Good Practices Resource Book
Urban E-Governance and ICT

This publication is a collection of global good practices contributed by technical experts and the Program Management Unit of the CITIIS program.

Published in July 2022 by the City Investments to Innovate, Integrate and Sustain (CITIIS) program under the National Institute of Urban Affairs (NIUA).

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The capture and transfer of knowledge has been an essential and catalysing element of the CITIIS mandate. In order to ensure that the CITIIS projects make significant contributions and have positive systemic impacts over and above the provision of finance, the program envisions to drive efficient knowledge management, encompassing the generation of new development-related and sector-specific knowledge, advancing the adoption of global best practices, as well as driving capacity enhancement across stakeholders.

Right from the conceptualisation of the program and through the Maturation Phase there has been emphasis on introducing and strengthening global best practices of project design, implementation, monitoring and evaluation, community engagement, as well as environmental and social safeguards in the program. This is done by the provision of technical assistance to the 12 Smart City SPVs in the program. The experts work with their cities to refine project quality in line with the CITIIS principles of participation, integration, and innovation. With strong emphasis on new strategies for partnerships and collaboration, and enhancing institutional capacities for implementing projects, these experts have identified and contributed a vast number of global good practices to address a variety of urban challenges. Apart from the technical assistance, the PMU also takes the lead in disseminating best practices for learning and knowledge transfer.

This resource book comprises five good practices in Urban E-Governance and ICT from different regions of the world, shortlisted and documented in detail from the inventory prepared for the CITIIS program. CITIIS shortlisted the good practices for their specific characteristics, aligning with the values propagated by the program.

### Inclusion
Projects that targeted infrastructure creation in disadvantaged regions (equity and territorial cohesion), vulnerable communities (service access for all), and for the poorest (financial inclusion).

### Innovation
Projects that include measures that apply an approach beyond the common practice on urban governance.

### Governance
Projects that target effective sectoral governance (planning, financing, management rules) for operations and maintenance, and sound technical choices to boost local economies at a reasonable cost and over the long term (resilience).
### Sustainability
Projects that were designed to ensure safety, maximise positive impacts on the environment, and avoid, mitigate and compensate for the negative impacts.

### Physical Infrastructure Development
Physical Infrastructure Development – Projects that support new infrastructure creation to support initiatives led by Information and Communication Technology.

These good practices have specific characteristics of e-governance measures that can effectively support decision-makers in a greater uptake of innovative approaches to promote inclusive, resilient, affordable, and accessible healthcare systems. They are listed below for quick reference:

1. Enhancing Monitoring, Surveillance and Prevention of Malaria using Digital Platform, MosQuIT, India
2. Promoting a Healthy Lifestyle among Citizens, Estaciones Saludables (Health Stations), Buenos Aires, Argentina
3. mHealth Initiative Improving Community-Level Health Systems, ReMiND (Reducing Maternal and New-born Deaths), India
4. E-Government Strategy to Create a Centralised Healthcare Database, E-Health Infrastructure, Estonia
5. Use of Artificial Intelligence in Disease Management, AccuHealth, Chile
In our endeavour to promote sustainable urban infrastructure development, NIUA through the CITIIS program is facilitating the mainstreaming and adoption of good practices across the sectors of mobility, public open spaces, social innovation, and urban e-governance. This is the third resource book in a four-part series that aims to share city-level learnings and experiences from various urban e-health projects implemented across the world — ranging from building centralised healthcare databases to creating apps to monitor the spread of diseases, as well as innovative projects that use AI for disease management. I hope readers will find this book a useful resource.

The potential for information and communication technologies to revolutionise urban governance, e.g., by increasing access, management and oversight of services, has long been recognised. However, changing existing governance and government mechanisms to embrace new tools and technologies is not a simple task. In Kochi, the CITIIS project is boldly implementing an electronic health management system (e-health) across 13 public sector healthcare facilities, with the goal of making hospitals more efficient and effective in serving their clients. This needs multiple stakeholders, from patients, doctors, nurses, laboratory and other hospital staff to administrators, to embrace digital tools as part of the interactions between patients and the healthcare system. The CITIIS team in Kochi has worked with these diverse stakeholders in each facility, as well as hardware vendors and the e-health system developers (Kerala State Health Department) to ensure the success of this project. The CITIIS e-health project is not only expected to improve patient journeys in seeking healthcare, but also provide lessons for future e-governance initiatives that involve the digital transformation of existing practices.
Urban e-governance and ICT form the cornerstone of urban development as we embark on an era of data-based decision-making. Of the many facets and use cases, its relevance to the health sector cannot be overstated. The COVID-19 pandemic has further highlighted the significance of coordinated, seamless and accessible healthcare. The Kochi e-health project envisages to develop an IT-enabled integrated framework in order to ensure efficient health service delivery to the citizens and provide a centralised database of healthcare information allowing close monitoring and control measures. An ambitious initiative conceived with the objective of modernising the public healthcare domain in Kochi, this project will ensure optimum use of resources while enhancing patient experience, thereby improving the daily lives of citizens.

The CITIIS program is underpinned by the core values of sustainability, participation, integration, and innovation in urban development and has encouraged the SPVs to develop contextual and innovative solutions by collaborating with end-users in co-creating solutions. In this endeavour, we encourage the adoption of global best practices, city-to-city networking, peer learning and knowledge sharing. This documentation comprises five good practices in urban e-governance and ICT from around the world, selected from an extensive and evolving repository of good practices and prepared jointly by the CITIIS Program Management Unit and the technical assistance cohort.
Urban E-Governance and ICT– Tools for Transformative Governance

Feature Article

In the past few decades, Information and Communication Technology (ICT) has been widely accepted as a tool for transforming urban governance in cities across the world. E-governance, also known as electronic or digital governance, refers to the use of ICT to deliver government services to citizens and businesses more effectively and efficiently. It is being recognised as an effective mechanism for achieving public ends by digital means.¹ E-governance provides a quick and flexible response to understanding urban challenges, and have a more regular interaction between citizens and government authorities. This not only helps to improve the efficiency of services provided by local authorities, but also promotes inclusiveness and competitiveness.

ICT, with its diversified application in urban management, has provided a major thrust to develop a robust welfare system. With the coming of the digital age, tech-savvy citizens, and a demand for better and timely access to infrastructure services, ICT acts as an enabling technology for stimulating the social and economic development of cities, and developing efficient service delivery mechanisms. The increased realisation about the efficiency of ICT has led individuals, organisations and state governments to deploy these tools in providing better services and improving governance mechanisms. The inherent capability of ICT to make systems faster, cost-effective, efficient, and transparent has further helped in promoting policy integration, enhancing public accountability, providing equitable and public services for all, and attaining sustainability measures. The ultimate goal behind employing ICT in urban governance is to make governance oriented towards the common people, and develop transparent and accountable service delivery mechanisms.

Role of ICT in Urban Governance

The role of ICT in governance should be viewed as a means of assisting with decision-making processes and policy for better development of cities. It necessitates collaboration between government authorities at all levels, from the national to the regional, inter-regional or local, as well as citizens and socio-economic actors. Thus, ICT plays a critical role in facilitating the essential flow of information and knowledge sharing, reducing inefficiencies, and encouraging network development, while promoting social and territorial cohesion.

According to a joint definition framed by International Telecommunication Union (ITU) and United Nations Economic

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Commission for Europe (UNECE), “A smart sustainable city is an innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.”

Given the recent processes of socio-economic transformation, the importance of ICT in local governance in urban planning is that it supports innovative models of urban management by providing effective tools, technological resources, procedures, and appropriate forms of action, to create favourable conditions to assist decision-making groups. Further, the adoption of ICT modes allows for an enhanced interaction between local government authorities and citizens through active citizen engagement and participation at the decision-making level. By strengthening the technical bases and capacity to deal with planning instruments, implementation, monitoring, and evaluation systems, ICT contributes to the integration of policies within the larger governance framework.

ICT and Sustainable Development Goals

The scope of ICT in the fulfilment of the Sustainable Development Goals (SDGs) is recognised in a report prepared by UN Habitat in collaboration with Ericsson, titled ‘The Role of ICT in the proposed Urban Sustainable Development Goal and the New Urban Agenda.’ The report outlines the three major areas that are necessary to produce an ICT-enabling environment for more prosperous and efficient cities – effective governance systems, infrastructure and technical platforms and people, resources and capacity building. These would further support the fulfilment of the 11th Sustainable Development Goal (SDG), ‘Making cities and human settlements inclusive, safe, resilient and sustainable’, and enable transformative change across various sectors of urban areas, their policy-making, and the structural operations of governance. ICT encourages development through an effective governance system, as the precursor requires efficient technologies, policy measures and a proper legal framework. In reality, it is difficult to transform the entire urban governance into digitally enabled platforms.

UNECE, Housing and Land Management, Sustainable Smart Cities. Available at: https://unece.org/housing/sustainable-smart-cities
without conscious civic engagement. More prominently, e-literacy is the most crucial factor to consider. It is often experienced that a new technology-based facility is made available in the city, but citizens are not capable enough to utilise it. Therefore, to harness the benefits of ICT to the maximum level, proper training, education, and awareness are to be developed.

- **Effective Governance Systems**– There is an increase in ICT tools in key government policies and service delivery systems in cities. It requires the establishment of comprehensive policy frameworks to guide local, state and national governments, and non-state actors in creating a favourable environment for ICT usage in cities. Some of these frameworks focus on policy measures and guidelines, legal frameworks, and guidance for infrastructure development. Through the use of ICT tools, policy-makers can strengthen governance systems by supporting a bottom-up approach that allows for better public participation in taking key decisions for a city. Thus, ICT-based platforms can ensure effective coordination and interaction between a government and its citizens.

- **Infrastructure and Technical Support**– To create an enabling environment for ICT in the implementation of key policy decisions, and guide city governments, other state and non-state actors, it is necessary to identify and develop key ICT infrastructure. The existing insufficient infrastructure systems, poor cross-sector integration, and lack of understanding of key infrastructure environment has often failed to deliver ICT-based visions. Thus, the creation of diverse data-based platforms, and the provision to collect, store and analyse city-level data are critical for transforming city life and take informed decisions. Accessibility to data can further empower citizens and authorities in bridging the existing gap in knowledge sharing.

- **People, Resources and Capacity-Building**– The lack of affordability, accessibility, and digital literacy may exacerbate the digital divide that exists in the country. To eliminate the urban inequality in cities, it is critical to focus on the excluded and marginalised groups, and better equip and train them with ICT tools. ICT tools, if effectively communicated to all sections of the society, have the ability to transform the social and economic status of communities. They can serve as a learning tool and provide crucial support to otherwise neglected segments of the population in key social indicators such as health, education and welfare activities.

### Shift from Municipal E-Governance to Other Social Services

Municipal e-governance in India was initially oriented towards the automation of departmental operations, with the major thrust areas confined to the collection of property tax, financial accounting, and management of works and building plan approval. E-governance has basically three corresponding sections: e-administration dealing with government processes in the public sector, e-services focussed on the efficient delivery of public services, and e-democracy aimed at involving common people in the decision-making process. However, there is remarkable potential in using ICT tools in other key urban sectors such as health, transport, education, waste management, and water. ICT products, systems and networks are the essential drivers of productivity improvements and innovation in these key urban sectors. They can be the enablers of sustainability solutions in all networks of urban life: buildings, energy production and use, mobility, water and sewage, open spaces, education, and public health and safety. ICT innovation is also the catalyst for changes in personal, work and community life, which will be fundamental for sustainable economic development. Thus, there is great potential for leveraging societal innovation and resilience, and transforming governance to better achieve the SDGs.
Citizen-Centric Interactive Models of Urban E-Governance

Critical introspection into models of e-governance yields three independent, but mutually intersecting, constituents of urban e-governance: citizens, ICT, and ULBs and their officials. Their interdependency endorse the formulation of citizen-centric interactive models of urban e-governance. This model explains that, while citizens would be endowed with better access to facilities, single window clearance, participatory development, and first and cost-effective services, the ULBs would deal with information sharing through a common integrated platform, improved coordination, consensus generation, better revenue collection, addressing grievances, and effective management information system (MIS). The system facilitates officials to have an improved decision support system, better monitoring, efficient MIS, tracking of project progress, greater control over the mechanism, and timely audit and account management. Above all, ICT provides the digital interface which is the key actor of e-governance.

Urban E-Governance and ICT in CITIIS

CITIIS recognises that there is a growing need for Indian cities to adopt new and fundamentally different pathways to provide clean, cost-effective, and sustainable social innovation with the least environmental footprints and impacts on human health. The program recognises that there is a greater need to shift focus from only financing large-scale infrastructure, to finance projects that are less capital-intensive and have strong social and climate-related impacts, while also mainstreaming gender and innovation.

Under the theme of Urban E-Governance and ICT, CITIIS is implementing one project in Kochi to the tune of INR 19.1 crore that aim at developing a centralised healthcare management system, providing safe, secure and efficient affordable healthcare services to its citizens. The details of the project is as follows:

Kochi

e-Health Solution

Project Cost: INR 19.13 crores,
CITIIS Grant: INR 15.1 crores

In Kochi, the CITIIS project aims to provide state-of the art ICT infrastructure to foster e-health implementation. The government healthcare system has been used by 50% of the population in Kochi city, and hence, this project aims to form an integrated, ICT enabled healthcare system where a centralised digital information database and management system will be introduced in the government hospitals. This will result in an affordable and accessible healthcare system in the city. The following are the components of the project:

1. Implement an electronic health solution in government hospitals
2. Develop a centralised healthcare management system
3. Provide affordable & quality healthcare services to the citizens
4. Ensure safe, secure and efficient health services in city’s primary and family health centres, and district hospitals

Other important components of the project include installation of IT and network equipment in 12 government hospitals for eHealth Implementation. Additionally, 10,000 new Unique Health Ids will be generated/issued for patients that will have all their health related data. A pilot that is being implemented under this project includes installation of three health kiosks. Citizens can use these kiosks to conduct basic medical tests.
Mobile-based Surveillance Quest using IT (MosQuIT), India

Enhancing the monitoring, surveillance and prevention of malaria using a digital platform

Summary
Mobile-based Surveillance Quest using IT (MosQuIT) is a digital platform and disease surveillance system for malaria. The project was developed by the Centre for Development of Advanced Computing (C-DAC), a government agency of the Indian Ministry of Communications and Information Technology, in collaboration with the Indian Council of Medical Research (ICMR), to address the challenge of monitoring and assessing the spread of malaria, especially in remote parts of the country, particularly the North-Eastern states of India. It allows for efficient data collecting, updating, and collation for a centralised repository, decreasing the time it takes for information to spread and the State Health Department to take necessary action.

Project Background
In India, malaria poses a tremendous challenge for the entire public health system due to its spread and mortality rate. In 2013, the number of malaria cases was reported to be 0.88 million and the number of deaths 440000 (National Vector Borne Disease Control Programme, 2016). However, experts raised a question on the

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Key Values:

Innovation
Governance

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official estimated figures of malaria cases and deaths, and warned that incidence is said to be between nine and 50 times higher and mortality around 13 times greater than what was officially reported (Hay, Gething & Snow, 2010; Dhingra et al., 2010). To ensure better monitoring and assessment of the spread of the disease, the Centre for Development of Advanced Computing (C-DAC), developed the MosQuIT platform for malaria surveillance and streamlined the otherwise manual malaria surveillance process undertaken by the National Vector Borne Disease Control Programme’s Accredited Social Health Activist (NVBDCP/ASHA) workers in rural India.

The project has four main objectives:

- To provide a real-time snapshot of malaria incidence in a community
- To detect changes in malaria incidence distribution to initiate an appropriate health-system response
- To ensure transparency and accountability across the value-chain; and
- To measure the effectiveness of anti-malaria interventions and assess health system needs, such as stocks of medical supplies, in real-time.

The principles and policies that govern the national surveillance programme administered by Accredited Social Health Activist (ASHA) are used by MoSQuIT.

Meeting the Needs of Diverse Stakeholder Groups

The development of MosQuIT integrates the needs and services of multiple stakeholder groups that work at various levels of the health system in India.

- ASHA Workers – The first category of users of the MoSQuIT application are ASHA workers who are located in remote parts of the country and are the points of contact between C-DAC and the population residing in an area. The ASHA workers take blood samples to carry out a malaria detection test. Rather than relying on the conventional paper-based processing of health forms, the platform allows ASHA workers to gather patient data using a mobile phone application and upload the data on a central server immediately. The platform also provides training videos and audio clips on how to conduct tests, take precaution during an epidemic, and encourage health prevention.

- Malaria Lab – The second category of users are the ‘laboratory technicians’ located in the partner health centres of a particular state. The lab technicians perform various laboratory examinations based on the blood samples collected by the ASHA workers and confirm the presence of malaria cases. By delivering instant lab results for each patient, the platform provides ASHA workers with quick feedback on the status of malaria in an area. This further facilitates a prompt and timely reaction to disease monitoring.

- Public Health Governance and Research Staff – By collecting centralised health information, the automatic analysis transforms individual patient records into a real-time snapshot of the status of malaria spread in a community. Medical officers, who are the third category of users, can further use this information to swiftly identify, prevent and manage malaria outbreaks, and make recommendations to state and national authorities. In addition, the system examines a wide range of malaria indicators, emphasising key patterns such as regional incidence distribution, healthcare performance, and so on.
Enhanced Surveillance and Monitoring

The platform makes the processes of surveillance easier by collecting data through a mobile phone platform, transmitting data to a centralised system, followed by analysis and reporting. Through a cycle of reporting and analysis, the platform helps monitor, plan for control measures, and help detect both spatial and temporal changes of the disease spread. The data collected in the centralised system activates an early warning system for detecting and identifying potential outbreaks that occur frequently in a particular region. Though poor internet connectivity and low penetration of mobile usage among ASHA workers pose a challenge, regular video conferencing between medical teams and ASHA workers have managed to overcome the obstacles.

ASHA workers training on the use of MoSQuIT. Picture credits: Samir Abdelkrim, Field Survey Report for the Global South e-Health Observatory

The mobile-based application showing the analysis phase, where the user has the option to add more data and see the results instantly. Picture credits: Samir Abdelkrim, Field Survey Report for the Global South e-Health Observatory
Financing and Business Model
The MoSQuIT project is funded by C-DAC and ICMR. The application is completely free for the users and the main cost of the application is borne by C-DAC’s server hosting cost. The mobile phones are distributed to the ASHA workers for free. The cost of the internet package, remuneration, field trips and training of ASHA workers is funded by C-DAC.

Impact
With the use of technology, the project enhances transparency, communication, and trust among diverse healthcare professionals. The mobile-based application allows them to track and treat nearly 200 new patients each month. The time taken by laboratory technicians to transmit the results back to the ASHA workers has reduced to one day, instead of the previous average of 21 days with the paper-based data collection method. Further, it now takes only an hour for medical officers at ICMR to obtain a full epidemiological report from the database, instead of 30 days on an average using the conventional paper-based method to collect data. The platform has helped take the healthcare system to the grassroots level and remote parts of the country. The digital system has effectively reduced the time taken to collect and analyse health records. Further, the effective communication and coordination channel between multiple stakeholder groups such as ASHA workers, lab technicians, medical officers have helped streamline the process. The prompt reaction towards detecting and controlling the disease has also allowed for better monitoring and supply of medicines in an area. The project has received numerous awards such as the Open Group 2018 Competition, the e-Assam Challenge 2015, the 5th e-North-East Technology Award Summit 2014, the m-Billionth Technology Award, and the SKOCH Group’s Order of Merit.

Lessons Learnt
The MoSQuIT example shows how a simplified technology platform that collects data from various care providers along the patient care continuum may improve disease monitoring efforts. In a developing country like India, where the health system lacks efficient data collection and monitoring, integrated data gathering combined with real-time analytics can aid in the detection of disease outbreaks and prompt a speedier reaction from the healthcare system. The successful implementation of the project shows there is further scope to expand it to the surveillance of other diseases such as dengue fever, Japanese encephalitis, and AIDS.
Estaciones Saludables (Health Stations) – Buenos Aires, Argentina

Promoting a healthy lifestyle among citizens

Summary
Three quarters of deaths in Argentina occurred due to non-communicable diseases such as obesity, diabetes, high blood pressure, and high cholesterol. In a bid to prevent such deaths and unhealthy lifestyle practices among the citizens of Buenos Aires, the city government launched the Health Stations programme under the larger ambit of the public health initiative, Desarrollo Saludable (Health Development). Launched in 2012, Estaciones Saludables is a programme to promote healthy diets and living habits. Under the programme, health stations are located around main parks and squares to provide healthy habits consultancy services, accessible to residents in all neighbourhoods. Since its launch, the programme has reached more than 1.2 million people.

Use of Public Spaces and Neighbourhood Facilities
The Buenos Aires city government through the Estaciones Saludables programme offers free preventative health screenings and nutrition counselling for all residents. The programme is centred around three goals:¹

- To ensure access to routine health

¹ Wellness Stations, Buenos Aires: Urban Food Policy Snapshot. Available at: https://www.nycfoodpolicy.org/
· To promote health equity providing free preventative healthcare
· To support and facilitate healthy lifestyles through nutrition information and fitness resources

The health stations are intentionally constructed in busy public spaces such as train stations and parks throughout the Buenos Aires city. Citizens can visit the stations at any time of the day and get weight, height, blood pressure and blood sugar measurements, as well as nutrition counselling free of cost. Each of the stations has a dedicated team of doctors, nurses and nutritionists, who guide residents on eating habits and healthy lifestyles. Some stations are also equipped with fruit vending machines to encourage healthy snacking. Since the stations are located on the daily route of many residents or at a walkable distance, visiting them does not involve additional transportation costs. Strategically locating the health stations in the residents’ neighbourhoods has generated interest in free usage of the health facility.

**Activity-Focused Initiative**

Under the programme, health stations are central to the promotion of healthy habits, detection of risk factors, identifying poor diet, and prevention of heart diseases and stroke. Various activities are organised around the health stations for people belonging to different age groups. Based on the specific age criteria, people participate in healthy living movements. Food and sports initiatives are supported by free services, such as the use of the health stations to celebrate healthy birthdays for children under the age of 12, and the free rental of sports equipment through Puro Movimiento (Pure Movement). Weekends are utilised for the elderly with free sports activities, games, dancing, and cognitive workshops for memory exercises. Apart from physical exercises, nutrition talks are organised with the help of doctors and nutritionists to promote healthy eating habits and update people on seasonal fruits and vegetables.

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*A doctor providing consultancy services in a health station located in a neighbourhood park. Picture credits: Silvia Marta Velito*
People engaging in different types of physical activities and programmes. Picture credits: Silvia Marta Velito

The wellness stations are designed in bright colours and use pictures for the health awareness campaign. Photo credits: Telam Digital, Iniciativa
Rooted in Social and Health Equity

The programme by providing free health services to all the residents of the city ensures social and economic equity. It focuses on a preventative healthcare service, rather than reactive services. The free access to the health services has also removed the tentative barrier of incurring extra costs that the city’s residents faced. Though the city government started the stations as a city-based initiative, there is a strong political will to promote similar activity at the national level and there have been plans to extend the programme beyond Buenos Aires. The programme through its strong commitments and targets demonstrates the government’s focus on the importance of nutrition and routine health screening.

Impact

The health stations being spatially located at the neighbourhood level have proved to be a quicker and easier way to access a health facility regularly. After two years of its implementation, a study found that half a million Buenos Aires residents had used the public services. The exercise activities (yoga, stretching, walking groups) appear to be almost entirely populated by women, primarily local. In a health study conducted in 2014 to measure the impact of the programme, it was observed that people reported to have checked their blood pressure and blood glucose levels more frequently than they earlier used to. For instance, 88.4 percent of the respondents reported having checked their blood pressure more than once a month at different locations during the past three months, and 78 percent had done so at a health station. Further, the percentage of young people who reported to have learned healthy lifestyle habits and the importance of healthy eating increased significantly. Moreover, the programme facilitated periodic blood pressure and blood glucose monitoring in chronically ill patients, some of whom did not do this prior to visiting the stations.

Lessons Learnt

Promoting a healthy lifestyle is the backbone for achieving equity, reduce economic expenses, and promote social justice. To create healthier cities, it is important to improve the quality of life of people and increase their well-being by encouraging them to accept responsibility for maintaining and monitoring their own health. The Health Stations programme is a remarkable example of a neighbourhood-level programme that can significantly alter the health system of a city, especially in post-COVID times and with rising non-communicable diseases.

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Children’s play area outside a wellness station. Picture credits: Buenos Aires, Medios de La Ciudad.

2 Wellness Stations, Buenos Aires: Urban Food Policy Snapshot. Available at: https://www.nycfoodpolicy.org/buenos-aires-wellness-stations/

ReMiND (Reducing Maternal and Newborn Deaths), India

An mHealth initiative improving community-level health systems

Summary
The ReMiND project was launched in 2011 to address the lacunae in the Accredited Social Health Activists (ASHAs) program to reduce the maternal and infant mortality rates in rural areas. The program was launched by Catholic Relief Services with other supporting partners to check the low level of literacy amongst ASHA workers and poor management structure. The project focuses on the prevention and well-being of pregnant women and new mothers. The digital mobile phone-based technology used in the project has led to improved access to care and delivery of timely results, and motivated behaviour change among the rural population. Over the last several years, the project has effectively contributed to saving lives by providing better and cheaper access to health services.

Project Background
In the absence of adequate and proper health services in rural parts of Uttar Pradesh, pregnancy-related complications took the lives of or affected the living condition of mothers, their infants, and families. Even though the Government of India launched the Accredited Social Health Activists (ASHA) program to provide guidance on maternity and pregnancy-related care in remote parts of the country, the low literacy levels and massive time gap created a challenge for receiving a speedy and effective response. Using a mobile-based health technology (mHealth), the ReMiND project aims to provide key healthy practices and care pertaining to maternal, new born and children’s nutrition. The objectives of the project include:

An ASHA worker counsels village women on maternal healthcare services as part of ReMiND. Photo credits: Jen Hardy, Catholic Relief Services, The Leaven.
- Coverage of the ASHA (i.e., increase the number of pregnant women who are visited at least once by an ASHA)
- Frequency and quality of counselling provided to pregnant women by ASHA workers
- Better knowledge of danger signs in pregnancy and postpartum.
- Adoption of key maternal, new born and child health and nutrition practices for women during pregnancy and postpartum (e.g., the number of antenatal care (ANC) visits, Tetanus Toxoid (TT) injections, care seeking for danger signs, and appropriate breastfeeding)

Keeping in mind the low literacy levels among ASHA workers, the mHealth app was redesigned to include pictures and videos on maternity care.

The ReMiND Project: Reducing Maternal and Newborn Deaths: Implementing the principles for digital development, Catholic Relief Services (CRS), 2017.

User-Friendly Application
Catholic Relief Services credits the project’s success to the user-friendly apps being developed and the structured interpersonal communication methods that improved the effective response of ASHA workers. The project involved the development of two apps:

- **The ASHA app**: A phone-based counselling job aid to support the ASHA workers to mobilise the beneficiary to access health services.
- **The Sangini app**: An app that helps the ASHA supervisors to supervise and support the ASHA’s work, according to a ten-indicator list.  

Pregnant women are registered and followed throughout their pregnancy, birth, and postpartum periods, with infants and small children being monitored through their second year of life. As soon as a birth is reported in a community, ASHA workers receive an SMS reminder to make postpartum visits on a regular basis until the delivery is recorded in the system. ASHA workers, with the apps installed in their Android phones, maintain and record the data of all the pregnant and lactating mothers in a community. The apps serve as an effective platform for knowledge sharing and data

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storage for rural health workers. Further, using an already prepared checklist of health behaviours, the application provides easy access to ASHA workers to counsel young mothers and families on the steps to be taken and considered for better maternity care. The application also has an inbuilt feature that plays an audio recording of a native ASHA worker reading the questions aloud to the women.

The large ASHA worker meetings which involved more than 100 participants, including workers, supervisors, and local government officials, now conducted smaller number of meetings involving with 20 ASHA workers and a supervisor. This has allowed ASHA workers more time to share field-related concerns with the health authorities and greater opportunities for problem-solving.

Scaling Up of the Project
The ReMiND project aligns closely with state government interventions to provide better maternity care at all levels of the health system. Catholic Relief Services (CRS) provided private funds to support the start of the ReMiND project in 2012 in one of the districts of Uttar Pradesh. Later, with the help of USAID funding, the project was scaled up to cover a second district in 2013. Initially, the application was designed for ASHA workers, however, the National Rural Health Mission in Uttar Pradesh requested CRS to build another app for the government-led cadre of ASHA Supervisors. The Sangini application was then designed for ASHA supervisors, facilitating the direct role of state health authorities in the implementation of the project. To avoid the huge economic cost of providing each ASHA worker with a phone, the state authorities provided each ASHA supervisor (1 for 20 ASHA workers) with a phone. This served as an efficient touchpoint to connect with other ASHA workers in an area and helped in meetings with ASHA workers at block-level primary health centres.

Data and Technology as Enablers for Better Health Services
By using a simple mHealth mobile-based application, the ReMiND project focuses on improving care management at the community level. The interoperable data and health platforms as part of the project have helped in modifying the traditional
data collection methods and strategies. The mHealth application ensures a user-friendly interface for ASHA workers and their supervisors for collecting data. To ensure that ASHA workers are well-equipped and aware about the application usage, Catholic Relief Services conducts regular workshops for them. The app serves as an effective and engaging tool for ASHA workers to counsel women and their families on prenatal care, delivery, and postnatal care. The custom reports generated as part of the project are further used to discuss the performance of ASHA workers and resolve their problems.

Impact
The impact of the ReMiND project on maternal and infant health has been significant. Since the implementation of the project, awareness of delivery danger signs amongst pregnant women who participated in the program has increased. Some studies indicate a 12.7 percent increase in iron-folic acid consumption, a 12.5 percent rise in identification and self-reporting of complications during pregnancy, and a 15.5 percent increase in after-delivery checks such as blood pressure measure, ultrasound and abdominal checks.\(^2\) Further, in the first two years after the project’s launch, 28 percent more women were likely to receive a counselling visit from ASHA workers and 15 percent more pregnant women received a visit from ASHA worker. Even though the ReMiND project is implemented at the community level, the results and potential benefits are visible at the district and state levels in terms of better maternity care. The success of the project can be seen from the potential interest shown by other states in initiating a project on a similar model. For instance, at the National Health

\(^2\) Digital health technology – Global case studies of health care transformation. A report from the Deloitte Center for Health Solutions.
Lessons Learnt
The ReMiND project has been transformational in increasing the ASHA workers’ coverage amongst the rural population of the country. The project’s success lies in its creation of a strong linkage among women, ASHA workers and ASHA supervisors. With the help of data-driven tools and technology, ASHA workers have managed to successfully implement the program’s core objective of improving maternity care through counselling not just pregnant women but their in-laws and other family members who influence decision-making on healthcare and delivery. India, which is still grappling with challenges in providing better health services in remote parts of the country, needs such transformative programmes to truly revolutionise the healthcare system and provide better and cost-effective services.
E-Health Infrastructure, Estonia

E-government strategy to create a centralised healthcare database

Key Values:
- Innovation
- Governance
- Inclusion

Summary
The Electronic Health Record (e-Health Record) is a powerful tool that integrates data from Estonia’s different healthcare providers to create a centralised common record of patients. The Government of Estonia began to develop e-health infrastructure in the early 2000s after its successful initiatives in other e-government services in tax, voting, education, healthcare and public safety. The first e-health service was launched in 2008. The national database retrieves patient data from various healthcare providers who might be using different platforms and systems, and collate the data into a standard format via the e-Patient portal.¹

¹ Patient Portal. Available at: https://www.digilugu.ee/login?locale=en
**Strong Reliance on Digitalisation of Health Records**

The four major components of the e-health service included:

- Creating a centralised database for electronic health records to collect data on patients’ diagnoses, lab tests, procedures, and prescriptions. This enabled providers across Estonia to easily access patients’ health records.
- Provision of digital registration services to support digital referrals and patient appointment scheduling
- Initiating a digital image program for archiving and developing a communication system for collecting and exchanging medical records that included X-ray images
- Issuing digital prescriptions for providers and pharmacies to manage patient health database

Each person who has visited a doctor in Estonia has an online e-health record that can be easily tracked. After feeding a patient’s health records in the centralised database, doctors can access the records from a single electronic file, read test results, and prescribe medication even from remote hospitals.

For example, in emergency situations, using a patient’s e-Health ID code, a doctor can access important health information such as their blood type, recent or on-going treatments, and past medical history. In order to support e-health initiatives that included the mandated use of Electronic Health Record (EHR) by providers, compulsory citizen health ID cards, data security and access requirements, and an entirely new legal framework were formulated by the government. These included Estonia’s Health Information System Act (2007) and Government Regulatory Act of Health Information Exchange (2008).

**Prompt and Timely Response to Healthcare Service**

Apart from doctors and state authorities accessing the data, a patient can access their own health records. There is a provision for guardianship and authorisation access by parents for underage children and people who cannot access their health data. By logging into the e-Patient portal, a patient can enter his electronic ID card number, review doctor visits, current prescriptions, and future prescribed medications. This allows for a more proactive response to...
health matters. Patients can save valuable time by having a doctor on call and being issued an e-prescription which can be shown at the pharmacy to get medicines. Further, the e-ambulance system allows for a rapid response to track a patient’s location and provide emergency support on the spot.

Centralised Database
The Government of Estonia built a dedicated centralised data architecture and provided a secure environment for data collection, storage and transfer. After developing the centralised database, Estonia introduced additional e-health initiatives that further supported the integration of healthcare services. These included:

• Using anonymised population-level data in statistics services to conduct public health research and frame policy recommendations
• Creation of an e-ambulance system that enabled emergency teams to access a patient’s medical history and make informed treatment decisions
• Developing and integrating a decision support system that uses an e-prescription database and provides drug-related warnings to physicians prescribing medicines

Embedded with Security Principles
Since developing an e-health system requires immense security at the centralised level, Estonia relied on using blockchain technology. Access to e-health data required an authentication with ID card or digital signatures. Personal data was separated from medical data with an encryption system and monitoring of actions, which helped users know who accessed their health data. This not only ensured data integrity but also helped mitigate internal threats to accessing the medical data of patients. The six main security principles embedded in the Estonian e-health system are:

• Secure authentication of all users with ID card or Mobile ID
• Digital signing or stamping of all medical documents
• All actions leaving an unchangeable and unremovable secure trail to ensure transparency
• Coding of personal data
• Encrypted database that allows removal of the confidentiality risk from the technical administrators
• Monitoring of all actions together with the corresponding counter-measures, both organisational

Impact

Estonia has successfully managed to digitise 99 percent of its health data. 99 percent of patient prescriptions are digital and approximately 2.3 million queries are addressed by doctors every month. One of the reports suggested that after the integration of the e-prescription database, an estimated 15-17 percent of prescriptions changed in response to the warnings provided by the decision support system. The integration and digitalisation of health data has also provided critical support to the national government by measuring health trends, tracking recurring diseases, and formulating health policies accordingly. The centralised e-health system provides an opportunity to integrate the existing system with other systems such as the genome centre, which can enable personalised treatment. Further, there is an opportunity to integrate this with environmental indicators, which can potentially help in mapping public health outcomes to environmental factors.

Lessons Learnt

Estonia’s realisation of the e-government vision in transforming its healthcare system lies in the availability of technical expertise, continued support and political commitment from the government, digital literacy of the public, and trust in the government. The e-health system not only provides a cost-effective and efficient solution to tackle health crises, but also facilitates a shift towards a preventive approach to healthcare, rather than a curative one. The healthcare services have also allowed citizens to avoid high out-of-pocket expenditure, thus, showing how e-health services can lower costs and provide cost-effective healthcare.

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5 E-Estonia, Healthcare statistics. Available at: https://e-estonia.com/solutions/healthcare/e-health-record/
6 Sikkut, Learning from the Estonian e-health system.
AccuHealth, Chile

Use of artificial intelligence in disease management

Summary

Chile-based healthcare management company AccuHealth initiated an artificial intelligence (AI) powered remote monitoring system to manage health data in Chile. The project, started in 2009, performs real-time assessment and monitoring of health data, prioritising high-risk patients, and providing immediate intervention. Using telemedicine technology, AccuHealth provides healthcare facilities to healthcare institutions and patients at their own place. The patient-centric tele-monitoring services have been successful in delivering affordable healthcare services in rural and peri-urban regions of the city. The project is a part of the Business Call to Action (BCtA) initiative, a global initiative that encourages companies to fight poverty through inclusive business models. The project is supported by the United Nations Development Programme (UNDP) and other international organisations.
Targeting Non-Communicable Diseases
Close to 5 million people suffer from chronic health conditions in Chile. The health expenditures in Chile constitute around 7.7 percent of the country’s GDP. With a rise in non-communicable diseases (NCDs) among the poorest sections of the country, particularly because of obesity, there is greater demand for quality healthcare facilities. The huge out-of-pocket expenditure on health-related complications such as diabetes and high cholesterol levels has led to significant loss of productivity among the country’s population. In response to the rising NCDs, AccuHealth aims to provide patients with telehealth monitoring service at an affordable cost. The company uses big data, predictive modelling, and data mining to produce an evidence-based health monitoring service for patients. It enables hospitals and clinics to enhance bed rotation, improve patient management, and expand specialised regional coverage. Simultaneously, it allows insurance companies to better manage their clients’ health requirements, minimising the occurrence of medical crises, and keeping expenses under control. This inclusive health model further supports SDG 3: Good Health and Well-Being.

Strengthening the Capacity of the Healthcare System
AccuHealth collaborates with major health institutions to improve health practitioners’ ability to better serve patients while also providing timely access to treatments. Working with a wide variety of medical instruments that helps to connect with telemonitoring system, AccuHealth allows easy access to data for patients that they can access from their homes or nearest telemonitoring centre located inside a medical facility. The registered patients are provided with a portable, user-friendly telemonitoring device with a set of biometric sensors. With an installed user-friendly interface, patients can monitor their blood pressure, blood glucose, and temperature. To provide a better understanding on how to use the device, patients are trained and guided on the interface usage and handling of device according to their needs. The device captures both quantitative and qualitative data on patients’ development through custom-created questionaries by health professionals demonstrate the handling and usage of a device. Picture credits: Facebook, AccuHealth.

1 Deloitte Center for Health Solutions interview with AccuHealth executive, April 29, 2019.
2 AccuHealth, Business Call to Action, UNDP.
practitioners. The data which is collected is then transferred to a telemonitoring centre, where AccuHealth specialists evaluate it before relaying it to the patients’ primary care physicians. A secure network database ensures that information is kept safe throughout the processing and storage of data.

**Evidence-Based Monitoring**
Remote monitoring by AccuHealth is based on medical evidence and patient participation in the project. The AI-based platform anticipates disease-related occurrences and treats them according to each patient’s individual health profile, diagnosis, and surroundings, resulting in a higher quality of life. The strategy emphasises on handing over illness management to patients and providing 24/7 emergency care to the people. The innovative healthcare model not only provides vital and accessible information to medical staff, but also reduces costs for health insurance companies, and offers people a better quality of life. The telehealth care facility follows a preventive and proactive model by informing patients on the next line of action.

**Impact**
Before rolling out the project on a large scale, AccuHealth conducted several pilot projects in Chile. The company attended to around 2,000 patients with non-communicable diseases who are served by the national health insurance programme of Chile. These patients were mostly affected by diabetes and hypertension, and more than 40 percent of them belonged to the low-income category. Successful implementation and a positive response from the people led to AccuHealth proposing to expand the model within Chile and to Colombia and Mexico in 2015.
Lessons Learnt

Good Health and Wellbeing are part of the Sustainable Development Goals. To ensure the social and economic development of a country, it is necessary to focus on the poorest sections of society and address their immediate and long-term health needs. AccuHealth provides a successful example of an inclusive healthcare model on how the private sector can be accommodated in the healthcare system and fill in the existing gaps.
City Investments to Innovate, Integrate, and Sustain (CITIIS) is a sub-component of the Smart Cities Mission. Launched in 2018, it is a joint program of the Ministry of Housing and Urban Affairs (MoHUA), the Agence Française de Développement (AFD), the European Union (EU), and the National Institute of Urban Affairs (NIUA).