



WEHUBIT

Country

Zanzibar, Tanzania



Implemented by



Budget

349.887 €

Duration

12/2019-05/2022

Contributions to SDGs



Implemented by



Financed by



Learning from

The machine learning project: Using AI and machine learning to personalize and improve perinatal health in Zanzibar

Can digital social innovation help achieve universal health coverage? How? And in what context?

PROJECT OVERVIEW

Reason

Zanzibar faces high levels of neonatal mortality as a result, among others, of delays in the search for or inability to seek care, and of biological risk factors that go undetected due to the lack of contact with health providers. The health system in general suffers from a lack of resources, including for **Community Health Volunteers (CHVs)** *.

In 2019 the Ministry of Health in Zanzibar, with support from D-tree International, launched **Jamii ni Afya** (*Communities are Health*), a nationwide community health programme that uses technology to improve community health services.

Led and managed by the government, the programme aims to bring health services to every household in Zanzibar by equipping local CHVs with a **case management** and **decision support app on smartphones**, enabling them to better promote health, give personal counselling at people's doorsteps and refer patients (i.e., advise them to go to a facility).

CHVs are the first contact points of economically vulnerable and/or rural communities for health services. They bridge the gap between communities and formal health facilities. Although CHVs need to comply with a set of conditions to enrol, such as knowledge of the context and the local language, they do not necessarily have a health education degree. To improve the quality and efficiency (especially usages of resources) of their services, the programme provided them with tools to **better target their services by identifying community members** with a specific medical issue or need.



* Other terms for this type of health care provider include community health officer, community health worker, village health worker, community health aide, community health promoter, and health advisor.

Digital Social Innovation

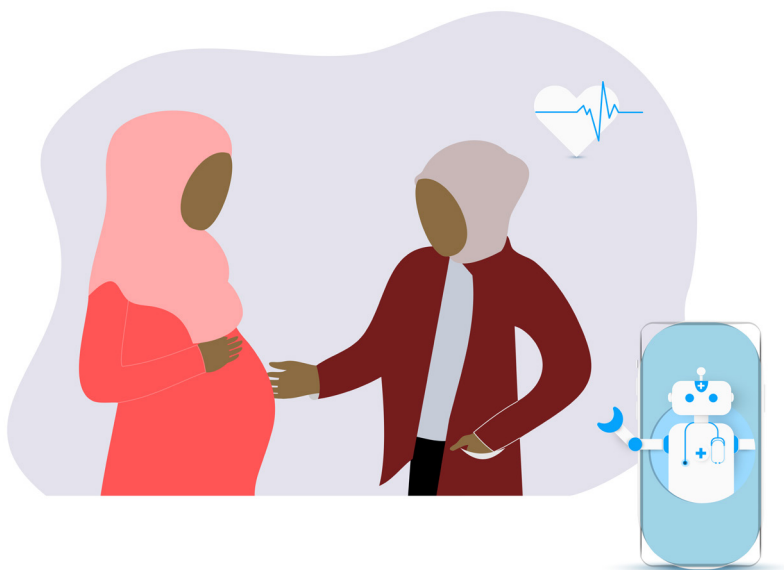
Under Wehubit, D-tree developed a **machine learning model** that was incorporated into the Jamii ni Afya app for two of the 11 Zanzibar districts. The model aimed to identify pregnant women with an estimated high risk of perinatal death, in order to provide them with additional household visits to discuss risk factors and mitigation strategies.

The objective of the digital social innovation is to make CHVs services **more efficient** and **qualitative**: CHVs plan extra visits only to those pregnant women who are at risk.

When a CHV identifies a new pregnant woman in his or her area, he or she enrolls her – after receiving her consent - into Jamii ni Afya, using the smartphone app. The CHV then collects demographic data, data about past pregnancies and health conditions from the woman. Based on the collected data, a machine learning model estimates whether the **woman is at risk of experiencing child death during the pregnancy**.

The machine learning model runs “offline” (without requirement of an Internet connection) on the CHVs smartphone. The machine learning model was created using data from a previous digital community health program implemented by D-tree targeting pregnant and postpartum women. The model output is simply “estimated higher risk” or “no estimated higher risk”, but the model output is not directly communicated to the CHV or the pregnant woman. If the model estimates a higher risk, the app **schedules additional visits** where the CHV discusses pregnancy risks and mitigation strategies with the woman.

Due to the novelty of machine learning in the program, an additional manual risk assessment was conducted each time, where the CHV went through a list of relevant health conditions and other questions. If either the machine learning model or the manual assessment estimates a **high risk of perinatal child death**, additional visits by CHVs are scheduled. The manual assessment was included to safeguard against possible bias in the machine learning model.



▶ **93%** of women that were identified as high-risk received at least one additional CHV visit = **3182 out of 3422**

▶ All CHVs (**194**) and supervisors (**19**) involved in the pilot project were trained on the use of the app in the two concerned districts in Zanzibar

KEY MESSAGES

What the project showed regarding machine learning:

A machine learning model can be integrated into a mobile decision-support app used to make **real-time predictions of clients' health outcomes**, taking into account limited internet connectivity.

One major condition that needed to be met for a successful implementation is that the machine learning model has to be **accurate in predicting positive and negative outcomes**.

The machine learning model should have improved the efficiency and quality of health services by making sure additional CHV visits would be delivered only to mothers that specifically need them. However, **individuals who were actually at low risk were wrongly classified as high risk**, i.e. services were unnecessarily delivered to women who did not need them.

Why?

To be fit-for-purpose, the machine learning model needs to have high accuracy i.e. the machine learning model needs to predict what it is expected to predict, based on the available data. However, the project faced the **unavailability of adequate data** to 'train' the machine learning model.

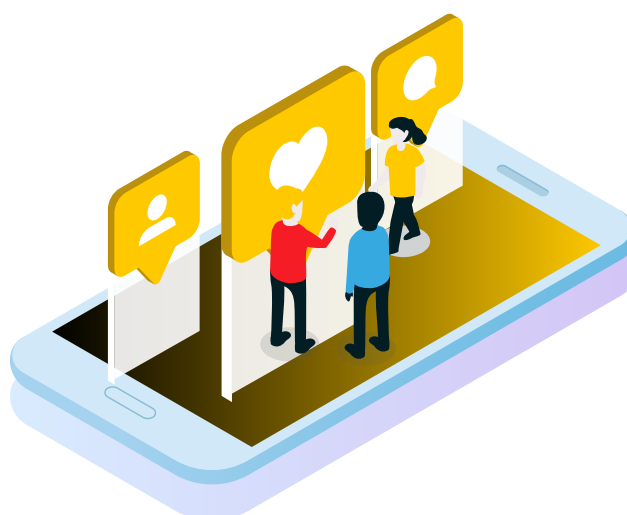
What the project showed regarding the app:

The Jamii ni Afya app gives CHVs simple procedures to follow without requiring specific health or IT skills. The machine learning model runs without requiring any action from the CHV and does not communicate final outcome (high risk or not). It **automatically creates tailored care pathways**.

Community Health Workers/Volunteers (CHVs) are willing and able to use the app to deliver different packages of care to different clients – based on specific needs – as it is simple and enables them to use **their time more efficiently**.

What the project showed regarding health outcomes:

Identifying pregnant women at risk and securing antenatal care is only part of the solution. It cannot lower neonatal deaths without being followed by **health care delivered at facilities during and after the birth of the child**. These conditions are not always met in Zanzibar.



LESSONS LEARNED

Inclusion and equity

Accessibility and equity are a core part of Jamii ni Afya programme, as CHVs are **able to reach individuals who may otherwise not be able to access essential health services** (e.g. Not affordable), or whose needs may otherwise be overlooked (e.g. No trust in formal healthcare providers).

In line with the Research Ethics Committee, the pregnant women included in this pilot project were informed, by the CHVs, about the **research's objectives** and **data management guidelines**.

Stakeholders and users' responsiveness

The Jamii ni Afya programme in general, and the Wehubit project in particular, supported CHVs work to provide better services. It acknowledged their key role in the health system, this fostering a **positive response to the app's use** and **evolution**.

The project was from the beginning presented to the Ministry of Health (MoH) as a pilot phase. To get the MoH's buy-in, D-tree interacted with high-level officials (i.e. political level and not technical staff) to explain the **potential outcomes** and **added value**, as well as **risks mitigation strategies**.

Ownership from the MoH was secured by integrating the machine learning model into an **existing programme and app**, led and managed by the MoH itself.

Use of digital tools beyond project's end

Although the innovation received support from all key stakeholders and its implementation has led to several valuable learnings, the project did not result in the intended outcomes. **Because (not enough) qualitative data was available**, the machine learning model to predict neonatal death could not work as intended. Therefore, the innovation supported by Wehubit is not going to continue to be used as such within the Jamii ni Afya programme.



In 2021, Wehubit began a trajectory of exchange and capacity sharing around **artificial intelligence (AI)**, in collaboration with AI for Social Good Dagstuhl Seminar. One of the three organisations that have been through the whole process is **D-tree International**. The Knowledge Exchange Network (KEN) first Working Group published in November 2022 a Checklist on the prerequisites for implementing **digital innovation using machine learning!**

Do you want to discover the Wehubit AI Checklist?



PERSPECTIVES

▶ The innovation implemented by D-tree International and supported by Wehubit was a pilot project and as such, was not guaranteed to achieve its objectives. One critical shortcoming of the current implementation was the unavailability of data to train the machine learning model to predict neonatal deaths. As long as qualitative data regarding this matter will not be available, the **tested machine learning model will be withdrawn**.

▶ However, based on the learnings of the Wehubit project – including the possibility to include a machine learning model within the CHVs app - D-tree International will **develop other machine learning model(s) to predict other outcome(s)**. These new models will be identified in line with (1) literature review and/or interactions with clinical experts able to provide advice on **what sort of data is required** (2) **identification of the data that is already available** and **of high quality** in Zanzibar's context. For example: delivery locations.

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