Project funded by the GSMA Mobile for Humanitarian Innovation Fund

This initiative has been funded by UK Aid from the UK Government and is supported by the GSMA and its members. The views expressed do not necessarily reflect the UK Government's official policies.

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OmniVis: Project lessons and outcomes

Project: Mobile Solution to Detect the Cholera Pathogen

Grantee:
OmniVis is a biotechnology company that has developed an integrated platform to transform the speed, accuracy, and economics of pathogen detection. Their mission is to create rapid detection technology that equips communities around the globe with the power and knowledge to protect their health.

Grant details:
- July 2020 to October 2022
- OmniVis received £312,000 of grant funding
- COVID-19 adaptation grant of £25,000

Project:
OmniVis had developed a handheld device to rapidly detect cholera in water and received a grant from the GSMA Mobile for Humanitarian Innovation Fund to test the device in Bangladesh, Haiti and Kenya. They also received an additional COVID-19 adaptation grant to develop and trial a new SMS alert function to notify communities following the detection of cholera in a nearby water-source.

Partners:
International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in Bangladesh and Code for Africa (CfA) in Kenya. Twilio as Technical partner for SMS alert integration.

Grant timeline: Key project events

Start
July 2020

Adaptation
Additional COVID-19 adaptation grant awarded to help OmniVis respond to the impacts of the pandemic.

Adaptation
Twilio engaged as implementing partner to speed up piloting of new cholera alert SMS messaging in Kenya and Bangladesh.

Activity
Trial of SMS cholera alert messages following the integration of messaging technology into the OmniVis platform.

Adaptation
Appointment of new manufacturing partner to supply more reliable single-use testing kits.

Activity
Remote partner trainings with prospective device users at CfA and ICDDR,B on using the OmniVis equipment.

Activity
Contextual cholera research conducted to explore how the device can best support existing cholera detection and prevention mechanisms.

End
March 2022



Project background

Each year there are an estimated 4 million cases of cholera worldwide that result in nearly 150,000 deaths.[1] Many of these deaths could be avoided through earlier outbreak detection, however the systems currently in place are slow, inaccurate and costly. In response to this, OmniVis developed a handheld device which can detect the cholera pathogen in water and collect data on cholera hotspots without the need for a lab or trained technicians. The platform consists of a mobile phone-based application, a hardware platform and a disposable test kit that can accurately detect cholera bacteria in a water sample in under 30 minutes.

Project timeline details

COVID-19

National lockdowns and strict movement restrictions meant that it was not possible for the team to conduct the lab-based research activities and technical tests planned. As the pandemic continued the imported materials needed to manufacture the hand-held devices became unavailable and all planned in-county visits and activities with implementing partners had to be cancelled. When the political instability in Haiti worsened in 2021 it also became clear that piloting the device there was not going to be possible.

COVID-19 adaptation grant

The GSMA awarded OmniVis an additional £25,000 to develop and trial a new SMS-based cholera alert messaging system. OmniVis had identified the potential of using SMS messaging as a fast, effective and COVID-safe way to alert surrounding communities following the detection of cholera in a water-source. By partnering with Mobile Network Operators (MNOs) in Kenya and Bangladesh they hoped to use the additional funding to pilot the approach and understand more about how people respond and react to cholera alert SMS messages.

1. https://www.who.int/news-room/fact-sheets/detail/cholera

Engaging Twilio

The COVID-19 adaptation grant was awarded based on the assumption that OmniVis would be able to establish partnerships with MNOs in Kenya and Bangladesh within the grant timeframe. Despite initial interest from MNOs in both countries, the need for swift action prompted OmniVis to engage Twilio as a contractual implementing partner instead. Once they had successfully integrated their messaging technology into the OmniVis platform, Twilio swiftly trialled the SMS cholera alert messages with consenting community members in both locations.

Appointing a new manufacturing partner

The single-use disposable test kits are a key component of the OmniVis cholera detection platform and successfully piloting the device relies on their availability. Unforeseen problems in the manufacturing process resulted in financial losses, further project delays and highlighted the importance of good communication with a reliable supplier. OmniVis was able to successfully appoint a new manufacturing partner following a thorough values and competency-based assessment process.

Understanding the cholera context

Due to the pandemic and unforeseen delays in the device production it became clear that on-the-ground testing of the device would not be possible within the initial grant timeframe. OmniVis consequently decided to focus on working with their partners in Bangladesh and Kenya to conduct research to understand how their device could potentially support existing cholera detection and prevention mechanisms already in place. This included a specific focus on understanding how people receive and react to current cholera alert warnings.



End of the grant

Although field testing of the device was not possible, following their project pivot OmniVis was able to achieve the following activities during the grant period:

Complete remote training with partner staff at CfA and ICDDR,B on using the OmniVis equipment and conduct field-worker surveys with their prospective device users.

Work with their partners to conduct community surveys in cholera-prone areas:

- **Bangladesh:** Kamukunji, Mathare and Kayole.
- **Kenya:** Dhaka and Cox's Bazaar.

Build a contractual relationship with Twilio and integrate their tools into the OmniVis solution before then piloting SMS cholera-detection alert messages in Bangladesh and Kenya.

Undertake interviews with key cholera detection and water, sanitation and hygiene (WASH) experts at the Kenyan National Laboratory Services, British Red Cross, MSF Holland and Oxfam International.

Project outcomes and lessons



Research finding[2]

Slow-moving cholera response mechanisms currently in place

Water testing for cholera does not currently happen in either country, instead cholera is detected through routine lab testing of hospital stool samples. Bangladesh has a National Cholera Control Plan in place and Kenya has a National Multi-Sectoral Cholera Elimination Plan under development. However, neither country currently has a national surveillance mechanism in place. Limited laboratory facilities also mean that cholera is rarely reported at regional levels and there can be considerable delays between cholera detection and response mobilisation.

Research finding[3]

An opportunity for SMS cholera alert messages

OmniVis worked with their partners CfA and ICDDR,B to understand more about the current cholera knowledge, prevention methods and outbreak warnings in their communities:

- 54% of the community members in Kenya had previously received warnings about cholera in their local water supply compared to only 16% in Bangladesh.
- The majority of the warnings in Kenya were through word of mouth (70%), as well as alerts from national government TV or radio campaigns (57%), community leaders (38%), and NGOs (27%).
- All warnings received in Bangladesh had included some word of mouth, in addition to national government campaigns (50%) and advice from community leaders (50%).

None of the communities surveyed had previously received any form of cholera warning directly to their mobile phones, however 95% of those in Kenya and 92% in Bangladesh said they would like to.

Outcome

Successful trial of SMS cholera alert messages

Having identified SMS messaging as a communication channel that is already well known and used, OmniVis was keen to test the potential of automated SMS alerts to warn communities about nearby cholera outbreaks. Twilio was contracted as a technical implementing partner so that their community engagement and data management tools could be used to pilot SMS cholera alert messages in small-scale test projects in both Kenya and Bangladesh. Once Twilio had successfully integrated the functionality into the OmniVis platform they were able to send test SMS alert messages to 24 consenting community members in Nairobi and 11 in Bangladesh. All 35 participants successfully received and read the alerts. Although only conducted on a small scale, these trials provided the test-cases needed to evidence the potential of automated SMS messaging to successfully deliver cholera alerts.

2. The Research People conducted five key informant interviews with stakeholders involved in the detection and response to cholera in Bangladesh and Kenya
3. OmniVis partners CfA and ICDDR,B conducted face-to-face community surveys during March and April 2022 to understand more about the communities' knowledge and understanding of cholera:
   - Kenya: 61 community members (41 male, 20 female) in Kamukunji, Mathare and Kayole
   - Bangladesh: 25 community members (12 male, 13 female) in Dhaka and Cox's Bazaar

Research finding[4]

This innovative approach could enable more proactive and effective cholera detection and response

According to the stakeholders interviewed in both countries the device has the potential to revolutionise cholera detection, enabling a proactive rather than reactive response to the disease. More accessible and accurate cholera detection that does not rely on laboratories or technicians would enable communities and governmental agencies to act more quickly to cholera outbreaks. Having data automatically upload onto a cloud-based platform would also enable organisations to know where and when cholera is present and provide near real-time alerts. Longer term the stakeholders also thought the approach would be useful for monitoring persistent cholera hotspots to help understand the ongoing causes of regular outbreaks. This would also generate evidence to advocate for improving water and sanitation infrastructure and for more targeted ongoing community sanitation and hygiene intervention activities.

Lesson

Disease surveillance and response can be a complex sector to navigate

Communicable diseases can be a politically sensitive subject, with some authorities reluctant to acknowledge the presence of cholera due to concerns about the impact it might have on their economy. Cholera is considered as a 'priority disease' in Kenya and government involvement is required to verify the accuracy of any testing. For testing community drinking water, OmniVis found that permission was needed from both the Ministry of Health and the Ministry for the Environment, and that they would only accept the accuracy of results processed at Kenya's national laboratory.

Different countries have different regulations and processes for importing testing equipment as well as verifying and validating test results. When undertaking pilots like this it is important to identify which government bodies are responsible for testing and disease control in each country, as well as their rules, regulations and preferences. Without the appropriate government ministries and associated laboratories involved it may not always be possible to validate pilot study findings.

Lesson

An opportunity for key strategic partnerships

As there is currently no systematic water-source testing in Bangladesh or Kenya the right partnerships would be crucial for the ongoing device trial, validation and adoption. Gaining buy-in from large influential INGOs and UN bodies and working with them in a targeted approach would be important for the device to successfully impact cholera surveillance. Working with UN organisations and large INGOs such as the International Federation of Red Cross and Red Crescent Societies, Oxfam, and Médecins Sans Frontières to understand how the device could enhance their programme responses would also help further build confidence and buy-in from the sector. Gaining World Health Organisation's accreditation could be a crucial step to help build credibility. Additionally, raising awareness amongst UN WASH cluster actors would help position the device within their existing surveillance and response mechanisms.

4. OmniVis partners CfA and ICDDR,B conducted a Field-worker Survey with 15 Bangladeshi and Kenyan staff members before they undertook the online device training:
   - Kenya: 10 field workers (9 male, 1 female)
   - Bangladesh: 5 field workers (4 male, 1 female)

Conclusion

A more targeted approach is needed for successful testing, adoption and integration

Although it was not possible to complete on-the-ground testing of the devices in Kenya and Bangladesh the project confirmed that longer-term, after sufficient testing and validation, the OmniVis platform has the potential to be instrumental in supporting countries to have more locally-led systematic cholera testing and mapping. The stakeholders emphasised however, that the device would need to be accepted and adopted by the right organisations to be transformational in the way cholera surveillance is conducted. It is clear that good working relationships with governments would also be essential for the device to be successfully tested, adopted and incorporated into ongoing cholera surveillance.

What's next for OmniVis?

Following the grant OmniVis continued working through Twilio to engage with their target communities in a fast, effective and COVID-safe way. They also continued to work collaboratively with CfA, applying for further grants together to explore testing in Kenya, Niger and South Africa. Since the end of the grant over 20 other organisations including UNICEF, MSF, Action Against Hunger and IFRC expressed interest in working with OmniVis to use their cholera technology.

Towards the end of the grant OmniVis begun to explore how the device could be used to test for other common water-borne diseases such as E.coli and in 2022 they decided to move entirely into food safety testing in the USA. They subsequently received an additional $200,000 in funding to develop testing kits for food borne pathogens and in 2023 successfully launched their E. coli O157:H7 test for surface swabbing and water samples. They are now also developing test kits for Listeria and Salmonella and as they continue to grow, scale and adapt, their technology continues to detect dangerous pathogens, prevent outbreaks and save lives.



Data sources

- OmniVis project reporting.
- The Research People conducted five key informant interviews with stakeholders involved in the detection and response to cholera in Bangladesh and Kenya.
- OmniVis partners CfA and ICDDR,B conducted face-to-face community surveys during March and April 2022 to understand more about the communities' knowledge and understanding of cholera:
  - Kenya: 61 community members (41 male, 20 female) in Kamukunji, Mathare and Kayole.
  - Bangladesh: 25 community members (12 male, 13 female) in Dhaka and Cox's Bazaar.
- CfA and ICDDR,B also conducted field-worker surveys with 15 Bangladeshi and Kenyan staff members before they undertook the online device training:
  - Kenya: 10 field workers (9 male, 1 female).
  - Bangladesh: 5 field workers (4 male, 1 female).