![GSMA logo]

Innovative mobile solutions linking health and identity

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

For more information, please visit the GSMA corporate website at **www.gsma.com**

Follow the GSMA on Twitter: **@GSMA**

GSMA Digital Identity

The GSMA Digital Identity Programme is uniquely positioned to play a key role in advocating and raising awareness of the opportunity of mobile-enabled digital identity and life-enhancing services. Our programme works with mobile operators, governments and the development community to demonstrate the opportunities, address the barriers and highlight the value of mobile as an enabler of digital identification.

For more information, please visit the GSMA Digital Identity website at **www.gsma.com/digitalidentity**

Follow GSMA Mobile for Development on Twitter: **@GSMAm4d**

Authors

Samantha Lynch
Matthew Wilson

Contents

Introduction

Official proof of identity is fundamental to an individual's ability to enforce their rights and secure access to a wide range of vital services such as healthcare, education, mobile connectivity and social protections. For this reason, the United Nations Sustainable Development Goals (SDGs) has set a specific target to 'provide every person with a legal identity, including birth registration, by 2030' (SDG 16.9).[1]

1.   See http://www.un.org/sustainabledevelopment/sustainable-development-goals/

By increasing access to both foundational and functional[2] forms of identity, the international community will also be in a stronger position to address SDG 3, which aims to provide all people, of all ages, with universal health coverage, financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccinations.[3] There is still much work to be done: the World Health Organisation's 2017 Global Monitoring Report reveals that at least half of the world's population still lacks access to essential health services, and almost 100 million people are being pushed into extreme poverty each year because of out-of-pocket health expenses.[4]

The World Bank Identification for Development (ID4D) programme has highlighted that access to digital identification is crucial to the efficient and effective delivery of health services.[5] In places where individuals lack a unique patient identifier, where patient identification remains paper-based, or where health information systems are not interoperable,[6] individuals are likely to receive inferior care and face distinct challenges when managing their health over time; accessing critical health-related information; proving their eligibility for vital services, such as vaccinations; and accessing health insurance programmes or other financial safety nets. The absence of unique patient identities also makes it difficult for health ministries and policymakers to aggregate records and generate statistics for planning and evaluating healthcare delivery, or to improve treatments and disease management.[7]

The transformative power of mobile technology has been recognised as an important enabler in the health identification process. By 2018 the mobile industry had connected more than 5.1 billion people,[8] creating 'more than five billion points of contact between consumers, healthcare workers, and health system administrators'.[9]

In this case study we highlight four mobile-enabled platforms that are facilitating the creation of unique health identities in low-income countries across Asia and Sub-Saharan Africa. This, in turn, is helping patients access timely, consistent and more affordable health services; widening access to low-cost health insurance; and improving the way patient information is shared and used. Although these platforms are still in the early stages of development, early evidence suggests that digital heath identification platforms are creating new opportunities for mobile network operators (MNOs) to develop cross-sector partnerships, deliver social impact and generate new revenue through subscription and service fees (from patients, doctors and health centres), and introducing customers to new life-changing, value-added services such as mobile money and remote health care.

2. Functional identities tend to be those that are created with a specific purpose in mind and therefore tend to be provided by one of many different entities; in contrast, foundational identities tend to be universally available, used for a variety of purposes and consequently are often provided by governments for their citizens to be able to prove their identities.
3. Target 3.8 https://sustainabledevelopment.un.org/sdg3
4. World Health Organization and World Bank (2017). 'Tracking universal health coverage: 2017 global monitoring report', Page V. Available at: http://documents.worldbank.org/curated/en/640121513095868125/Tracking-universal-health-coverage-2017-global-monitoring-report
5. World Bank (2018). 'The Role of Digital Identification for Healthcare: The Emerging Use Cases'. Available at: http://pubdocs.worldbank.org/en/595741519657604541/DigitalIdentification-HealthcareReportFinal.pdf
6. Interoperability means 'the ability of health information systems to work together within and across organisational boundaries in order to advance the health status of, and the effective delivery of healthcare for, individuals and communities'. (HIMSS Dictionary of Healthcare Information Technology Terms, Acronyms and Organizations, 3rd Edition, 2013, p. 75)
7. World Bank (2018). 'The Role of Digital Identification for Healthcare: The Emerging Use Cases'. Available at: http://pubdocs.worldbank.org/en/595741519657604541/DigitalIdentification-HealthcareReportFinal.pdf
8. GSMA "The Mobile Economy 2018". Available at https://www.gsma.com/mobileeconomy/
9. World Bank (2012). 'Mobile Applications for the Health Sector'. Available at: http://documents.worldbank.org/curated/en/751411468157784302/pdf/726040WP0Box370th0report00Apr020120.pdf

Credit: Vladimir de Sousa for Element, Inc.

Element

Even in places where access to official, foundational identity is widespread, it is estimated that up to 10 per cent of patients are at risk of being misidentified during their interactions with the health system[10] due to, for instance, multiple patients sharing the same name or personal attributes being incorrectly shared or recorded. The challenge of unique patient identification is compounded by the siloed nature of digital health platforms — including those delivered on mobile devices. The World Bank estimates that more than 500 different mHealth pilot studies have been conducted with mobile technology over the last several years and many of these solutions are not interoperable with one another, making it difficult to create comprehensive patient profiles and deliver continuity of care.[11]

While biometric identification is frequently used in financial services to verify and authenticate identity across systems, it has not been adopted widely in a healthcare context. This is due to many factors, including the cost of typical, clunky hardware platforms, the essential privacy and security considerations around sensitive patient health data, and the lack of available and appropriate solutions for infants and young children.

To address these challenges, Element has developed a mobile software-only solution for biometric recognition that eliminates the need for special hardware and creates a portable identity that can be used on mobile devices. The technology is based on the modern artificial intelligence (AI) field of Deep Learning, in which algorithms train themselves directly from data, rather than the conventional approach of having a human expert rigidly impose rules of classification. The technique was pioneered by Element co-founder Yann LeCun, a leading AI researcher and one of the 'founding fathers' of the modern AI field.

Element's current focus is on Asia and Africa, where a disproportionate number of people lack formal identification. Their end-to-end biometric solutions are used to provide a digital identity resource for healthcare providers and empower access to financial services, among others.

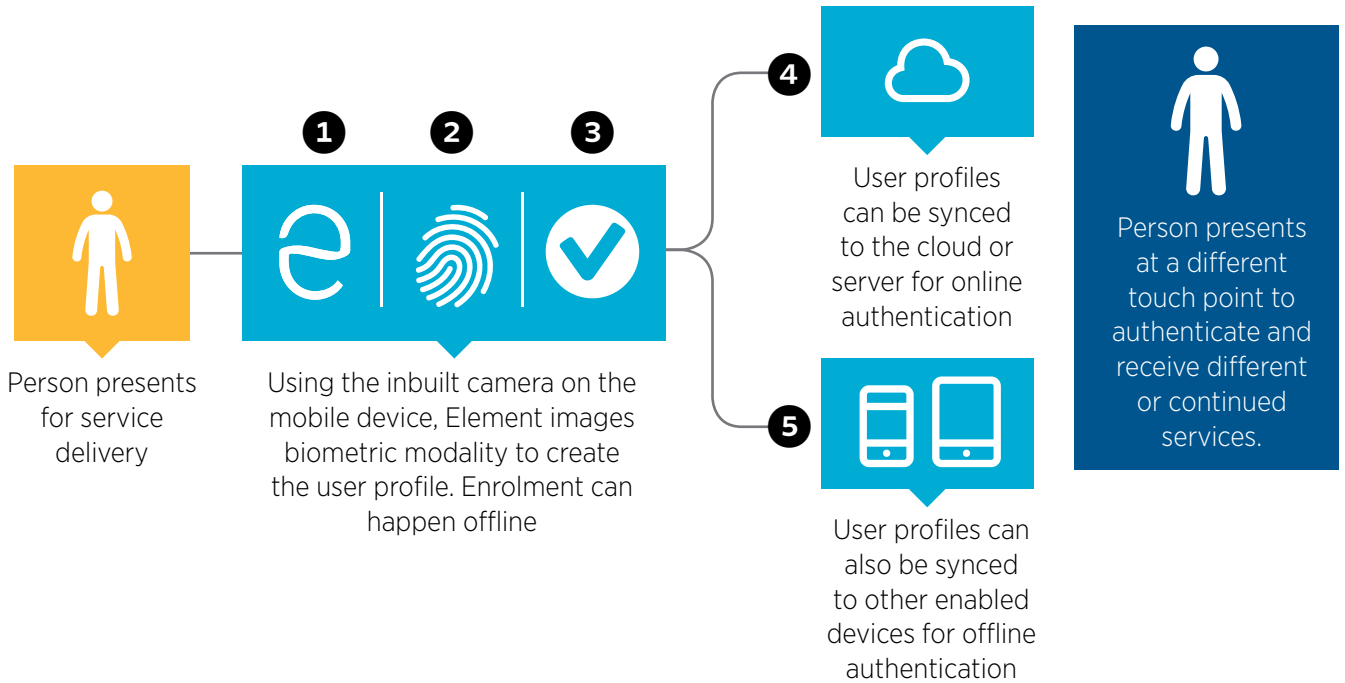10. Wall Street Journal (2013). 'Should Every Patient Have a Unique ID Number for All Medical Records?'.
    Available at: https://www.wsj.com/articles/SB10001424052970204124204577154661814932978. Accessed 18 Dec 2018.
11. World Bank (2012). 'Mobile Applications for the Health Sector'. Available at: http://documents.worldbank.org/curated/en/751411468157784302/pdf/726040WP0Box370th0report00Apr020120.pdf

How it works
Element's enrolment and authentication process

1 **2** **3**

4 User profiles can be synced to the cloud or server for online authentication

5 User profiles can also be synced to other enabled devices for offline authentication

Person presents for service delivery

Using the inbuilt camera on the mobile device, Element images biometric modality to create the user profile. Enrolment can happen offline

Person presents at a different touch point to authenticate and receive different or continued services.

Using the inbuilt cameras on smartphones and tablets, Element's software captures images of a person's biometric 'modality' such as palm or face, without use of specialised hardware, and uses Deep Learning algorithms to create a highly abstract, highly compact user profile that is unique to the individual. Deep Learning is well-suited to address the challenges of biometric recognition, as the algorithms learn directly from the individual's natural features, can be deployed to understand changes in features over time (such as with infant growth), and can be applied to multiple modalities at once — creating a robust identity recognition that cannot be achieved with typical biometric sensors. By running these algorithms local to the devices, Element enables mobile delivery of biometric digital identity.

The user profiles are natively secure, as they cannot be reverse-engineered into the original images, and Element does not need to use or store the underlying images for authentication purposes. Industry-leading data and code protection are added for further security, complimented with liveness detection and other anti-spoofing algorithms. Additionally, in implementation, the data is stored separately from programme or sensitive health data and personally-identifiable information.

The user profiles are also highly compressed, providing a lightweight design that enables offline enrolment and authentication, with the capacity to enrol upwards of one million people on a single mobile device. User profiles can also be synced across devices to ensure that a person can be authenticated on any enabled device — allowing anyone, anywhere to create and use a biometric digital identity to access services. For example, a woman could enrol in a community maternal health programme, use the same biometric identity to access a record at a health clinic providing antenatal care services, and the same biometric identity to verify an insurance claim for specialised care.

Biometrically-verified service delivery leads to higher quality data on patient care, which can be used to make informed decisions on referral management, programme design, and healthcare delivery. The creation of a digital identity layer, which could be accessed across devices, helps connect siloed digital health platforms without requiring the sharing of sensitive health information. These portable digital identities could also ultimately give patients increased control over their own data when it comes to accessing services.

Digital biometric identity use cases for the health ecosystem

Birth registration and immunisation

Biometric enrolment during the birth registration process would allow parents to create a digital identity for their child which is linked to a legal framework. Linking a biometric identity to a digital immunisation record could help verify that children receive the right vaccinations at the right time, improving both vaccine delivery and coverage.

Community case-based management

In rural and community settings, mobile and offline capabilities are essential for case management. In Bangladesh, for example, government community health workers use an Element application on Android tablets during house visits to link pregnant women to antenatal care records in a mobile-based pregnancy registry.

Closing the referral loop

In Tanzania, Population Services International (PSI) used Element on smartphones and tablets to link young women to PSI's mobile health application at both the community and clinic-levels. The verified service delivery triggered the appropriate incentive payment to PSI health workers and helped close the service delivery loop for clients.

National health information systems

Within large clinics and hospitals, innovations in patient registration, connected diagnostics, pharmacy applications, and lab management systems are increasingly delivered on mobile devices. Mobile biometric identity can be used to link patients across these touchpoints to create comprehensive patient profiles for care.

Health insurance and universal health coverage

With the rise of public and private health insurance schemes, mobile biometric identity can be used to verify health insurance claims. This enables patients to receive care, ensures hospitals and clinics get paid for services, prevents fraud, reduces the time for claim processing, and saves costs — potentially key to helping countries finance ambitious universal health coverage goals.

Mobile money and medical wallets

Just as health services are increasingly delivered on mobile devices, mobile money is increasingly used to deliver disbursements, incentive payments, vouchers, and health insurance payments. The rise in "mobile medical wallets" — such as Safaricom's M-TIBA in Kenya[12] — give unprecedented control to patients over how they interact with and pay for health services. Mobile biometric identity delivered on the devices in their hands could allow these platforms to verify transactions and moderate user access, protecting sensitive health and financial information and reducing fraud.

---

12. See: https://m-tiba.co.ke

Credit: Vladimir de Sousa for Element, Inc.

The role of mobile network operators

There is now a mobile device at nearly every touchpoint of the health system. In fact, multiple digital health platforms could be delivered on the same mobile device — for example, a digital immunisation card and a nutrition decision-making application that could end up sitting side by side. In the absence of interoperable systems, the mobile device has become a foundational platform for healthcare delivery. With digital identity, MNOs can encourage greater linkages between the disparate systems that operate on their networks, helping to optimize delivery of care.

Additionally, as people increasingly access health services on mobile devices, their use of mobile money for health expenditures will also increase. In Kenya, for example, the National Health Insurance

Fund (NHIF) experienced a 500 per cent increase in voluntary payment subscribers between 2009 and 2017 after the organisation started receiving payments via Safaricom's M-PESA. By integrating a mobile biometric solution like Element directly into their mobile money platforms, MNOs can verify transactions across the health platforms in their network — increasing digital payment volumes, preventing fraud, and creating mutually beneficial and sustainable opportunities for health-related partnerships. In this way, MNOs are able to diversify their revenue streams, through the provision of access to affordable and inclusive healthcare, which can also help to increase customer retention and reduce churn.

Next steps

Element has a number of partners across the health ecosystem, spanning Indonesia, Philippines, Bangladesh, Cambodia, Kenya, Tanzania, and Mozambique. Their technology is available as a standalone mobile application or through a Software Development Kit, for integration into partners' mobile and web-based applications.

Through their partnership with Intellectual Ventures' Global Good Fund, Element has extended the biometric solution to infants with the aim to create the first digital biometric platform capable of following a patient from birth through to old age.

The initial trials were completed in Bangladesh and Cambodia on 8,000 infants and young children followed longitudinally, representing the largest infant biometric study in the world, with field validation underway in Mozambique. Element was selected as a 2018 Pacesetter by Gavi, the Vaccine Alliance, to scale the infant biometric solution to support immunisation delivery across low- and middle-income countries.

For more information see:
www.discoverelement.com

Kea Medicals, Benin

Without access to a unique patient identity and verifiable medical history, individuals are likely to face challenges proving their eligibility for health insurance schemes or other health-related entitlements – which are often a prerequisite for accessing public health services or treatments. Furthermore, the World Bank notes that 'where health information systems are fragmented and patients seek care at multiple facilities, there may be instances of double charging, double payment, or patients not being properly reimbursed'.[13]

In Benin, the government has made community-based health insurance (CBHI) schemes an important component of their universal health care strategy, with CBHIs used to provide financial risk protection to the segments of the population who are underserved, uninsured, and work largely in the informal sector. However, despite the existence of approximately 200 of these schemes in the country, CBHI penetration remains relatively low, covering less than five per cent of the population.[14] According to the World Bank, the lack of financial protection for health expenditures means that around 40 per cent of health costs are paid for by households out-of-pocket.[15] For those without insurance, access to healthcare remains quite limited.

It is within this context that Kea Medicals (Kea) has identified a need to provide healthcare providers in Benin with better access to the medical records of their patients. The current information deficit makes it difficult for physicians to provide timely care, and can lead to patients receiving duplicate treatments or procedures, which increases health costs and hospital mortality rates. Kea's Hospital Information System was developed in 2017 with an aim to connect hospitals in Benin — and eventually across Africa — through a single database which facilitates the management of patients' medical information and aims to increase access to healthcare and health micro-insurance.
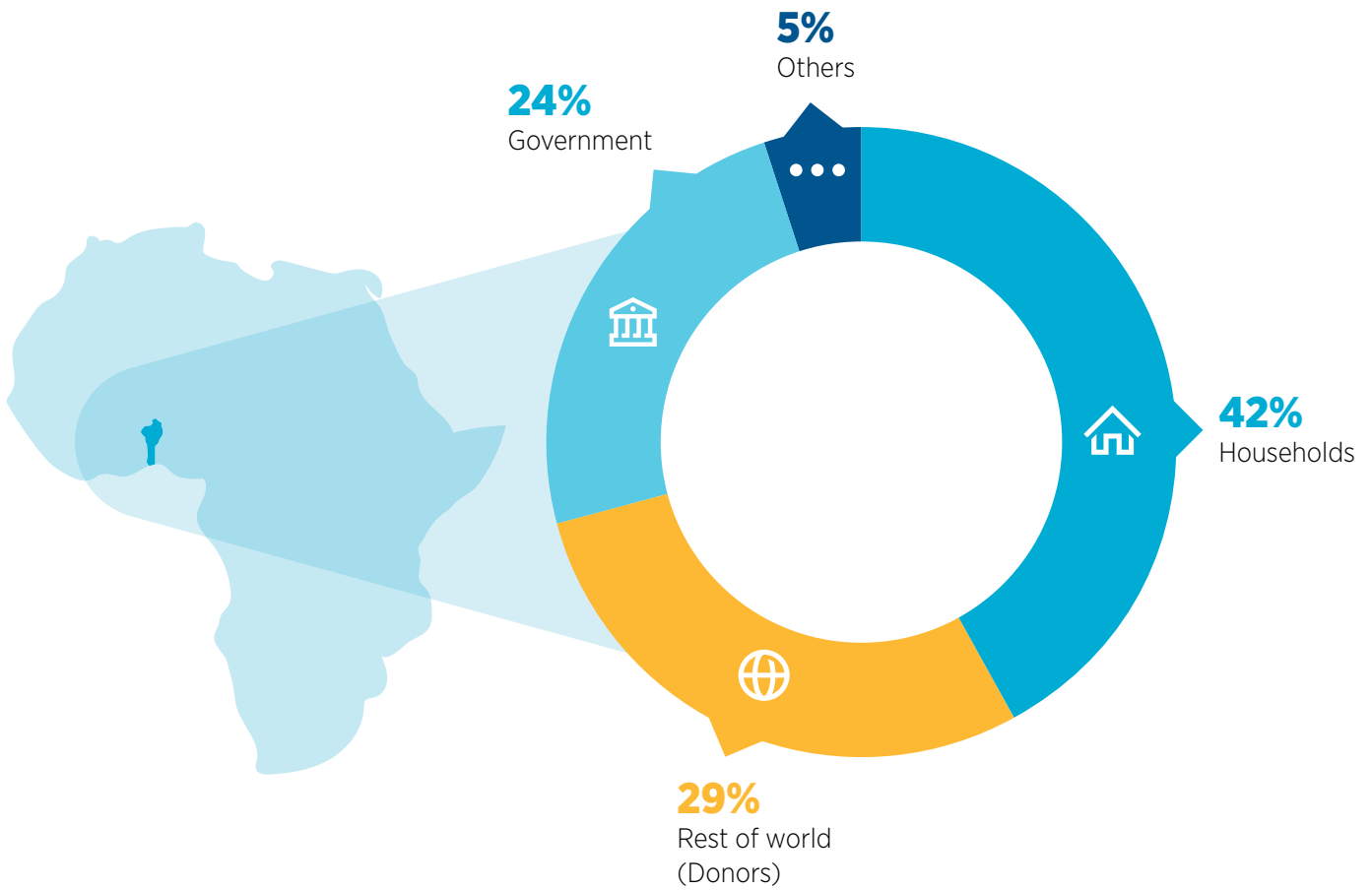
13. World Bank (2018). 'The Role of Digital Identification for Healthcare: The Emerging Use Cases'. Available at: http://pubdocs.worldbank.org/en/595741519657604541/DigitalIdentification-HealthcareReportFinal.pdf
14. USAID (2017). 'Financing of Universal Health Coverage and Family Planning: A Multi-Regional Landscape Study and Analysis of Select West African Countries: Benin'. Available at: https://www.hfgproject.org/financing-of-universal-health-coverage-and-family-planning-a-multi-regional-landscape-study-and-analysis-of-select-west-african-countries-benin/
15. See: https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=BJ

Total health spending by source

5%
Others

24%
Government

42%
Households

29%
Rest of world
(Donors)

Source: Benin National Health Accounts. 2012

How it works

Through Kea's Hospital Information System, doctors are able to create universal medical identities for their patients by registering their basic personal details, health information (such as allergies, chronic diseases or blood type) and emergency contacts online. Access to the registration service is free, but patients pay a one-time fee between $4-10 (depending on the identity token chosen) to print a unique QR code onto a physical token, such as a bracelet, card or sticker that can be attached to the back of a phone. During consultations, doctors can use their own mobile device to scan the patient's QR code, validate the patient's identity and access their medical records in a matter of seconds. Once registered in the system, patients have the ability to access their medical history anywhere at any time.

Step 1

A doctor uses Kea's platform to collect information from the patient and create a Universal Medical Identity (IMU)

Step 2

The Universal Medical Identity is linked to the patient's fingerprint and social security number, as well as a QR code that is printed onto a physical token

Step 3

The patient's medical history is accessible to doctors anywhere, at any time

The creation of a digital medical identity allows patients to overcome common challenges associated with paper-based systems and scarcity of medical facilities, which can be particularly acute in rural areas, allowing patients to choose the most appropriate medical facility (based on need and location) and still have access to their health records. Kea's platform gives patients more control over which doctor they visit, and how much of their medical information is shared; in order to view sensitive information — such a person's HIV status — the consulting doctor must ask the patient to provide a unique PIN before the information can be accessed. By digitising health records, hospitals and doctors are able to provide a more efficient and streamlined level of care and find it easier to track the progress of their patients. The solution also improves the quality of healthcare in hospitals by reducing the time it takes for doctors to access critical patient information, while also reducing the cost of treatment for patients.

Kea hopes to facilitate easier and more affordable access to health care services for over 125,000 people in rural communities in Benin alone by the end of December 2019. Half of those that have already registered as of January 2019 are women. The success of the platform has allowed Kea to build strategic partnerships with the Health Ministry in Benin, as well as with international organisations such as Sanofi, Pierre Fabre foundation, Mercy Ships, NSIA Group, Caretech Group and the Tony Elumelu foundation. Kea's business model reflects the platform's ability to generate value for both health system providers and patients, with revenue generated through: the sale of the universal medical identity tokens and hospital subscription fees.

The role of mobile network operators

Opportunities exist for MNOs to increase the uptake and usage of their mobile money services through these type of solutions, as mobile money wallets are viewed as the ideal platform to pay for medical consultations or micro-insurance subscriptions. Kea is currently working with MTN in Benin to integrate their mobile money application-programming interface (API) in order to offer patients a simpler and more integrated method to pay for services via mobile money. In addition to integrating a mobile payment service into their solution, Kea is also working with MTN to offer free internet for participating hospitals, and to make the Kea app available for patients to use even when they have no data remaining. Finally, in order to offer a fully inclusive service, particularly in rural areas where connectivity can be problematic, Kea is working with MTN to develop a solution that will work via USSD (via a "quick" or "feature" code). MTN will also help to promote the Kea service.

Future opportunities for MNOs could include the ability for disadvantaged citizens to receive government health subsidies through their mobile money wallets.

"The Benin government plans to use Information and Communication Technologies (ICT) as a catalyst for economic dynamism and national modernisation in order to quicken the pace of economic growth and social inclusion by 2021. The government aims to provide social protection for the poorest and most vulnerable, ultimately aiming to support four million Beninese citizens through a universal health coverage system. Solutions created by local start-ups — like Kea Medical's Digital Identity solution — could enable our country to improve health outcomes through equipping medical workers, patients and hospitals with mobile-enabled technologies. Beyond creating an enabling regulating environment for startups to thrive, The Ministry of Digital Economy and Communication is committed to shed light on such local achievements and promote these solutions beyond Benin borders"

H.E. Ms. Aurélie Adam-Soule Zoumarou,
Benin's Minister for Digital Economy and Communication

Next steps

Kea's aim is to democratise and reduce the cost of health care services for economically disadvantaged people by:

- Connecting over 125,000 potential patients in Benin to 16,000 healthcare providers, and interconnecting 781 hospitals by the end of December 2019;

- Revolutionising healthcare practices by offering an opportunity to every doctor in Benin to become an independent medical entrepreneur, through Kea's online consultation platform;

- Establishing a digital healthcare network and facilitating access to better quality of health care for Beninese citizens no matter how remote their location may be from big cities;

- Making medical insurance affordable for 100,000 patients in Benin.

To support these ambitions, in November 2018 Kea received a grant from the GSMA Ecosystem Accelerator Innovation Fund. The purpose of the grant is to help Kea deploy a mobile-enabled (USSD and mobile apps) integrated health system, ensuring that more doctors will be able to use the platform at any hospital location across the country.

For more information see:
www.keamedicals.com

Dialog Doc990, Sri Lanka

Although public healthcare services in Sri Lanka are offered at no cost as part of the government's Universal Healthcare Cover (UHC), there remains a high demand for private healthcare services and Sri Lankans tend to self-refer and choose the hospital and/or specialist they wish to see. With only six per cent of the population covered by medical insurance, an estimated 86 per cent of health expenditure comes from out-of-pocket expenditure.[16]

At most health centres, the majority of healthcare appointments are booked on the same day and in-person; this manual process frequently causes appointment backlogs and long delays for patients. This is also a highly inefficient process for hospitals, as it makes it harder to manage doctors' time, access patient information in a timely manner, and secure payments for services. These challenges led to the creation of a 'doctor channelling' service, through which patients could use a mobile phone to make Doctor Channelling bookings.

High mobile adoption and smartphone penetration in Sri Lanka presented an opportunity for mobile application-based services to address key challenges around healthcare provision, improve efficiencies and drive cost savings for both the healthcare providers and the patients. Launched in April 2016, Doc990 is now operated in Sri Lanka by a joint venture partnership between a subsidiary of Dialog Axiata and three key private hospitals in Sri Lanka (Asiri Hospital Holdings, Durdans Hospital and Nawaloka Hospitals). The primary function of Doc990 is to enable digital bookings and payment of appointments with doctors and health specialists, but it has also expanded to include several complementary services, including the creation of 'Digital health records'.

---

16. The Health Sector of Sri Lanka, PWC, 2014

How it works and the role of the mobile network operator

The key value proposition of Doc990 was initially to offer patients and hospitals a cheaper alternative to existing 'doctor channelling' services — a suitable entry point considering consumers in Sri Lanka were already familiar with, and willing to pay for, this type of service. The 'Channel Your Doctor' service allows patients to book an appointment digitally through a call centre, the Doc990 mobile application, via the Doc990 website or through a Doc990 agent (agents can be a Dialog agent, or a registered pharmacy or shop). Users are charged a hospital fee, a consultation fee and a Doc990 service fee, and this payment can be made via cash, credit card, mobile money or directly through the patient's mobile phone credit. The mobile application provides customers with both a time and cost-saving alternative to in-person hospital bookings, and relieves hospital staff from the often frustrating and tedious task of capturing patient bookings, freeing more time to spend caring for patients. The Doc990 service has been popular due to the cost savings involved (estimated between Rs300 - 600 equating to roughly $1.60 - 2.30), but also due to its ease of use and transparency compared to the previous system.

Over time, the Doc990 has expanded its offering to include several complementary services, including:

Tele doctor service
This feature enables remote consultation between a patient and a doctor over the phone. These virtual consultations, with over 170 doctors, can be booked in the same way as physical consultations are booked through Channel Your Doctor and allows patients to be consulted in the comfort of their own home.

Medicine to your doorstep
This virtual pharmacy enables users to order and pay for prescription drugs by uploading a copy of their prescription to Doc990. Prescription orders are processed and delivered directly to the patient's home. Prescription payments can be made upfront upon placing their order, through a range of payment options, or in cash upon receipt of delivery.

Healthcare to your doorstep
Through this feature, patients can request health services to be delivered to their home or location of choice. These health services include patient transport, home-based assessments, doctor consultations and specialist care or treatment (nursing, physiotherapy, etc.).

Lab reports
Staff at partner hospitals upload lab results to Doc990 and patients can access these conveniently and securely through Doc990 by entering their lab reference number and a passcode printed on their bill.

In addition to the above, Dialog is developing a centralised, online portal which allows patients to securely access and store their health records. When a patient establishes a health profile, Dialog assigns a patient health number (PHN) and links this to their mobile phone number. The PHN ensures that all of a patient's medical information can be digitally grouped together in a digital record; previously these records would have been paper-based, which could be easily misplaced by the patient, or stored in disconnected health information systems across different health facilities, which are inaccessible to the patient. The PHN can also be used to authenticate the patient's identity: the patient is simply required to provide their doctor or hospital with their registered mobile number and consent, after which the number is used to look up the corresponding PHN and related health information. This improved patient insight to their personal health records allows them to track their health over time, improving their ability to manage their own health.

Further services can then be linked to this digitally enabled health number, such as being able to view and store laboratory reports online with their profile. To ensure that this digital health identity is kept secure a password is required, but Dialog is in the process of evaluating methods to simplify logon without compromising security, such as through a single-sign-on mechanism.

As Dialog has worked with the hospitals to provide both a back-end solution and a front-end booking solution, there is a double revenue stream for the service. In addition to charging hospitals a licencing fee to use the software, and patients for using features of the service, corporate companies are also subscribing to the service on behalf of their employees. An additional revenue stream comes from Dialog's distribution channels (agents, arcades and franchises) which as well as being used for booking appointments through the Doc990 system represent an opportunity to onboard new customers or sell them additional Dialog products and services.

Next steps

To date Doc990 has captured approximately 41 per cent of the private healthcare market share, and approximately 40 per cent of the doctor channelling market share. Future opportunities could include creating user profiles for different user types to streamline their interaction with the service. For this Dialog has identified three types of users: guests, frequent users, and those looking for a more encompassing digital health identity. This latter presents the most interesting group when looking at the future possibilities for mobile health identity services. For example, this group could be given the ability to register via the mobile application or website and maintain all their families' health details together in one place, using their primary mobile phone number and PHN as the main means of identification. This would put the patient in greater control of their health choices and medical information that they share

with health providers. Further partnerships with other providers are also being explored, such as InsureMe for the reimbursement of out-of-pocket healthcare payments.

Given the success of the service, Dialog is also exploring the possibility of replicating Doc990 in other markets. Maldivian citizens frequently make use of Sri Lankan healthcare services and as such it is being considered as a suitable market for expansion of the Doc990 service. Further opportunities in Sri Lanka could also exist through sharing aggregated and annoymised data with the medical industry or Ministry of Health to predict trends and patterns in service usage (for hospitals), general health (disease prevention) and complementary services (lifestyle services).

For more information see:
www.dialog.lk/mobile-commerce-doc990/

Credit: Vodafone Foundation - Lesotho

CASE STUDY 4

HIV testing and treatment, Lesotho

Despite its small population, Lesotho has the second highest HIV prevalence in the world.[17] It is estimated that in 2017, approximately 320,000 people within the country were living with HIV,[18] however an estimated 20 per cent were not aware of their status. Testing and treatment coverage has dramatically improved in recent years, but poverty, gender inequality and HIV stigma and discrimination remain major barriers to HIV prevention in Lesotho.[19]

Children born to HIV-positive parents and those from remote mountainous regions are particularly likely to not be tested for HIV and, as a consequence, not receive antiretroviral treatment (ART). Additionally, whilst the Millennium Challenge Corporation provided funding to the government of Lesotho to invest in strengthening Lesotho's health system (resulting in the rehabilitation of approximately 87 per cent of health centres across the country[20]), many affected people are still unable to access these centres.

To address these issues, the Vodafone Foundation, a UK registered charity, and Vodacom Lesotho, the local affiliated business, worked with a number of partners[21] to design and launch the 'Mobilising HIV Identification and Treatment' initiative. This initiative aimed to increase the number of HIV-positive children being tested and accessing ART over a three year period. The solution was designed to be deployed nationally, and in particular to reach remote mountainous regions. The solution aimed to raise awareness, improve accessibility and increase efficiency of the service through the use of mobile technology.

17. See: https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/lesotho
18. See: https://www.vodafone.com/content/index/what/connected-she-can/hiv-testing-and-treatment-in-lesotho.html
19. See: https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/lesotho
20. See: https://www.mcc.gov/our-impact/story/story-mcc-strengthens-health-systems-in-lesotho
21. Lesotho Ministry of Health, USAID, Elton John AIDS Foundation, ViiV Healthcare & The ELMA Foundation

Credit: Vodafone Foundation - Lesotho

How it works and the role of the mobile network operator

The initiative first worked to raise awareness of HIV by partnering with local organisations such as Kick4Life, who used sport as a means to raise awareness and encourage testing among children. Another awareness initiative involved working with the Vodacom Lesotho Activation team on community mobilisation for HIV screening. Vodacom events were hosted in villages and rural communities to promote Vodacom products, but also to promote basic healthcare and encourage HIV screening.

To address the problem of access, particularly in rural areas, the Vodafone Foundation formed a strategic partnership with the Clinton Health Access Initiative (CHAI), Baylor College of Medicine's Foundation – Lesotho, and Riders for Health, to support a mobile outreach programme. This involved paediatric nurses travelling to remote communities that were identified through a mapping exercise (which mapped areas with traditionally high numbers of HIV positive children) via 4x4 vehicles to hold "Mother & Baby" clinics. In addition to testing for HIV, these clinics provided other primary healthcare services such as vaccinations, antenatal care and nutritional advice. Today 160 communities are being served through these clinics on a fixed

rotation schedule, and the service accounts for the delivery of eight per cent of Lesotho's vaccinations.

The third part of the initiative involved the Vodafone Foundation and Vodacom developing a mobile application that was used by nurses and HIV counsellors to register and collect information about patients. Once registered, the application is used to monitor the programme in real time, and ensure that children and pregnant women living with HIV, who are financially disadvantaged, are able to access ART in conjunction with a service called 'Text to Treatment'. The 'Text to Treatment' service allows money to be sent via mobile money to patients, guardians and health workers to cover transport costs incurred travelling to health clinics to receive ART. The service was further used to identify HIV positive pregnant women to enable them to be brought to appropriate medical facilities to help prevent the transmission of HIV from mother to baby. Use of the application allowed for better monitoring and evaluation, particularly with regards to ensuring that ongoing treatment was made accessible.

The combination of identity and health in this use case allowed for a number of improvements in the targeting and delivery of the service. The use of technology enabled the tackling of barriers such as geographical challenges and identification of new patients, allowing the healthcare system to be positively transformed. Prior to the introduction of the service, patients were tracked using a paper-based system which made the targeting and identifying of new patients a laborious process. By using the mobile application to record patient information, stakeholders were better able to identify infection patterns and target new communities for testing. This resulted in approximately 86 per cent of children being tested for the first time as children who other programmes had not previously identified were targeted for testing. The ability to combine the service with mobile money encouraged patients to start medication sooner (it was estimated that following a diagnosis, children whose parents/guardians received an M-Pesa payment were found to commence their treatment two weeks earlier than

those who did not receive payment), facilitating the tracking of patients and monitoring their adherence to the treatment programme.

In addition to contributing towards the initial cost of setting up the service and raising awareness of the initiative, Vodacom's primary role involved supporting the development of the mobile application. Through the application, and the associated data it provided, the Ministry of Health of Lesotho and other stakeholders were able to access and view the data which permitted them to have a greater level of accountability and to manage the service more effectively. The mobile application replaced a paper based system and resulted in greater efficiencies, allowing health workers to better manage and track patients, issue them with reminders, as well as giving them much faster access to test results, and overall improving the rates of patients who take up and continue treatment. An estimated 60 per cent of patients who tested positive were registered with M-Pesa and used the mobile wallet to receive funding, enabling them to access free transport to health care facilities.[22]

Next Steps

On the 24th October 2018, the Mobilising HIV Testing and Treatment programme was officially handed over to the Lesotho Government, who are looking to sustain and scale the programme. In three years, the use of mobile technology for this service provided HIV testing to over 161,000 people and supported over 600 HIV positive children, adolescents and pregnant women to receive life-saving care and treatment.[23] The Government of Lesotho is continuing to invest in the service and is gradually integrating the programme into their own primary healthcare strategy. The Lesotho Government plans to replicate and extend the reach of the programme by providing primary healthcare to an estimated 15,000 – 45,000 people each year, and HIV testing and counselling to 12,000 – 36,000 people each year.[24] One way that the application could be further enhanced would be to follow examples of other countries, such as Sri Lanka, to combine the functionality of the mobile application

with national health numbers, to offer a national digital health record for citizens which could be used to keep track of diagnosis, medication and vaccinations received.

Another option for the service is to extend the functionality of the mobile money service, 'Text to Treatment', to expand it to other health beneficiaries, for example to provide subsidies for maternal health services or vaccinations. Variations of the service could be used to support other targeted health initiatives, for example Vodafone Tanzania's adaption of the service to identify high-risk expectant mothers in Tanzania and provide them with a taxi ambulance service paid for via M-Pesa.[25] Alternatively, the service could be used to support the implementation of national digital health records or a universal health care initiative.

For more information see:
www.vodafone.com/content/foundation/hiv-treatment

22. See: https://www.vodafone.com/content/index/what/technology-blog/roadmap-for-fighting-hiv.html
23. See: https://www.vodafone.com/content/foundation/hiv-treatment.html
24. See: https://www.vodafone.com/content/index/what/technology-blog/roadmap-for-fighting-hiv.html
25. See: https://www.vodafone.com/content/index/media/vodafone-group-releases/2016/maternal-health-tanzania.html

Credit: Vodafone Foundation - Lesotho

Conclusion

The case studies highlighted in this report demonstrate how mobile technology can be leveraged to establish health identities for the underserved, and ultimately create healthcare efficiencies and improvements that benefit individual patients, households, health workers, and health systems. Digital identity services will only reach full scale if they can create value in sustainable ways, including for mobile operators. Early evidence suggests that these platforms provide MNOs with opportunities to offer new services, either through in-house development or collaboration with new partners, to enhance market share and reduce churn, while at the same time increasing brand value, loyalty and revenue.

There is a clear opportunity for mobile-enabled digital identity solutions to support access to healthcare. Previous research from the GSMA[26] has shown that the idea of establishing digital patient records — linked to a mobile number and SMS health messages — is easy for consumers to understand and highly appealing. Digital identity solutions are particularly appealing to potential users if they make the healthcare experience faster, easier and more supportive, or provide access to a healthcare provider via mobile, thereby reducing the need to attend hospitals in person. Low-income consumers also face challenges related to poor diagnoses and low availability of medicine; here, digital identity solutions that could improve health outcomes are in high demand. Finally, paper-based health records are often kept in hospital silos or misplaced by the patient, leading doctors to repeatedly prescribe medicines that do not work or send patients for repeated testing for the same condition, which has cost, time and safety implications. Interoperable health databases with electronic records linked to a digital identity could address these issues and are, therefore, highly appealing.

However, participants engaged in GSMA's previous research have also raised concerns about keeping health data secure from both MNOs and healthcare workers, as they worry that others might share their details publicly. As the World Bank has previously noted, trust is a critical ingredient in the demand for health services, and neither large providers such as government health systems nor individual consumers will use these services if the privacy and security of their data cannot be assured.[27] Mobile operators can play a leading role in developing strong data management systems for storing and securing sensitive personal data, and be able to demonstrate this security. To make digital health identity solutions truly inclusive, MNOs and other tech innovators must also consider how to design for the lowest common denominator: the most basic handset and the person with the lowest level of digital literacy.

26. GSMA (2016). 'Driving Adoption of Digital Identity for Sustainable Development: An End-user Perspective Report'.
27. World Bank (2012). 'Mobile Applications for the Health Sector'. Available at: http://documents.worldbank.org/curated/en/751411468157784302/pdf/726040WP0Box370th0report00Apr020120.pdf

gsma.com

For more information, please visit the
GSMA website at www.gsma.com