Using satellites to fight dengue

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By Wilson Chua

What's worse than having dengue? Having Dengvaxia before having dengue.

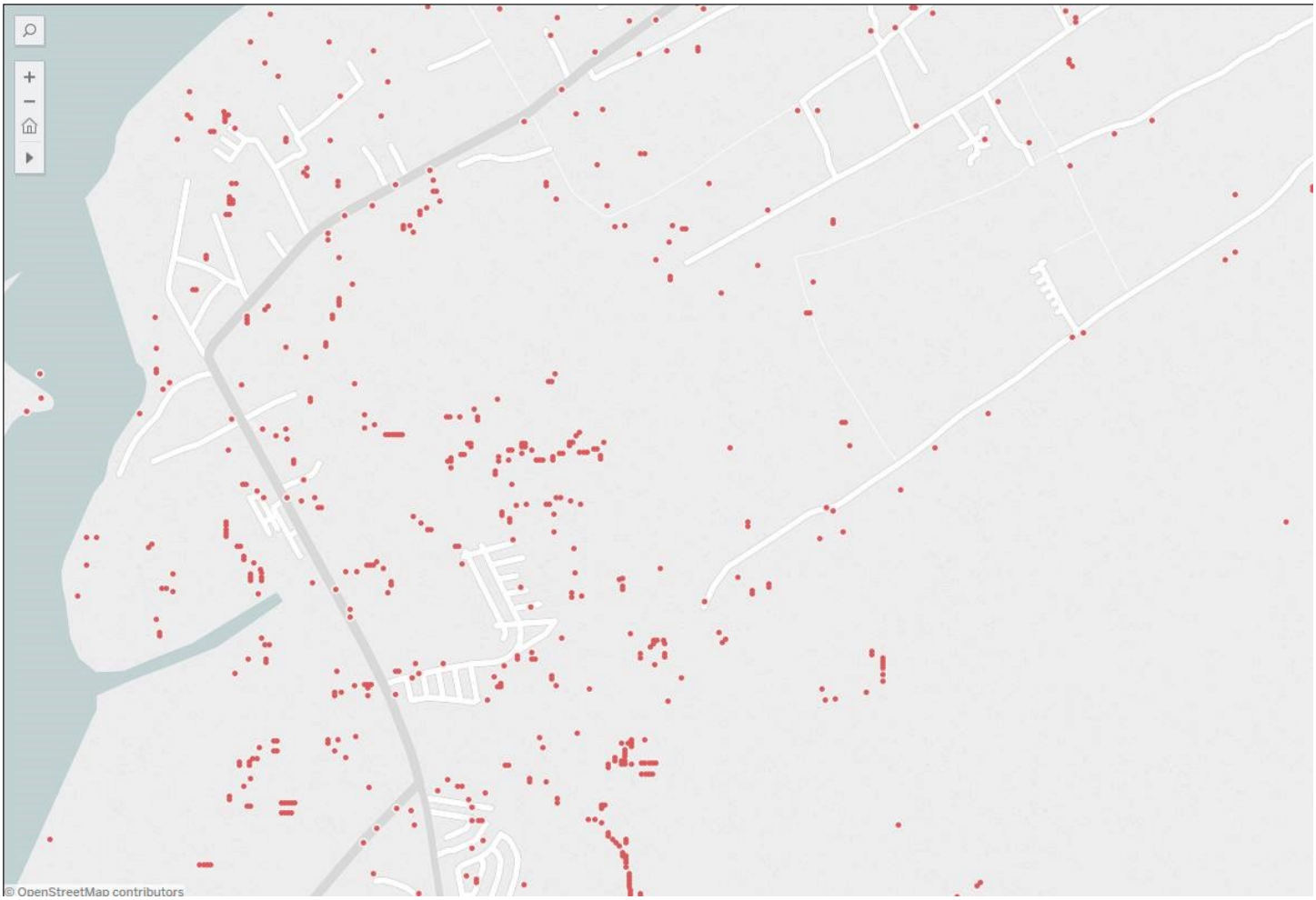
Dengvaxia was given to over 800,000 Philippine schoolchildren. It turns out that Dengvaxia "increases the risk of hospitalization and severe dengue in those who had never previously been infected with the mosquito-borne virus." In layman's terms, "Dengvaxia increased the risk of severe, life-threatening dengue infection."

Fleire Castro from Cebu became concerned when she learned about Dengvaxia's severe effects. Her son, David got his first dose of Dengvaxia in July last year. She was mad why there are no info campaigns. She trusted the schools. She feels powerless and it's a situation where parents don't have control over. I have heard similar sentiments from other mothers as well.

What can we do? What's the plan?

In Singapore, the popular slogan is "If they breed, you will bleed." We eliminate their breeding grounds and lower mosquito populations. Breeding grounds are areas with stagnant waters. Without mosquitoes, dengue infections stop. Communities can eliminate areas with stagnant waters. Communities just need to 'see' where these stagnant water areas are.

We can highlight potential stagnant water areas. We use RUS-Copernicus satellite spectral data. Here is an example graph showing areas around Bonuan District, Dagupan, Philippines. The potentially stagnant water areas are shown in red dots in the graphic below. Each red dot is 5m x 5m area. This is a preliminary result. We need volunteers on the ground to help confirm the findings.



How we used Satellite Images

First, we use the spectral images from RUS-Copernicus satellites. We can extract values from satellite images. These values help us identify areas that have both Water AND vegetation. These are likely to be areas with stagnant water. We then show these areas in a map. Graphs such as the above help Local Governments and communities to quickly visualize the areas needing their attention.
It was Marc Renmel Abiva who first suggested the use NDWI values in satellite images. This is the Normalized Difference Water Index that can identify water logged areas. This image below is graphic showing NDWI values. Dry areas are represented with blue dots. Each dot represents a 5m by 5m area. The satellite data was from a recent June 4, 2018 image.

Secondly, unlike flowing waters, stagnant waters will have some vegetation. Both Benjamin Tan or Lourdes Montenegro shared this insight. For vegetation cover, research suggests the use of FAPAR (Fraction of Absorbed Photosynthetically Active Radiation). FAPAR models can approximate the vegetation cover of an area. So, when we combine both NDWI and FAPAR together, we should get areas with both WATER AND Vegetation. These areas are most likely to be stagnant.

Each green dot shows likely vegetation cover. The darker the green color, the higher the FAPAR value.

FAPAR

We can then combine the two to highlight areas with **both water and vegetation**. We should (in theory) be able to show areas that *potentially* have stagnant water in them.

Check out this interactive Pangasinan Stagnant Water Map. NDVI values closer to 0 signal water. FAPAR values closer to 1 signal vegetation. You can slide the range of values to see predicted stagnant water areas. You can zoom in. You can Pan. Hover over each red dot to see its GPS coordinate, NDWI and FAPAR value.

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If you are interested and want to help us out, please join the Mosquito Real Time Census FB group.

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