Global Partnership for Zero Leprosy
Research Agenda Working Group
Subgroup on Digital Health

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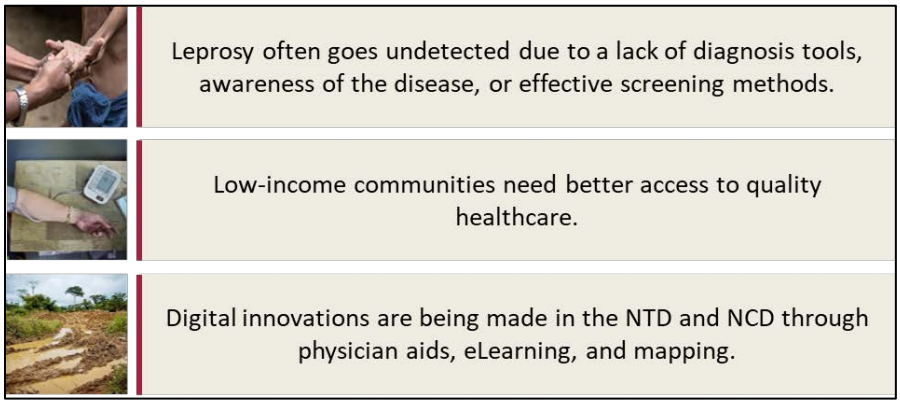
Summary

The use of digital health-based interventions in leprosy is limited. Several examples have been compiled and outlined in this report. There are clearly many opportunities to apply digital interventions in the broader field of neglected tropical diseases (NTDs). Examples include digital diagnostics, surveillance, disease mapping, eLearning, policy and digital strategy, and monitoring and evaluation.



National leprosy programs are showing willingness and taking action to incorporate national digital registries into their prevention efforts. These registries will help ensure accurate case detection and rates and improve targeting of resources.

Partnerships with the IT sectors could encourage and fuel innovation and funding for leprosy prevention. The use of digital diagnostics will lead to new research to enable more rapid diagnosis of disease. These advances will contribute to policy developments and help build strategic partnerships for adoption and scale up of new and existing interventions, which can potentially serve as important models for other NTDs as well.

The Subgroup on Digital Health of the Global Partnership for Zero Leprosy (GPZL) Research Agenda Working Group identified several major gaps for digital health application for leprosy. These include lack of

- Sufficient evaluations of digital health interventions
- Interest in and use of digital technologies in the field of leprosy
- Skilled workers and resources for digital health training and application
- Scalable and sustainable digital health solutions that can be integrated into national health systems
- Strategic planning for successful interventions to be scaled (and applied) to other NTDs

The Subgroup identified the following digital health research priorities to fill these knowledge gaps and help reach zero leprosy

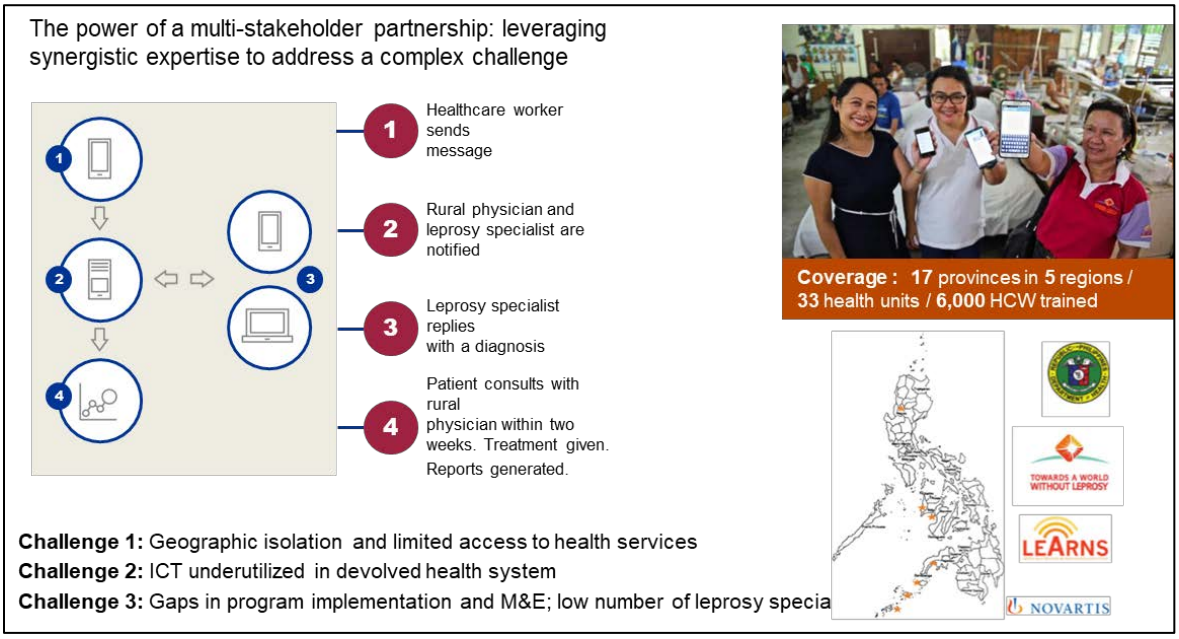
- Geolocalization of cases
- Digital diagnostics
- eLearning and hands-on training (with accreditation)
- Policy research, implementation, and tracking
- Independent evaluation of digital interventions (with scale-up plans)

Existing Digital Interventions in Leprosy

Nikushth for Patient Registration. In India, the National Leprosy Eradication Programme (NLEP) has commissioned a digital tool, called Nikushth, for registration of leprosy patients. This application was built by HISP India on the DHIS2 platform from the University of Oslo, and is open source.

Leprosy Alert Response Network and Surveillance System (LEARNS). The Novartis Foundation and the Department of Health and Department of Science and Technology in the Philippines have worked together to build an enhanced leprosy referral and surveillance network among healthcare providers (HCPs). The goal of this project is to have a positive impact on the disease burden for leprosy in the Philippines by introducing a role-based teledermatology system that will enable health workers to consult with specialists by providing images of skin lesions and patient details and then get an expert diagnosis for the patient. The patient can then be referred through the system for further treatment and follow-up. The system allows for the storage of images and patient details, creation of alerts based on delayed response by HCPs, unusual case reporting (low or high) in a given region, failure of follow-up, and other capacities. The system also allows reports to be generated for evaluation of the regional health centers, system effectiveness, and other considerations. Importantly, the LEARNS tool has been evaluated for sensitivity and specificity in the clinic and in a 'real world' field setting.

Results of the evaluation have shown that when LEARNS is used new case detection rates increase while the time to diagnosis decreases (from approximately 2 months to 2.5 days).



GIS Mapping Application. The Novartis Foundation has also worked with the University of Oslo and HISP India to develop a GIS mapping application that uses data from Nikushth to provide a visualization of cases over time at the level of the Indian "block," an area that includes approximately 50,000 people. This is currently the most granular level of mapping available; while the name of the center where the patient was diagnosed is captured in the data, the location of each center has not yet been given map coordinates. This information will be available soon, however, and will enable the government to map cases to the location of the health centers and therefore provide targeted assistance for health worker education, medication provision, and resource mobilization to strengthen efforts to interrupt transmission. This application is also built with the open-source DHIS2 platform and is therefore available in any country where a digital patient registration system is in operation.

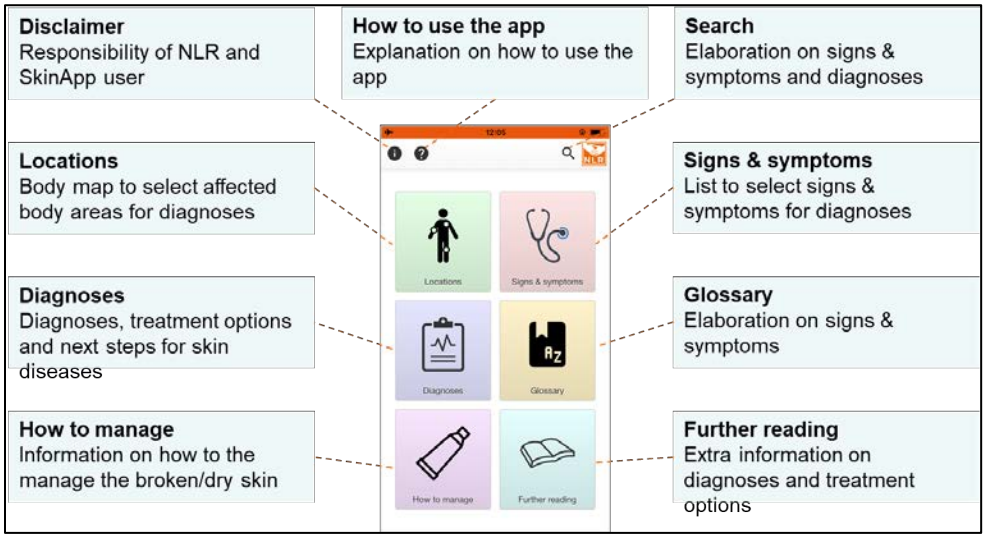
Digital Diagnostics. The Novartis Foundation and Microsoft are partnering to develop a proof-of-concept artificial intelligence (AI)-enabled digital health tool and a Leprosy Intelligent Image Atlas to aid in the early detection of leprosy. As part of the collaboration, Microsoft and the Novartis Foundation will work with local investigators from Oswaldo Cruz Foundation (Fiocruz) in Brazil to develop a protocol to examine anonymized images collected by Fiocruz. This will include a high-resolution image and

metadata capture protocol to process the leprosy skin lesion images. The imagery and AI code will be publicly accessible at a later stage.

Capturing an image for the Leprosy Intelligent Image Atlas at Fiocruz in Brazil

The SkinApp. Developed by Netherlands Leprosy Relief (NLR), the SkinApp is a smartphone app designed to support peripheral health workers in diagnosing and treating common, NTD- and HIV-related skin diseases. Although skin diseases are highly prevalent, the availability of dermatologists in many areas is limited (in Mozambique, there are 10 dermatologists for a population of 27 million people). Many public health centers are run by clinical officers or nurses who have very limited training in dermatology. NLR developed the SkinApp after field-testing an adapted version of Mahé's algorithm for diagnosis and treatment of common skin diseases in Nigeria. A first version of the app was field tested in Zambezia Province in Mozambique, in both urban and rural districts. Findings and feedback have led to an improved version of the SkinApp that can now be downloaded and in the Google Play Store. In April, NLR will field test this improved version of the SkinApp in Mozambique with the aim of

improving the quality of diagnosis and treatment of skin diseases and enhancing early detection of skin-related NTDs as well as HIV-related skin diseases.



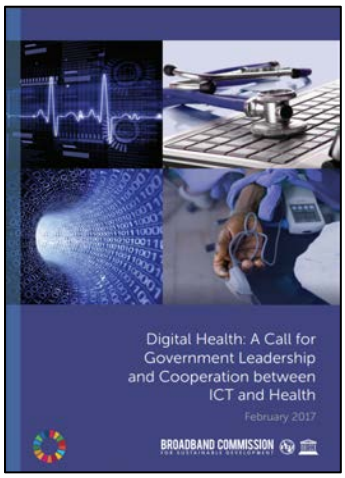
Benefits of SkinApp

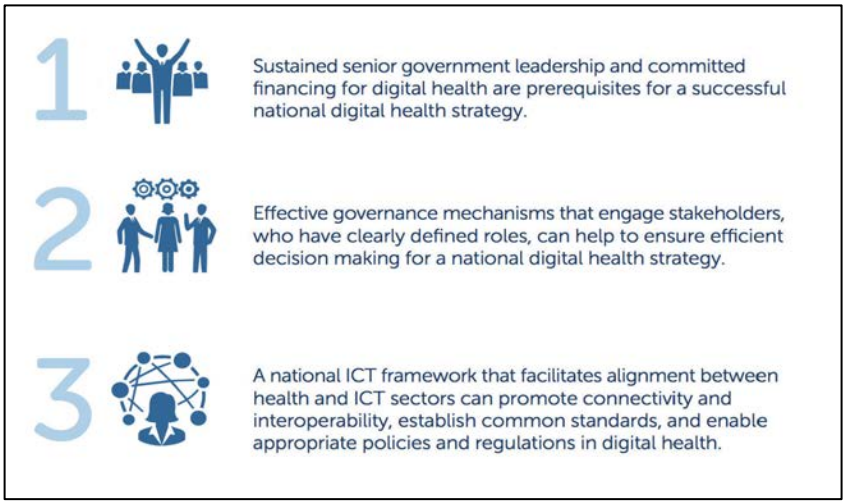
- A **simple tool to diagnose skin diseases** by check boxing signs and symptoms and affected body areas
- An **easy-to-use database of skin diseases**, including signs and symptoms, pictures, and treatment options, which helps in making diagnoses and provides eLearning for community health workers.
- Available in rural settings since it **can be used offline**

Digital Health Policy

Despite the widespread use of mobile phones (with approximately 99.7% market penetration), the use of digital health-assisted interventions is uncoordinated and often fragmented. These interventions and applications rarely reach scale. The Broadband Commission Working Group on Digital Health has convened the world's top experts to develop recommendations on ways that policymakers and other stakeholders can develop sustainable digital health solutions to address national health priorities. This will help to accelerate universal health coverage and the achievement of the United Nations' Sustainable Development Goal 3.

The Working Group's 2017 report, *Digital Health: A Call for Government Leadership and Cooperation between ICT and Health*, created a blueprint for how information and communications technology (ICT) and health leaders and policymakers can collaborate to develop national digital health strategies.





The Working Group's 2018 report, *The Promise of Digital Health: Addressing Non-communicable Diseases to Accelerate Universal Health Coverage in LMICs*, builds on the earlier work. It provides practical recommendations and best practice examples of how policymakers can implement sustainable digital health solutions that address NCDs in low- and middle-income countries, therefore accelerating Universal Health Coverage and achieving Sustainable Development Goal 3. The report sets out six building blocks, accompanied by country examples, to help policymakers realize the full potential of digital technology to strengthen their health systems and accelerate universal health coverage:

1. Policy makers need to prioritize, formulate and coordinate national digital health strategies
2. Legal frameworks are essential to protect patients while enabling innovation
3. Standardized infrastructure allows information to be shared and used across the journey of patients with chronic diseases such as NCDs
4. Interoperability between diverse digital health solutions and data sources is a must to enable coordinated NCD management
5. Partnerships combine expertise, assets, and ideas to amplify the scale and impact of successful digital health solutions
6. Sustained financing is mandatory to scale successful digital health solutions