FROST & SULLIVAN

\Orchestrating a brighter world

NEC

# Toward an Accessible Society for All

*~Identity for All Children and their Brighter Future~*

**LEAVE NO ONE BEHIND:**
**INCLUSIVITY THROUGH DIGITALIZATION**

VOLUME
**1**

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# Executive Summary

The United Nations (UN) has expressed its aims to "provide legal identity to all, including birth registration" by 2030 as part of the Sustainable Development Goals (SDGs), target 16.9. A significant motivator for achieving this goal is reducing the mortality rate of children under the age of 5, which is a target of SDG 3: "ensure healthy lives and promote well-being for all at all ages."[1]   Vaccine-preventable diseases, along with malnutrition, are among the major dangers plaguing young children in underdeveloped countries, where newborns are vulnerable because they are at their most crucial developmental stage.

Since June 2019, NEC, together with Simprints Technology Ltd, a UK-based non-profit social enterprise that built fingerprint scanners which work in harsh environments, has been working with Gavi, the Vaccine Alliance, on initiatives to promote vaccine immunization through scalable child fingerprint recognition. Implementing this plan with conventional extraction and matching engines is challenging, as young children's fingerprints blur because of their softness. NEC's fingerprint authentication engine, optimized for children aged 1 to 5, has achieved high-accuracy authentication to overcome these challenges. Combining the fingerprint images with vital information, such as name, age, and gender, makes it possible to verify children's identities without identification documents (IDs) through fingerprint authentication.



NEC aims to expand the target coverage of biometric solutions to children and even newborns. Through testing trials, the company's research efforts have demonstrated that its technology can identify newborns using their fingerprints 2 hours after birth.

The goal is to realize a society where every individual, regardless of age, gender, or socio-economic background, is properly represented by their unique, convenient, and accessible digital identity. Through this increased inclusiveness, unrepresented communities will have more opportunities to access the essential public services they need to live safely and healthily throughout their entire lifetimes. This will, in turn, strengthen and cultivate human capital, especially in developing countries, so that people can achieve their potential more quickly.

This white paper will examine the challenges tied to identification and how to leverage biometric technologies to get governments and aid organizations a step closer to the goal of advancing global welfare.

1 UN Department of Economic and Social Affairs, THE 17 GOALS, https://sdgs.un.org/goals

# Uncovering the Challenges of Vulnerable and Marginalized Children

**Immunization Challenges Affecting Children Globally**

According to statistics from UNICEF, in 2019, 7.4 million children and young people died, many from preventable illnesses. Almost half of the 5.2 million children (2.4 million) who died before age 5 were newborns. Because of the hindered delivery of immunization services in more than 68 countries, about 80 million children younger than 1 risk contracting fatal diseases that vaccines can prevent.[2]

Invisible communities, especially their vulnerable children, account for a significant portion of low birth registration rates in developing countries. According to global estimates from UNICEF, as Figure 1 shows, the birth of more than 166 million children under age 5 are not registered. Eastern and Southern Africa, and South Asia have the most unregistered births, as about 51 million children in each of these 2 regions lack birth registrations. In Eastern and Southern Africa, 62% of children do not have registered births. In comparison, birth registration rates are much higher in other regions, such as Western Europe, and Eastern Europe and Central Asia, where the percentages of unregistered children are 0% and 1%, respectively.
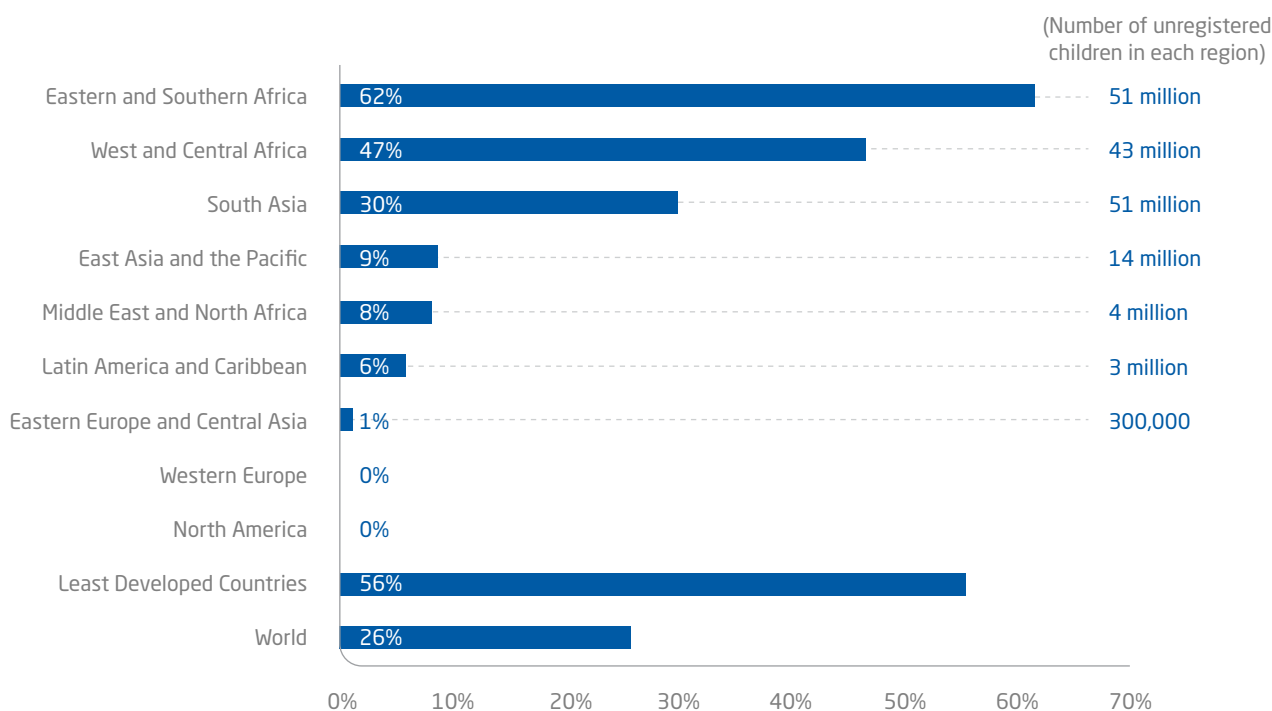
(Number of unregistered children in each region)

| Region | Percentage | Number of unregistered children |
|---|---|---|
| Eastern and Southern Africa | 62% | 51 million |
| West and Central Africa | 47% | 43 million |
| South Asia | 30% | 51 million |
| East Asia and the Pacific | 9% | 14 million |
| Middle East and North Africa | 8% | 4 million |
| Latin America and Caribbean | 6% | 3 million |
| Eastern Europe and Central Asia | 1% | 300,000 |
| Western Europe | 0% | |
| North America | 0% | |
| Least Developed Countries | 56% | |
| World | 26% | |

*Figure 1: Percentage of children under age 5 whose births are unregistered, Global, 2021[3]*

2  UNICEF, Levels and trends in child mortality 2020, https://www.unicef.org/reports/levels-and-trends-child-mortality-report-2020
3  UNICEF, Birth Registration: 1 in 4 children under the age of 5 do not officially Exist, https://data.unicef.org/topic/child-protection/birth-registration/
    UNICEF, Birth Registration for Every Child by 2030: Are we on track?, https://data.unicef.org/resources/birth-registration-for-every-child-by-2030/

The COVID-19 pandemic has compounded these challenges, as wide-scale vaccine rollout involves various vaccines from different companies, all with particular delivery schedules and dosages. In recent research, the UN Refugee Agency (UNHCR) notes the disproportional impact of the pandemic on marginalized groups because of the potential challenges they face in accessing the COVID-19 vaccines.[4] As seen in Figure 2, Covid-19 vaccine coverage varies widely by region, with lower coverage in developing countries than in Europe and Northern America.
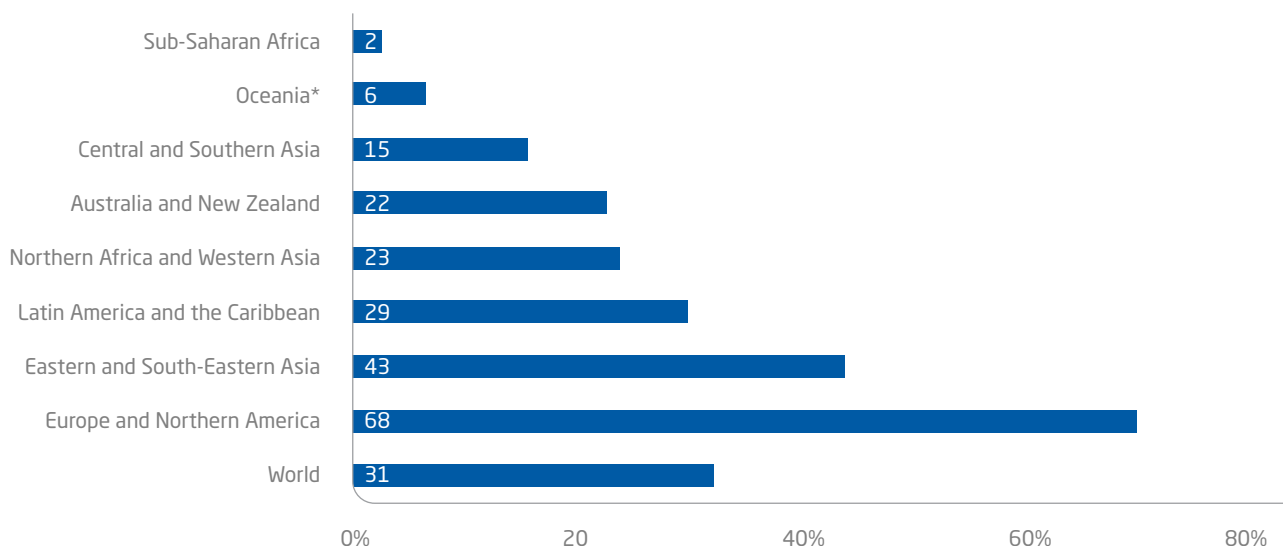


* Excluding Australia and New Zealand

*Figure 2: Number of COVID-19 Vaccines Administered per 100 people (as on 17 June 2021)[5]*

Significant challenges hinder the effective and timely delivery of vaccines. Statistics from Gavi indicate that 22.7 million children worldwide are under-immunized and miss out on essential vaccines, and 13.7 million children have not received even a single shot of vaccine in Gavi-supported countries.[6] The lack of reliable identity registration makes it exponentially harder to identify children who have not obtained their 1st vaccine dose or those that require essential follow-up vaccinations. Most times, vaccine delivery to communities in need does not occur because local health authorities cannot accurately track who already had the vaccine, when vaccination occurred, or what vaccines they need.

4 UNHCR, COVID-19 pandemic, https://www.unhcr.org/coronavirus-covid-19.html
5 United Nations, The-Sustainable-Development-Goals-Report-2021,https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf
6 Gavi, Facts and Figures, https://www.gavi.org/programmes-impact/our-impact/facts-and-figures

SUSTAINABLE
DEVELOPMENT GOALS

| 1 NO POVERTY | 2 ZERO HUNGER | 3 GOOD HEALTH AND WELL-BEING | 4 QUALITY EDUCATION | 5 GENDER EQUALITY | 6 CLEAN WATER AND SANITATION |
| --- | --- | --- | --- | --- | --- |
| 7 AFFORDABLE AND CLEAN ENERGY | 8 DECENT WORK AND ECONOMIC GROWTH | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 10 REDUCED INEQUALITIES | 11 SUSTAINABLE CITIES AND COMMUNITIES | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION |
| 13 CLIMATE ACTION | 14 LIFE BELOW WATER | 15 LIFE ON LAND | 16 PEACE, JUSTICE AND STRONG INSTITUTIONS | 17 PARTNERSHIPS FOR THE GOALS | |

**Sustainable Development Goals (SDGs) toward a Bright Future for Children**

The SDG initiatives set by the United Nations are drawing attention from across the world. In particular, this white paper presents 2 goals that are relevant to life-saving vaccines. The agenda calls for all countries working in a global partnership and based on 17 SDGs to achieve the aims by 2030. These SDGs work toward a united end goal of eliminating poverty and protecting the planet.

**3 GOOD HEALTH AND WELL-BEING**

## SDG 3: Ensure healthy lives and promote well-being for all at all ages

SDG 3 aims to achieve universal health coverage that seeks equitable access to healthcare services for all people. It proposes to end the preventable death of newborns, infants, and children under 5 (child mortality) and end epidemics. The official wording of SDG 3 is: "To ensure healthy lives and promote well-being for all at all ages."

**TARGET 16·9**
**PROVIDE UNIVERSAL LEGAL IDENTITY**

## SDG 16.9: Provide legal identity for all, including free birth registrations, by 2030

SDG 16 specifically addresses the need for personal identification through target 16.9: "to provide a legal identity for all, including birth registration" by 2030.[7]  Identification is a foundational enabler of many other vital SDGs, including SDG 3. Inclusive and accessible identification systems can serve as powerful cornerstones of social welfare, empowering public organizations to deliver meaningful services and programs with greater transparency and effectiveness.

The principal goal of a valid legal ID is **inclusion**; it will empower individuals and ensure that the system accounts for all, benefitting the individual and the country. Developing countries can advance their human capital more quickly and achieve their potential faster with these developments in place.

7 UN Department of Economic and Social Affairs, SDG 16, https://sdgs.un.org/goals/goal16

**Major Obstacles Preventing Accessible Legal IDs for All**

For a country to have a robust identification system, it is essential to have both civil registration (CR) and civil identification (CI) systems. CR systems record all relevant biographical information (e.g., name, date and place of birth, and parents' names) for a person, beginning with birth registration. CI systems include all information from CR systems and additional attributes that allow unique identification, such as photos and biometrics. CI systems then provide the necessary infrastructure to capture and record all of the attributes that uniquely identify a person.

While many developed countries have robust CR and CI systems, developing countries face many challenges in effectively implementing robust ID framework systems. The World Bank's research on Africa's identification systems highlights some of the significant barriers to rolling out robust ID systems:[8]

**Regulatory gaps**

Many African countries are still in the nascent stages of setting up robust legal frameworks to support and regulate modern identity management systems. Most lack sufficient regulations to protect personal data and uphold individual rights to data privacy while several international organizations, such as The World Bank, are making a great effort with these issues by making their own guidelines.

**Lack of funding and resources**

Many countries in this region still lack stable information and communications technology (ICT) infrastructure, such as the internet and power, thought the situation is improving, making it challenging to set up, launch, and maintain identity systems and services effectively.

**Low accessibility and coverage**

Countries in this region have not had significant success in establishing broad civil registration and identification. The barriers limiting accessibility and coverage include high costs, user abilities, and complex legal and administrative requirements. Other restraints are paper-based record systems vulnerable to damage, geographic constraints (e.g., rugged terrain and sparse populations), and a lack of demand from users.

Developing countries need to establish frameworks and mechanisms to overcome these problems before they can provide legal IDs for all. Biometrics can play a pivotal role in contributing to this effort.

8 World Bank Group, The State of Identification Systems in Africa : A Synthesis of Country Assessments, https://openknowledge.worldbank.org/handle/10986/26504

**Role of Biometrics in Powering Personal Identification**

Biometric solutions provide the opportunity to identify individuals through their unique physical or biological characteristics. Existing modalities of biometric technologies include fingerprint, iris, face, palm, and voice recognition. Developed and developing countries are evaluating biometric technologies to create national identification programs and other broad use cases, such as cash transfers, voter registration, and disaster relief.

Use of multimodal biometrics (including fingerprints, facial recognition, and iris recognition) is the ideal approach because it provides increased flexibility for enrollment and authentication and improved accuracy and efficiency for biometric deduplication. According to research by the World Bank, the percentage of surveyed countries using multimodal biometrics (fingerprint, iris, and facial biometrics) in their foundational ID system reached 40% in 2018.[9]

With the 4 core benefits discussed below, biometric identification technologies can counteract the known limitations of paper-based and digital identification methods (those that use measurable physical characteristics to verify an individual's unique identity):

**Permanence:** Biometric solutions rely on distinct physical traits such as fingerprints that are unique to every individual; facial features, which do not change significantly with age; or irises that are highly stable over time. Biometric matching algorithms compare scans of these traits to identify and authenticate individuals, often reducing the costs of re-enrollment that other traditional ID systems require.

**1**

**Convenience:** Physical keys and cards are vulnerable to loss, theft, and forgery, while digital identification involves usernames and passwords getting forgotten or stolen. Biometrics offers significant advantages for individuals requesting authorized access the various services and applications, without the administrative burden of using passwords or personal identification numbers and their associated security risks.

**2**

**Accessibility:** With biometric technology, people from different social backgrounds can obtain legal IDs to access essential services, despite literacy and communication barriers.

**3**

**Geographic coverage:** Governments can also use biometric identification technologies to improve access for those living in rural areas and reduce barriers by eliminating the public's need to travel regularly to a city to ensure that their identification documents are up to date.

**4**

*(Source: Frost & Sullivan)*

9 World Bank, Understanding Cost Drivers of Identification Systems, https://id4d.worldbank.org/Cost-Model

By utilizing biometrics, developing countries can effectively work with their citizens for wide-scale enrollment and expanded public service delivery. The World Bank has endorsed biometric identification technologies as the most efficient and accurate method of identification, especially for 2 crucial use cases: [10]

When ensuring the **statistical uniqueness of large populations**, biometric identification is the most effective method, especially in countries lacking reliable sources of identity verification.

Biometrics can provide a relatively **high level of assurance** during authentication, which plays an essential role in enhancing the trustworthiness of identity verification systems.

A compelling example of a nationally implemented biometrics-based identification system is **India's Aadhaar**.[11] Managed by the Unique Identification Authority of India (UIDAI), the Aadhaar uses the names, addresses, and multimodal biometric information of enrolled participants to equip them with a unique ID through which they can have equal access to critical public and financial services. As the most extensive biometric identification system globally, more than 1 billion individuals are enrolled.[12] India and other developing countries increasingly utilize the unique advantages of biometric identification technology to enhance the accuracy of their core identity systems and expand their identification coverage to include broader segments of the population.

10 World Bank ID4D, Biometric data, https://id4d.worldbank.org/guide/biometric-data
11 Unique Identification Authority of India (UIDAI), Government of India, My Aadhaar, https://uidai.gov.in/
12 NEC, The Number of People Registered for India's Aadhaar Program Surpasses One Billion, https://www.nec.com/en/press/201610/global_20161012_02.html

# NEC's Efforts toward an Inclusive Society

Using NEC's range of biometric authentication technologies, governments and organizations can deploy swift authentication systems with secure access models and enhanced security through NEC's biometric authentication technologies. These authentication systems will enable individuals to move seamlessly through today's increasingly digital world by empowering them with:

- Better security by reducing the possibility of losing documents, as biometric authentication only requires an individual's presence

- Higher accuracy by minimizing the chance of manual human authentication errors

- Quicker access to commonly used applications and services by eliminating the need for passwords

**The History and Achievements of NEC's Best-in-class Biometrics**

For half a century, NEC has provided more than 1,000 systems in more than 70 countries and regions globally. Specifically, NEC's biometric authentication roadmap aims to provide individuals with safe, secure, convenient, and timely access to services in a society where digitalization is accelerating.

In 2020, NEC announced the **Purpose** of **Orchestrating a brighter world** backed by a statement that "[aims] to create the social values of **safety, security, fairness, and efficiency** to promote a more sustainable world where everyone has the chance to reach their full potential."

The spread of COVID-19 has caused a dramatic shift in our social environment and also caused us to rethink what social values mean to us. And in the process, we believe that society has also recognized the essential role that ICT plays in social change and transformation. For this reason, I am reminded once again that we have taken the right direction with NEC's purpose, and that NEC's technologies and businesses have an extremely large responsibility.

– Takayuki Morita,
President and CEO of NEC

NEC has developed 6 biometric authentication technologies that group under Bio-IDiom, its Biometric Authentication Brand:

**Face recognition** identifies individuals by analyzing their facial features using still images or videos. In recent years, the use of this technology has expanded rapidly because of dramatic improvements in the accuracy and speed of facial authentication as evidenced by its increased usage within national ID systems and airports.

**Iris recognition** identifies individuals using the iris pattern around their pupils. This technology has the distinct advantage of authenticating individuals in the dark using infrared cameras.

**Fingerprint and palm print recognition** has a longest history among NEC's biometrics authentication technologies. They are widely useful in varying scenarios globally, including personal authentication, immigration control, and national ID systems.

**Finger vein recognition** identifies an individual from the shape of their finger vein, providing strong anti-counterfeit capabilities.

**Voice recognition** identifies an individual by the characteristics of their voice. Because this authentication technology is independent of speech content or language, it can authenticate individuals over telephones. It is helpful in a variety of settings, including call centers and telephone banking.

**Ear acoustic authentication** identifies individuals by using the physical characteristics of their ear to enable hands-free authentication, allowing users to activate their computing devices safely and securely without having to enter passwords manually.

NEC actively seeks opportunities to submit its artificial intelligence (AI) solutions to independent, third-party testing authorities to help gauge and improve their performance. For example, NEC has regularly taken part in the US National Institute of Standards and Technology (NIST) vendor tests for more than a decade to obtain external assessments of the precision of its biometric models and algorithms across different demographic groups and a variety of use cases. NEC is proud to have consistently ranked among the top providers of fingerprint, iris, and facial recognition algorithms.

# World No.1 Biometric Technology

**World No.1**

**Fingerprint recognition**

• FpVTE (2003, 2012)
• SFSE (2004)
• MINEX(2006, 2016)
• ELFT (2007)
• PFT/PFTII (2009, 2013)

**World No.1**

**Face recognition**

• MBGC (2009)   • FIVE (2017)
• MBE (2010)   • FRVT (2019)
• FRVT (2013)

Top Ranked in FRVT Ongoing 1:N (2020 Aug, 2021 Jan)

**World No.1**

**Iris recognition**

• IREX 10 (2021)
• IREX IX (2018)
   (Iris Exchange IX)

All are the results of benchmark by the National Institute of Standards and Technology (NIST).

Moreover, NEC has received several other global awards[13] besides this recognition from NIST, producing inventive, high-quality, and powerful AI technologies. NEC's focus on creating novel biometric solutions and its dedication to establishing new customer cases and improving customer solutions resulted in it receiving the 2020 Global Biometrics in Security Market Growth Innovation & Leadership Excellence Frost Radar Award from Frost & Sullivan. Also in 2019, Frost & Sullivan named NEC the Asia-Pacific Biometric Company of the Year. [14]

With these achievements and experiences, NEC recognized its potential contribution to saving the lives of millions of children.

**Case Study: NEC, Gavi, and Simprints – Fingerprint Authentication for Children Aged 1 to 5**

NEC has formed, and continues to form, strong bonds and partnerships with a wide range of international organizations to overcome social issues by leveraging the strengths of each party to create synergistic and sustainable solutions. NEC's partnership with Gavi and Simprints to reduce child mortality by increasing vaccination rates in developing countries has been a successful initiative.

**The partners**
- **Gavi, the Vaccine Alliance**, is a public–private global health partnership with the goal of increasing access to immunization in poor countries. Since 2000, Gavi has helped immunize over 888 million children, preventing over 15 million deaths worldwide.

- **Simprints Technology Ltd.**, a UK-based non-profit social enterprise building biometrics for beneficiary identification in developing countries, offers a smartphone fingerprint app that uses Bluetooth to connect with a fingerprint scanner.

**The challenges**

Administering of vaccines should be done with an adequately scheduled program and correctly maintained records. However, this can be difficult for the many children who do not have their births properly registered or lack documentation as it is a challenge to determine if or when they can be given a vaccine. Not giving a vaccine at the right time can make the vaccine less effective and providing unnecessary additional doses can be harmful to the child's health (and sometimes even fatal).

Gavi adopted an identification solution from Simprints that uses a smartphone-based fingerprint recognition app to connect to a fingerprint scanner via Bluetooth for identifying individual children. This system is especially suitable for countries where internet connection may be unstable or unavailable because it works both in online or offline modes. However, while the solution could identify adult fingerprints, accuracy was a problem in identifying the fingerprints of children aged 5 years old and younger. In response, NEC suggested a fingerprint identification system designed specifically for children.

> Gavi is working with NEC and Simprints on a biometrics solution. My hope is that with this technology, if it succeeds, we are able to replicate it across countries and scale it up. It will help identify and register children for vaccination much more efficiently and accurately compared with the current way of registering them.
>
> – Anuradha Gupta,
> Gavi, The Vaccine Alliance, Deputy CEO

13 NEC, Industry Analyst Research, https://www.nec.com/en/global/analyst-relations/index.html
14 NEC, NEC Applauded by Frost & Sullivan for Biometric Identity Solutions, https://www.nec.com/en/global/analyst-relations/2020biometricsaward/

**The project**

Historically, biometrics providers have found fingerprint authentication challenging when used on children because of their unique physical characteristics in comparison to that of adults. Even though fingerprints do not change across one's lifetime, the size of fingerprints grows along with one's age. Compared to adults, children also have softer fingertips and the delicateness of their skin makes it more susceptible to dryness and roughness, all of which contributes to the difficulty of obtaining accurate fingerprint recognition results.

Despite the COVID-19 pandemic causing many travel and movement restrictions, NEC and Simprints persisted in their research, development, and testing efforts. In partnership with Gavi and Simprints, NEC made significant improvements through its tests in Bangladesh. This fingerprint ID solution is intended for use in developing countries, as the software has been optimized to work in environments where internet connection is unstable or unavailable.

Initial tests indicate the feasibility of leveraging biometrics to provide highly accurate, efficient, and secure fingerprint recognition technology for children aged 1 to 5, even in harsh environments with poor connectivity.

**Project outlook & NEC's perspective**

The field tests of NEC's fingerprint ID solution will begin at vaccination sites. The goal is to increase vaccination rates in developing countries and improve vaccination data management for children for optimal planning. In addition, once this technology is established and the child's identity and identification are verified, it will be easier to not only deliver vaccine programs, but also support other areas such as food aid and social security programs directly to them.

Working with its partners, NEC combines cutting-edge technology with Gavi's experience to protect children in developing countries and help governments and aid organizations to move a step closer to reaching the goal of leaving no one behind.

**Progress toward Achieving the SDGs by 2030:**
**NEC's R&D Efforts in Fingerprint Authentication for Newborns**

Newborns are at their most crucial developmental stage and at the same time, more vulnerable to severe diseases than older children. NEC has made crucial progress in fingerprint authentication for newborns. In the past, limited research on newborn fingerprints lacked sufficient verification data. Recorded fingerprints for identification are, by nature, unique and long-lasting. While similar to adult fingerprints, newborn fingerprints differ in several ways, such as elastic deformation caused by body water content. Newborn fingerprints are an entry point to solving more extensive birth registration and identification challenges.

NEC's cooperative research partnership with the Nagasaki University, Institute of Tropical Medicine, and the Kenya Medical Research Institute has significantly improved its ability to leverage imaging and authentication technology for newborns under a year old. As a result of this partnership, NEC experts successfully tested newborn fingerprint authentication with an error rate of only 0.3% at the research phase. NEC technology is a proven, highly accurate solution to identify newborns using their fingerprints 2 hours after birth. The actual process is straightforward: an operator slides a specially designed biometric scanner under a newborn's target finger to place the fingerprint on a sensing surface and take an image by pressing a button on the scanner.

The idea is to create an environment that ensures birth registrations provide legal, full-fledged identities to all children, regardless of where they were born, by utilizing fingerprint identification technologies that can enable children to identify themselves just by placing a finger. Following that, by utilizing this idea, we aim to provide a future environment in which children are able to reliably and properly receive the public healthcare, education, and social insurance they deserve as citizens.

– Yoshinori Koda,
Senior Research Architect, NEC

By collecting and authenticating biometric information soon after birth, NEC's technology makes it possible for parents, legal guardians, and state services to achieve the following

**Provide birth registration** and citizenship for children

**Enable identity verification** at discharge, post-birth

**Access unique identification** for all children to obtain and record their vaccinations

**Allow access to continued child welfare**, such as an opportunity for education based on the provision of legal identification

NEC's fingerprint authentication technology will continue to tackle ongoing challenges in national birth registration in an effort to further the UN's Sustainable Development Goal of providing legal identity to all, as listed in Target 16.9.

**Continuing to Develop the Biometrics of the Future**

NEC's central purpose of upholding the values of safety, security, fairness, and efficiency has steered its efforts to pursue greater heights at the frontier of biometric solutions. As a global leader of biometrics technology, NEC's R&D objectives revolve around three fundamental pillars of advancement: accuracy, convenience, and safety. NEC's upcoming milestones revolve around 4 significant advancements:

By building, advancing, and scaling NEC's industry-leading authentication technologies for **children between the ages of 1 and 5** and **newborns**, NEC will support governments and aid organizations to better meet the growing need for increased birth registration, vaccination delivery, and streamlined aid delivery.

**Confidential biometric authentication technology** will encrypt biometric data and registered personal information for authentication, reducing the risk of the misuse of a user's biometric information and providing significantly more secure and reliable identification processes.

**Multimodal authentication** will improve the accuracy of biometric solutions and enable broader use cases. Multiple modalities, such as facial and iris attributes, allow for a more comprehensive identification feature set, enabling more effective authentication algorithms.

**Contactless authentication** is a vital biometric identification capability to allow large-scale usage across the government, public, and private sectors. While multimodal technologies can solve many of today's identification challenges, NEC's goal revolves around taking this a step further by enabling several contactless biometrics technologies in the future for broader no-contact usability.

Besides the numerous advantages of biometrics, NEC is cognizant of the potential harm of not treating these technologies with caution and respect. Therefore, the NEC Group has established a set of **Group AI and Human Rights Principles,**[15] which reflects a commitment to privacy at every stage of development, and serves as a crucial blueprint for the ethical application and utilization of AI and biometrics data, ensuring compliance with international rules and regulations. All NEC employees prioritize human rights considerations and protect individuals' rights to privacy as the primary objective of the guiding regulatory foundation.

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15 NEC, NEC's Commitment to Its New "NEC Group AI and Human Rights Principles" Policy, https://www.nec.com/en/global/techrep/journal/g19/n01/190103.html

**Conclusion - Leave No One Behind**: **Inclusivity through Digitalization**

The UN has expressed its aims to "provide legal identity to all, including birth registration" by 2030 as part of the SDGs. A key motivator for achieving this goal is the reduction of mortality among children under 5 years old. Establishing a successful digital identity system for them requires thoughtful planning and the right blend of technical, financial, and political resources. However, the success will bring immense social benefits.

NEC's purpose, principles, and achievements create a foundation for a future-ready, security-first, and biometrics-powered digital society. In this future world, regardless of age, gender, or socio-economic background, every individual will be able to rely on their unique, convenient, and accessible personal identity. Their digital, biometrics-based legal identity will help them access the essential public services they need to live a safe and healthy life,  through all the stages of their life.

The next volume of this white paper series will cover the story of building supply chains, one of inevitable challenges humanitarian aid providers face in working to correctly bring the right goods to the right people at the right time. Please keep an eye out on this white paper series: Leave No One Behind: Inclusivity through Digitalization.

\**Orchestrating** a brighter world    **NEC**

NEC creates the social values of safety, security,
fairness and efficiency to promote a more sustainable world
where everyone has the chance to reach their full potential.

For more information, please visit
nec.com/sdgs/innovators