SEVERE ACUTE MALNUTRITION (SAM) APP PHOTO DIAGNOSIS PROJECT

While weight-for-height (WHZ) and mid-upper arm circumference (MUAC) are common techniques used for diagnosing acute malnutrition, there are still significant operational challenges for their use at scale.

This project is developing an innovative image-based diagnosis model for acute and chronic malnutrition, and integrating it in an easy-to-use mobile phone app to allow for effective and simple diagnosis in the community and enhance community management of malnutrition.

The present project comprises three stages:

**Phase 1 - Pilot phase: Generating knowledge**

This first phase of the project included two key streams of work:

1. Generation of the algorithm and templates used for diagnosis.
2. Development of the software application for both desktop and mobile phone applications.

The study of the Spanish sample allowed the design of morphometric landmark-based 2D models to describe, for the first time, the shape of the body of children aged 6-59 months. When diagnosing SAM by applying such models, an accuracy of SAM diagnosis of 100% was reached when analysing parts of the body separately.

A smartphone app prototype, containing the created models and algorithms required to obtain an in situ diagnosis was developed. This prototype permits the systematic registration of photographs as well as image processing, and application of a diagnostic algorithm. A methodology to code individuals was also included, to allow sending and receiving data through the app as well as data storage in a web service. An auxiliary desktop app was also developed to manage and configure the mobile app for the generation of templates and for image processing obtained from digital photographs for future research.
There is a further need to continue development of the app to study the accuracy of diagnosis for children aged 6-59 months in other populations beyond Senegal, and to improve the operability of the app by using more focused areas of the body. With the major hurdle of app and model development now done, it can now be further improved, and diagnostic accuracy refined as a larger sample is inputted into the software.

**Phase 2 - Validation phase: Adapting technology to users**

The rigorous design of the first phase allowed the development of an innovative diagnostic tool. At conception, it was recognised that a second phase of the project would be needed to further develop the tool, expand its use to different contexts and explore further use of the tool at scale. Thus, as both the programming of the App and the first preliminary results were being generated, new research questions and concerns were arising and opening-up potential future App functionality and usability paths to be developed. Here the aim is to reinforce both dimensions of the App as a research and diagnostic tool. Important usability improvements still need to be carried out.

This innovation has been recognized with two international awards and one national award. These outstanding results have encouraged us to carry out a further and wider exploration of the child’s body shape in terms of nutritional status designing the second phase of the project.

This new approach will allow caretakers and community members to diagnose and monitor the nutritional status of children. Additionally, the App would provide access to key nutrition information via messages, nutrition Social and Behaviour Change Communication, to prevent and manage malnutrition at the community level.

In order to fulfill this vision, SAMphotoD must comprise a user centred design, which means that the App will adapt its features to the needs of the different users, as well as an effective communication system between them, which will be families, community health workers, regional health centres and Health Ministries.

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EXPECTED IMPACT:

This project reinforces decentralization and sustainability of community management of malnutrition by empowering caretakers to diagnose and monitor the nutrition status of their children. Caretakers and community members will also have increased access to nutrition information for preventing and managing malnutrition. To measure impact in the targeted communities, Action Against Hunger will track App adoption rates, number of diagnosis completed, increase recovery rates and decrease defaults and relapse rates.

The project also presents a great opportunity for governments and local health systems to revolutionize nutrition assessments and improve the impact and coverage of nutrition programs. The potential for the app to facilitate rapid and easy diagnosis of malnutrition, together with the power of Nutrition SBCC to prevent and manage malnutrition, provides a unique opportunity to address malnutrition at scale. This is an important step towards achieving the Sustainable Development Goal 2.2 (SDG 2.2) and tackling malnutrition by 2030.

Innovation for communities (user driven): While the project intends to develop a new and innovative technology, from the very beginning Action Against Hunger will involve target communities in the process to ensure that the system is easy and intuitive for them to use, considering their feedback at each step of the project and adapting the technology to their needs and context when required. The tool will also incorporate a two-way communication system that will be completely customized to the needs of end-user needs as it will be developed following a user-centered design approach.

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