

Measuring Temperature throughout Global Health Supply Chains Using Internet of Things (IoT) Data Loggers

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PROBLEM

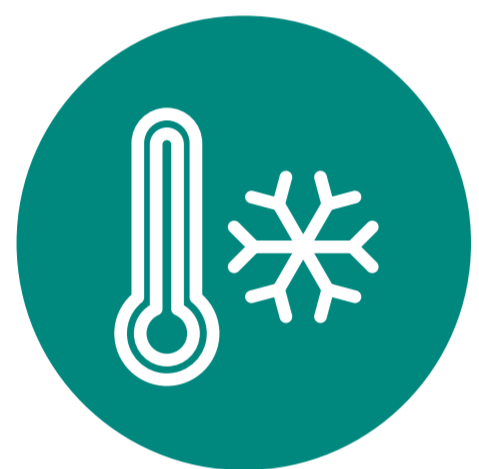
It is known that temperature excursions can negatively impact the quality of cold-chain health commodities, sometimes rendering them ineffective or even unsafe, but the storage conditions for ambient products — those which are considered shelf stable —

are not well documented or understood.

From international shipping down to central and regional warehouses and along in-country transport to the last mile, temperature monitoring of ambient products is limited, or in many cases, nonexistent. Without such data, the likelihood of product degradation increases while opportunities for corrective action are overlooked.

RESULTS

Temperature Monitoring By the Numbers



7 Countries actively monitoring temperature



3 Donor organizations have contributed to the work



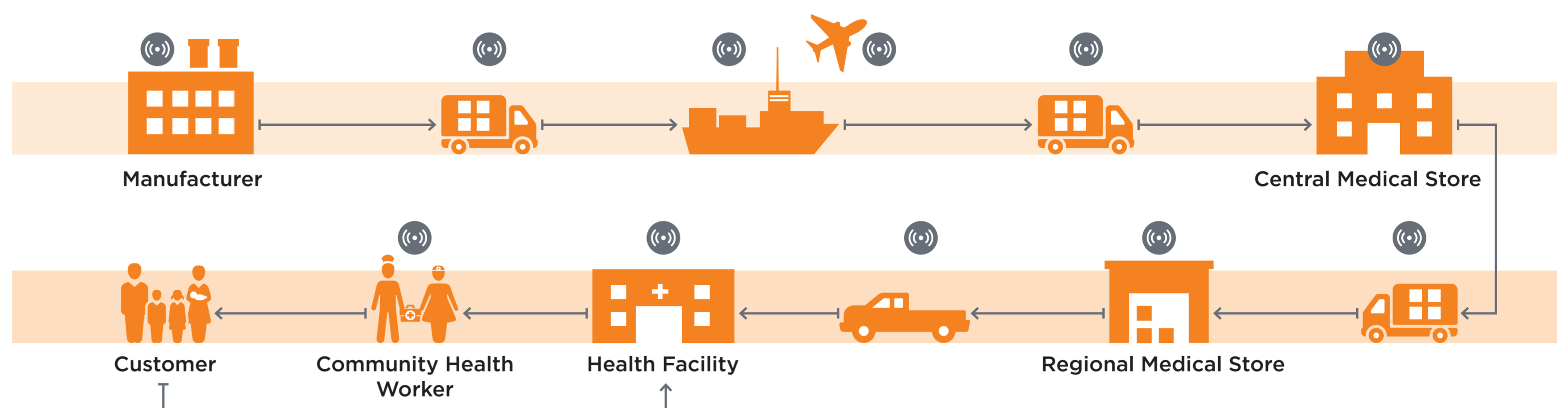
600+ Sensors installed to date

METHODS

Supported by multiple donors including USAID, The Global Fund, and The Bill & Melinda Gates Foundation, we work with numerous vendors for data logging technology and identify the most appropriate platform suited to each activity. The sensors we use have the capacity to collect a range of information including temperature, humidity, shock, tilt, and light. Data is being collected across the entire pharmaceutical product supply chain from manufacturer to end user. We do this by looking at both international shipments and in-country supply chains all the way down to the community health worker.

Each sensor in the warehouses collects data every five minutes, close to **300 times** a day — equivalent to more than **100,000 readings a year per sensor**. Currently, without our sensors, data for ambient products is almost non-existent, while cold chain temperature readings occur two times a day from a sensor or thermometer. Thus, even for the cold chain, our data will include 150X more digital readings.

With the data collected, we can work to determine correlations across various variables and identify the locations and frequency of excursions. Analytics will enable us to provide guidance on handling and work with engineers and designers to improve packaging, warehouses, and trucks.

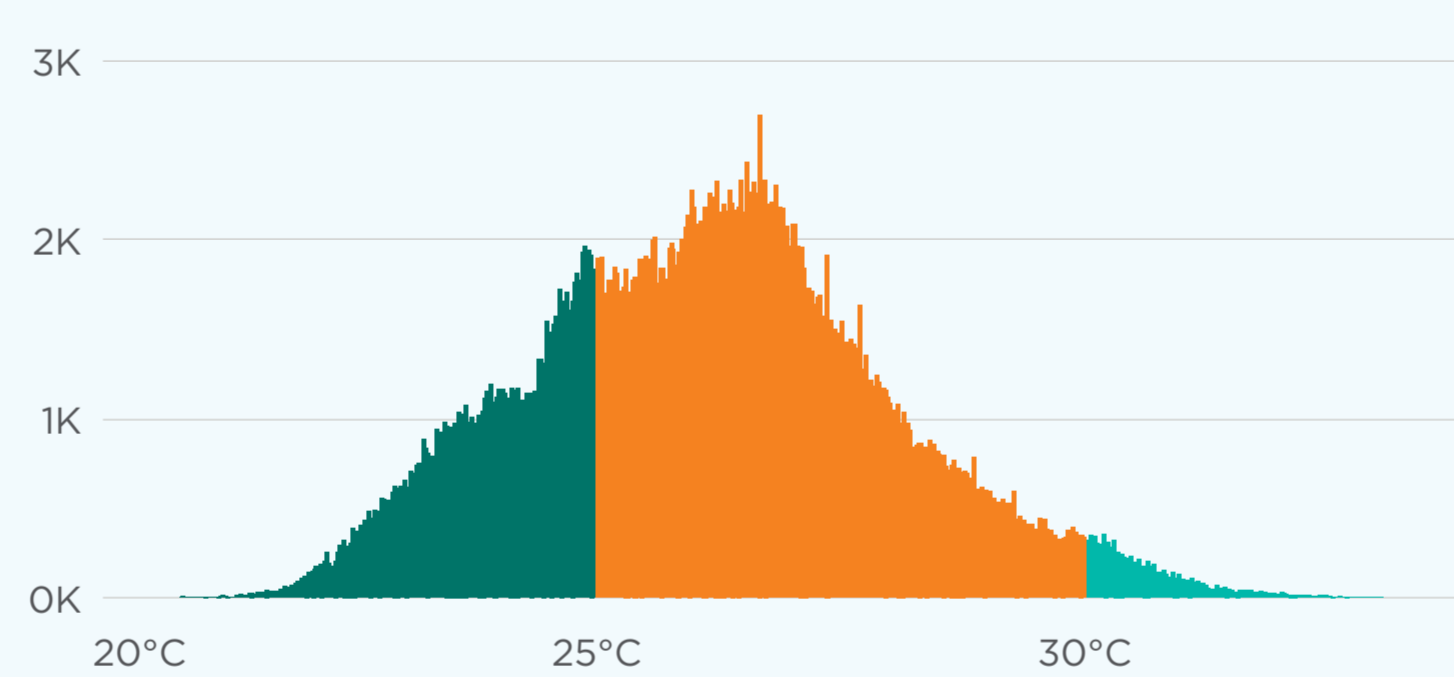


Temperature Monitoring Sensor Data

CENTRAL WAREHOUSE

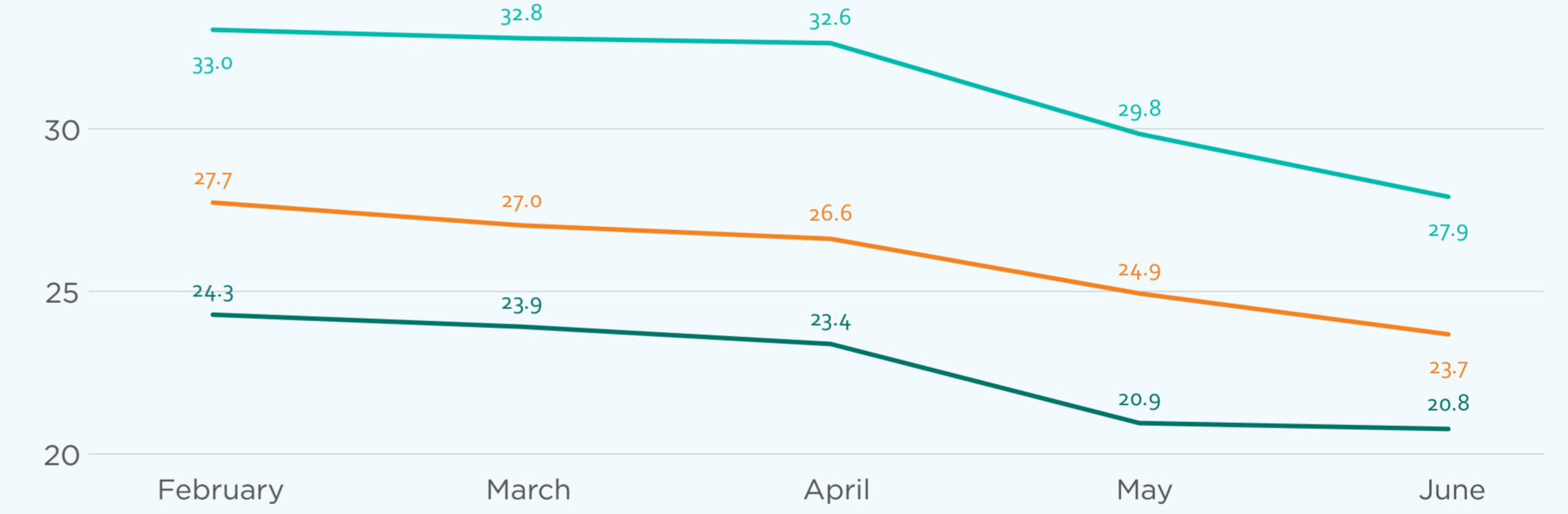
Number of Temperature Observations

Temperature: Above 30°C, Below 25°C, Between 25-30°C



Temperature (°C)

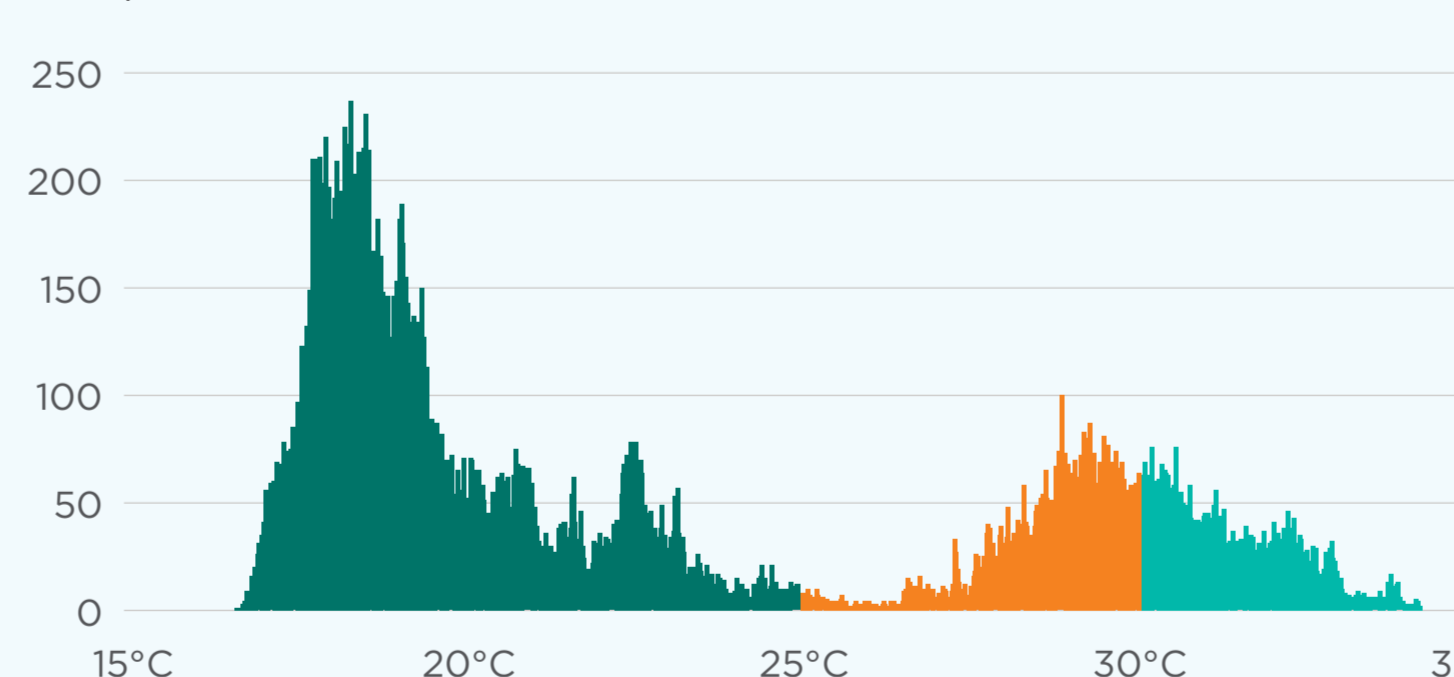
Max Temp, Average, Min Temp



DISTRICT WAREHOUSE

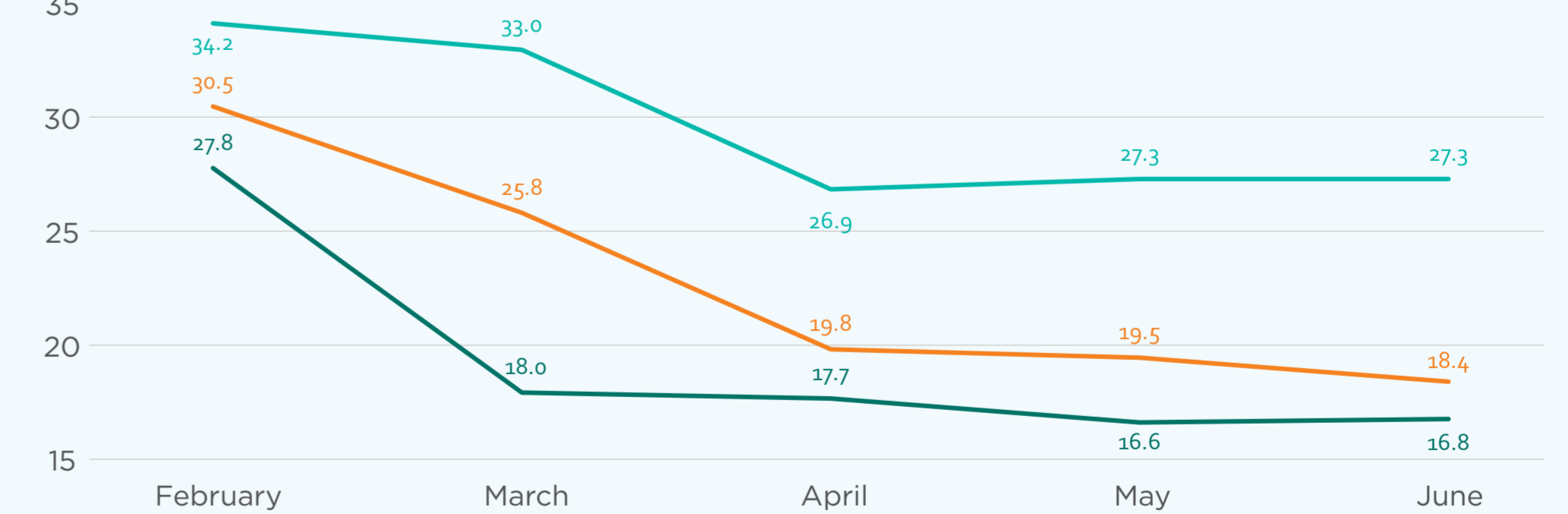
Number of Temperature Observations

Temperature: Above 30°C, Below 25°C, Between 25-30°C



Temperature (°C)

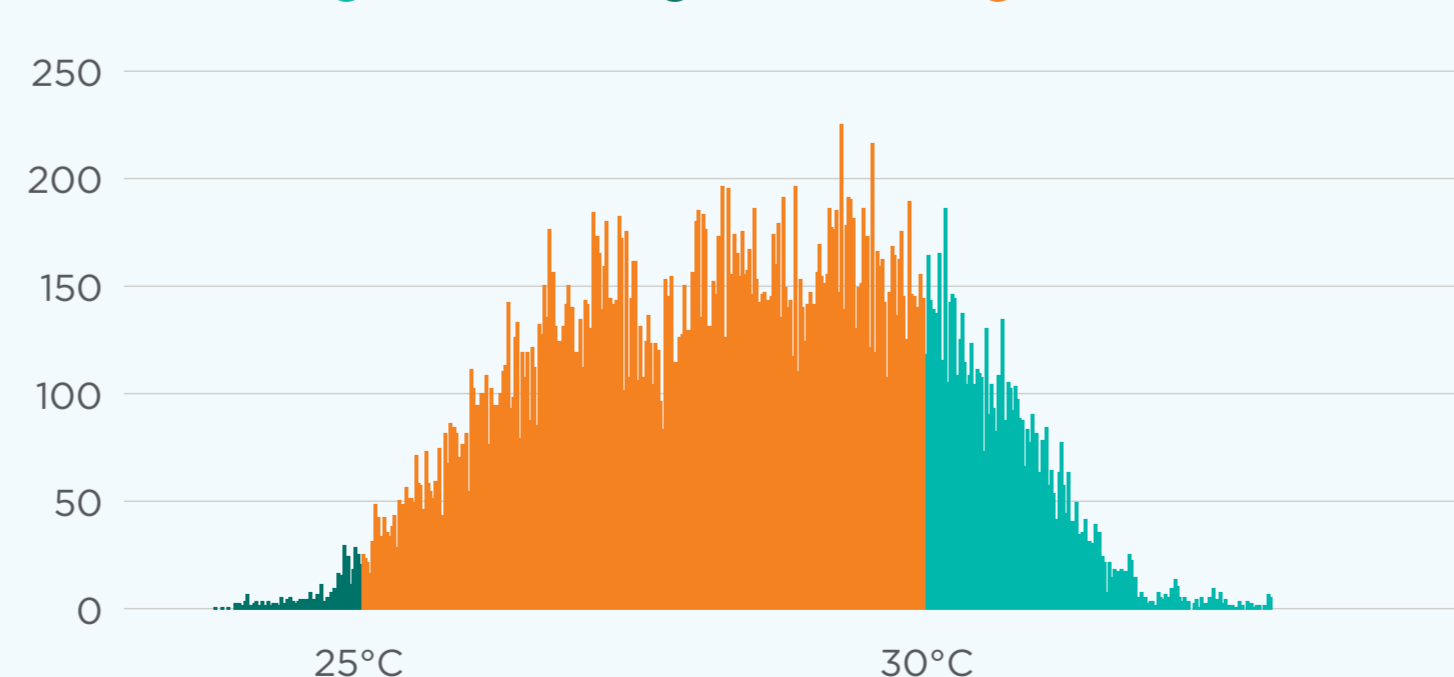
Max Temp, Average, Min Temp



CLINIC

Number of Temperature Observations

Temperature: Above 30°C, Below 25°C, Between 25-30°C



Temperature (°C)

Max Temp, Average, Min Temp

