health to arrive at the answers together. Technology implementation takes time, and there are opportunities for improvement along the way that we can manage more efficiently with teamwork. We will work shoulder to shoulder with governments to maximize the impact of our work in global immunization, clean household energy, neonatal health, and beyond.

## DEVICE ISSUES FOUND

FOUND IN **452** DEVICES

UNCHARGED BATTERY

SENSOR ISSUE

DEVICE NEVER SENT

OTHER DEVICE ISSUE

# The Future of Nexleaf

Innovation and problem-solving to facilitate infrastructure for strong and resilient healthcare systems will always be at the heart of what Nexleaf does. These products, working with each other and with people, build a Connected Clinic: a national healthcare infrastructure that uses data to better support decisions and actions at all levels of the Ministry of Health.

# When Power Failure Meets Life-Saving Equipment

As medical equipment floods low- and middle-income countries, there is an urgent need to ensure those investments generate the intended health impacts. However, very little data exists to appropriately address a country's context and barriers to equipment use, including reliable power infrastructure, trained staff, continuous maintenance, and robust supply chains. These often unmet needs run the risk of generating massive equipment graveyards, especially in Sub-Saharan Africa. We know health impacts rely on more than a successful ColdTrace installation. A strong system depends on an entire ecosystem of health workers, the availability of parts and consumables, and the reliability of grid power or alternatives. Without these parts working in harmony, intended health impacts go unrealized, equipment falls into disuse, and the vital roles of healthcare workers go unsupported.

In early 2020, Nexleaf Analytics launched the Medical Equipment Program. The exploratory study aimed to identify barriers to equipment use. One of the critical barriers to providing high-quality care in health facilities is unreliable power. The program studied newborn units within selected county referral hospitals in Kenya.

Thanks to partnerships with Global Health Labs, Inc., a nonprofit organization created by Gates Ventures and the Bill & Melinda Gates Foundation, and through conversations with country partners and multinational organizations, Nexleaf embarked on ten months of data collection. The goal--to examine barriers to equipment utilization.

Three facilities whose power we monitored experienced an average of ten hours without power during the period of observation. But even when facilities had power, **they experienced 9,036 power quality events that had the potential to damage equipment**. Those events produced a total of 2,877 hours of potential damage to equipment, an average of 40 days per facility.

In most cases, no single event is the sole cause of equipment failure; the problem lies in the combined quantity and severity of events. **This persistent strain on equipment likely shortens its expected lifespan** and degrades its built-in features' ability to protect the equipment.

We found that facilities are well aware of their power quality problems, see these problems as a significant source of damage to equipment, and have identified many ways to use power quality data to better advocate for their facility's needs.

As we move into the next phase of the program, we are engaging in conversations with upper-level decision-makers to see where data can achieve maximum impact.

One thing is clear: we must work to ensure that these investments yield long-term benefits—in terms of equipment performance and health impacts.

**8,273,224**
SMARTPLUG READINGS

across
**46**
pieces of
EQUIPMENT

IN **3** FACILITIES

**9,036**
RECORDED
POTENTIALLY
DAMAGING
POWER EVENTS
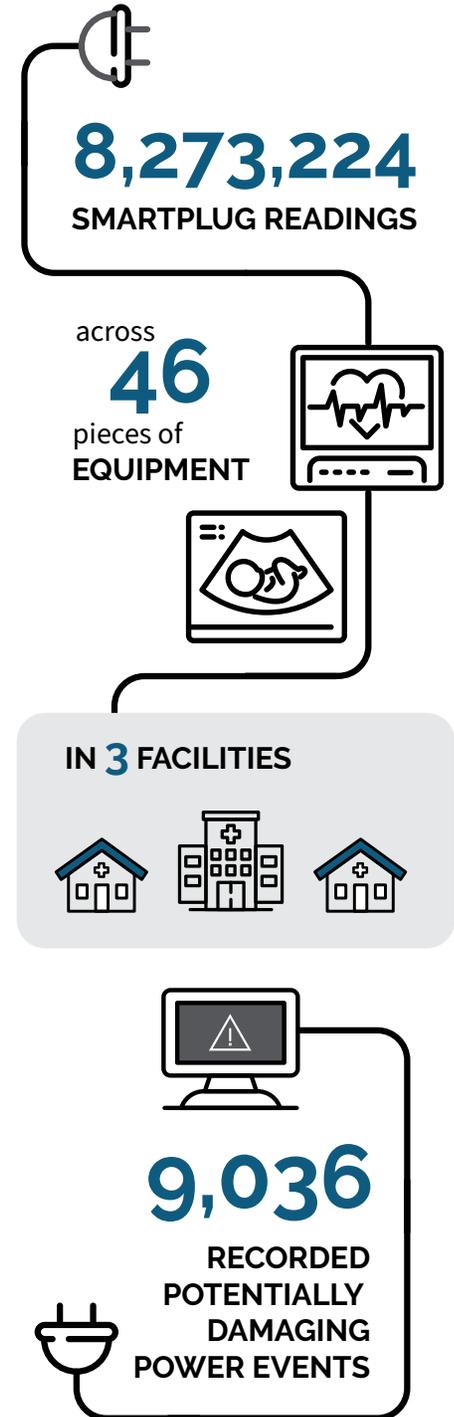
# Defining
## Our Focus

To stay ahead of the growth curve, we are thinking bigger and further into the future. We are making some changes as we align our time with our goals.

# SEforAll Partnership and Clean Cooking Data Initiative

This year, we officially launched the Clean Cooking Data Initiative (CCDI) alongside our partner, Sustainable Energy for All (SEforAll). A long time in the making, the idea for the CCDI arose from a gathering of clean cooking and household energy experts convened by SEforAll at a working group event in 2019.

A few years and many iterations later, the initiative is starting with a pilot project and research study in Rwanda. The team is also in the early development of prototypes of a global data platform designed to

facilitate the sharing of research learnings to advance the growth of the most impactful clean cooking solutions.

Activities kicked off earlier this year at the SEforAll Forum in Kigali, Rwanda. The first time traveling for many Nexleafers since the pandemic, the Forum brought together thousands of clean energy advocates, organizations, government ministries, and more. Nexleaf co-hosted a session on clean cooking data with Duke University, featuring CEO Nithya Ramanathan as a panelist and Clean Cooking Program Manager and Interim Director of Impact & Market Shaping, Megan Bomba.

The pilot study in Rwanda will serve as a model project drawing from the interests of both government and private sector stakeholders. It will generate evidence of the potential for electric pressure cookers to offset charcoal use in urban Rwanda. Charcoal remains the dominant cooking fuel in many Sub-Saharan African cities, presenting significant adverse health, air quality, and environmental impacts. The study brings together private sector partner Electrocook and global research group MECS (Modern Energy Cooking Services), with input from the Rwandan Ministry of Infrastructure and Rwanda Energy Group.

# Closing a Chapter

## Nexleaf's Legacy and the Future of IoT for Cookstoves

The CCDI pilot will be the final chapter in Nexleaf's clean cooking story. As Nexleaf matures as an organization and establishes its niche within the vaccine cold chain, it's become clear that we cannot achieve a high level of impact within both the healthcare and energy sectors. After more than a decade of experimenting, learning, and building novel ways to bring better data to clean cooking, **we are closing this formative chapter of Nexleaf's journey**.

Clean cooking was one of Nexleaf's first initiatives as an organization. Founders Nithya Ramanathan and Martin Lukac piloted our first remote monitoring system for cookstoves using a simple temperature sensor and, literally, a phone in a

box to transmit temperature readings to a remote dashboard. StoveTrace co-evolved alongside our early iterations of ColdTrace, from a phone in a box to a multi-sensor SIM card-based device and finally to the Bluetooth and mobile app-based technology—we call Trek used today in our Vaccine Transport initiative. StoveTrace was used to pilot innovative alternatives to conventional carbon offset projects, evaluate stove adoption and viability in new cultural contexts, and inform the design of contemporary stoves. Over the years, we monitored thousands of stoves across India, Bangladesh, Tanzania, Kenya, and Nigeria. Our tech adapting to cookstoves ranging from traditional threestone fires and mud chulhas to simple improved biomass, gasified pellet, ethanol, biogas, liquefied petroleum gas, and even a brief foray into monitoring small electric appliances with an adapted Trek measuring current.

We are incredibly proud of our early pioneering work to raise the bar for data collection in clean cooking projects and are encouraged by the way the sector prioritizes data and the end-user experience. Nexleaf was once a lonely voice conducting very out-there ideas about remote monitoring: now, IoT is a common topic among clean cooking advocates. Many companies are integrating IoT into stoves and enabling direct monitoring to be automated—something Nexleaf has long thought of as the ultimate dream. The most prominent players are calling for a higher quality of data and a closer look at how we measure impact. It's an exciting time in clean cooking, and we're proud to have been a part of the journey.

# Company Culture

2022 was another incredible year for Nexleaf. We found tremendous support in our donors, invited a wealth of new team members, and enjoyed every step along the way.

# Team Building

In 2022, we committed to growing our global team in our largest partnered countries, and with that goal as our guide, we added 15 new team members located in Kenya, Tanzania, Malawi, India, and the US.

Purposefully hiring to move our Nexleaf products forward for an even better customer experience on both the front-end and back-end, we identified several positions to bridge gaps faced by our team. These new hires include more Product Managers, a Product Designer, Engineers, and a Head Of Customer, all of whom are helping us move forward as a product-focused and customer-centered organization.
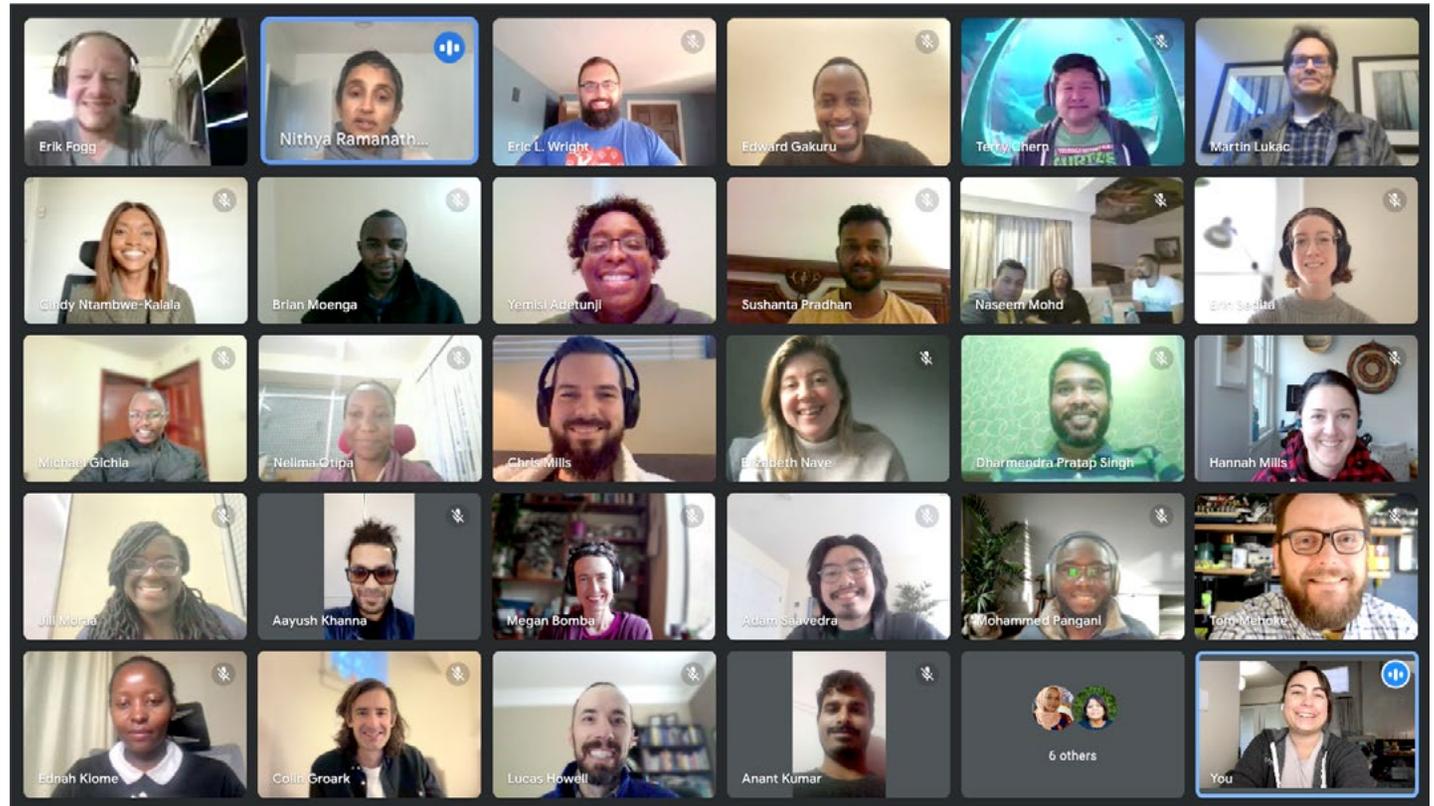


*ABOVE: Spanning across time zones to connect as a company. BELOW: Recharging and connecting, we looked for opportunities to connect whenever possible, from India to Seattle to Pakistan!*

# Financial Dashboards

## 2021 Revenue by Sources
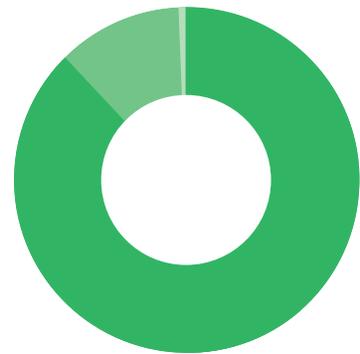


| | | 2021 | 2020 |
|---|---|---|---|
| 88 % | Foundation & Grant Revenue | $ 4,270,376 | $ 5,224,986 |
| 11 % | Earned Revenue | $ 526,022 | $ 215,675 |
| 1 % | Individual Revenue | $ 55,161 | $ 34,184 |
| | **Total Revenue** | **$ 4,851,559** | **$ 5,474,845** |

## 2021 Expenses by Program
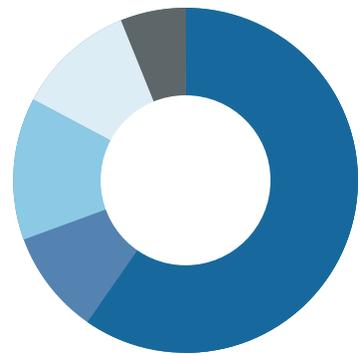


| | | 2021 | 2020 |
|---|---|---|---|
| 60 % | Vaccine | $ 2,503,654 | $ 3,059,287 |
| 10 % | Clean Cooking | $ 403,341 | $ 689,754 |
| 13 % | Medical Equipment | $ 546,042 | $ 44,252 |
| 11 % | Operations | $468,813 | $510,749 |
| 6 % | Fundraising | $267,100 | $283,734 |
| | **Total Expenses** | **$ 4,188,950** | **$ 4,587,775** |

# Recognition & Support



**Gavi**
The Vaccine Alliance

Starting as an Infuse Pacesetter in 2016, our relationship with Gavi, the Vaccine Alliance, has continued to grow. Gavi is making strides on its promise of innovation by supporting Nexleaf's out-of-the-box thinking and country-led impact. The team at Gavi has consistently been a sounding board for both successes and challenges in our work, facilitating growth and working shoulder-to-shoulder to solve problems.

Most recently, our team met with representatives from the Gavi Board in Dar Es Salaam, Tanzania, where we could provide a first-hand showcase of Nexleaf's partnership with the Tanzania Ministry of Health.
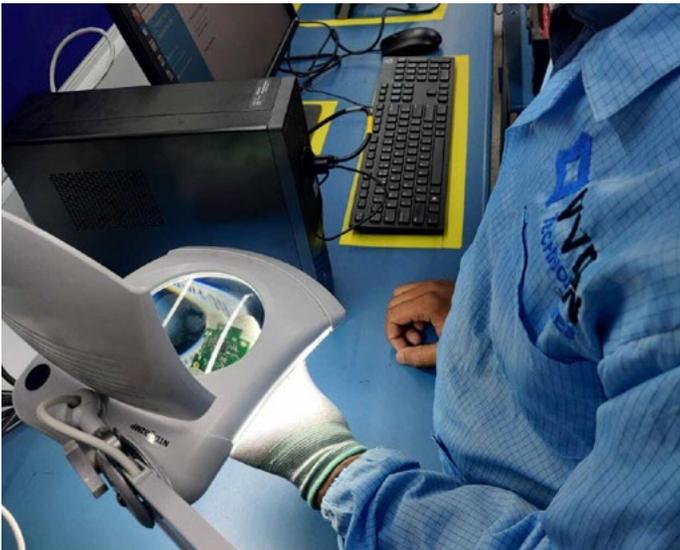


**PagerDuty**

We are thankful to PagerDuty for their support in our Medical Equipment learning program. Our team has begun to see the true value of collecting power data, with real change happening at the facility level and lives achieving impact. Utilizing PagerDuty's incident reporting and tracking system has directly contributed to multiple facilities' ability to lobby for better and more efficient power solutions.

# Mackenzie Scott Foundation

Nexleaf is honored and grateful to have received a $12M gift from Mackenzie Scott- the single largest donation from an individual in the history of our organization. This recognition of our impact has been transformative, opening new and promising avenues for how we do the work and increasing our capacity to make an impact. Ms. Scott's bet on our Team at Nexleaf directly indicates her belief in the importance of health equity.

# List of Sponsors

We are fortunate to work with so many amazing partners and we are sincerely thankful for each of you.

Autodesk Foundation

ELMA Vaccines and Immunization Foundation

Fair Climate Fund

Fast Forward

Gavi, the Vaccine Alliance

Global Health Labs

Google.org

MacKenzie Scott Foundation

McQuown Trust

Mulago Foundation

PagerDuty

Qualcomm Wireless Reach

RippleWorks

Sustainable Energy for All

UNICEF

VVDN Technologies

# NEXLEAF
## ANALYTICS

1964 Westwood Blvd Suite 410
Los Angeles California 90025
United States

nexleaf.org