Immunization needs a technology boost

Tracking who receives vaccines is essential, but will be impossible without innovations in digital technologies, says **Seth Berkley**.

Today, about 80% of infants living in the world's 73 poorest countries receive routine immunizations, a measure currently assessed by whether they have been given a full course of a vaccine regime to prevent diphtheria, pertussis and tetanus. In 2000, only about 60% received such protection. That progress is great, but achieving 100% coverage will require better insight into which children are missing out.

For that, we need a new approach: the global health community must move to digital systems. My organization, Gavi, the Vaccine Alliance, spends an average of nearly US$2 billion a year on getting vaccines to children in the poorest countries. It has also invested tens of millions of dollars in innovations to monitor immunization.

Current methods for measuring immunization coverage are based on how many vaccine doses are distributed — not how many children are fully immunized. Doses delivered are much easier to count, but knowing which children are covered is much more important. That picture is vague. Surveys done to plug this knowledge gap are rare, costly and — to be reliable — require mothers to have retained paper-based child health cards.

Putting the child at the centre of tracking efforts is not as simple as it sounds. Tens of millions of children have no formal record of their existence — especially those living in remote, impoverished or vulnerable communities. This global identity crisis is so important that it has its own indicator (number 16.9) under the United Nations' Sustainable Development Goals (SDGs) intended to ensure that everyone has a legal identity by 2030. Right now, unregistered births are one of the biggest barriers to achieving another SDG, which aims to end preventable deaths of children under five and achieve universal health coverage, with access to affordable essential vaccines for all, by 2030.

Digital technology and social media offer an opportunity. The technology sector is on a mission to equip everyone on the planet with a digital and online presence. And the innovations that will help to achieve that goal are exactly those that could aid the global public-health community in vaccinating every child.

Many relevant technologies are largely in place already. Big data, for example, can help public-health officials to anticipate the spread of disease and hone vaccination campaigns. Geospatial mapping and drones are already being used in Nigeria to identify communities that have not received polio vaccines, and in Rwanda to deliver blood needed for transfusions for mothers who haemorrhage after giving birth.

One of the biggest needs is for affordable, secure digital identification systems that can store a child's medical history, and that can be accessed even in places without reliable electricity. That might seem a tall order, but it is both achievable and necessary. Technology is already

intertwined with vaccine delivery. For example, Google.org — the charitable arm of Google — and Gavi are working together to scale-up wireless temperature monitoring to provide real-time data on refrigerators used to store medications. This will notify workers when the refrigerators are starting to fail, and generally ensure that vaccines are kept at safe temperatures. We are also supporting the use of cloud-based databases to track vaccines along the supply chain.

Other projects help to inform us of who receives vaccines. We are working with a company in India called Khushi Baby, which creates off-grid digital health records. A necklace worn by infants contains a unique identification number on a short-range communication chip. Community health workers can scan the chip using a mobile phone, enabling them to update a child's digital record even in remote areas with little phone coverage. In the Indian state of Rajasthan, Khushi Baby has tracked more than 15,000 vaccination events of thousands of children across 100 villages.

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We still have a long way to go. We should be more ambitious in defining what 100% vaccination coverage means. Although the common measure of routine immunization coverage suggests that only one in five children misses out, the reality is much bleaker. The current measurement leaves out at least 8 of the 11 antigens that the World Health Organization (WHO) recommends be included in vaccines given to all infants. Among the missing ones are the highly contagious measles. Also missing are antigens for pneumococcus, which causes pneumonia, and rotavirus, which causes severe diarrhoea — the two biggest killers globally of children under five.

Our analysis suggests that just 7% of infants in the 73 poorest countries — those that most need our attention — are fully immunized. That means that more than nine of every ten children in these countries are not getting the minimum recommended protection against infectious diseases.

A UN expert group is meeting this week in Bahrain to review indicators for the SDGs. Expanding indicators to include all the WHO-recommended antigens will help. And in theory, governments have already signed up to finding a solution to the problem of birth registration.

Both moves are essential to improve understanding of how many children are fully immunized. A third essential ingredient is information technologies targeted at helping the developing world. If we want to make sure that preventable childhood deaths are actually prevented, we need to go digital. ∎

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