PATH VIETNAM AND IMMREG

Expanding Reach of the Immunization Registry in Vietnam

Acknowledgements

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Acronyms

DTP3	Diphtheria-tetanus-pertussis
GDPM	General Department of Preventive Medicine
HepB BD	Hepatitis B birth dose
ImmReg	Digital Immunization Registry System
IWG	Innovation Working Group
mHealth	Mobile health
MNOs	Mobile network operators
MOH	Ministry of Health
NEPI	National Expanded Program on Immunization
NGO	Non-governmental organization
NORAD	Norwegian Agency for Development Cooperation
SMS	Short message service
UNF	United Nations Foundation
USAID	United States Agency for International Development
WHO	World Health Organization
WHO/RHR	World Health Organization Department of Reproductive Health and Research

Executive Summary

Vietnam is a country with a high immunization coverage rate of 95%, using the diphtheria-tetanus-pertussis (DTP3) vaccine as a key indicator of national immunization program performance.[1] However, the Vietnamese health system still relies on a paper-based system to administer, monitor, and report vaccines and immunization. This leads to a heavy workload burden on health workers and takes valuable time away from them to be able to spend caring for patients. It also leads to possible errors[2] in data recording and reporting which can lead to problems such as vaccine stock outs and possibly a child missing a vaccine and contracting a preventable disease.

In 2012, PATH Vietnam began piloting the Digital Immunization Registry System (ImmReg) to address these challenges. ImmReg is a web-based application that can be accessed via a computer or mobile phone. Health workers can record and access immunization data in real time. Health managers at the local, district and provincial levels have been able to drastically save time generating reports and planning. ImmReg is also used to send reminders to caretakers via SMS to remind them to bring their child into a health center in order to receive a vaccination on time. PATH estimates that each year the Vietnamese government can save USD 673,000 by switching from paper-based reminders sent to caretakers to SMS reminders. In addition to reducing workload burden, ImmReg has also improved accuracy in data recording. Most importantly, ImmReg has a direct effect in increasing on-time vaccination rates.

This case study explores how PATH was able to scale up the ImmReg program to nine districts and cover the entire province of Ben Tre, in the southeastern part of the country. Through the IWG grant program, PATH gained valuable lessons on how to obtain leadership support, help the government plan for expansion, raise awareness for its mission and integrate user feedback in order to scale ImmReg effectively. PATH's experience and lessons are valuable as it continues to scale on a national level and for other nonprofits considering a similar strategy.

OVERVIEW:
An Introduction to ImmReg and the Challenge of Tracking Vaccination Data

PATH's ImmReg program is the first digital system to tackle the challenge of tracking vaccination data in Vietnam, resulting in significant time savings in comparison to the current paper based system.

Vietnam's immunization coverage rivals those of other industrialized countries. Using DTP3 as a proxy for immunization coverage in the country, Vietnam's DTP3 coverage rate of 95% is high. In comparison, the United States of America's DTP3 coverage is 94%.[3] However, other vaccination rates remain low, such as Hepatitis B birth dose (HepB BD), where only 43% are covered.[4] More than 8% of the Vietnamese population has Hepatitis B and 90% of children born to mothers with Hepatitis B contract the disease. One in four adults who contract the disease as children die of health problems such as liver cancer.[5]

A fundamental challenge of preventing the spread of diseases such as Hepatitis B and others is immunization coverage, especially in rural areas. By tackling this challenge head on, many lives can be saved. In Asia, almost 300,000 people die from a Hepatitis B infection every year.[6] Although Vietnam has a robust National Expanded Program on Immunization (NEPI), its systems could improve. Most health centers throughout Vietnam still rely on paper-based records. Health workers record patient and vaccine information by hand. Monthly reports are required at the commune, district and provincial levels and the reporting requirements are a time burden on health workers, are often delayed, and can lead to errors in data reporting. Another factor that can increase errors is that caretakers may bring children to different immunization service locations to receive their vaccines, which makes it difficult to accurately track and report which vaccines were received. Inaccurate data leads to poor management of vaccine stocks which can cause delays in delivering vaccines, leaving pregnant women and children at risk of contracting vaccine-preventable disease.[7]

To help solve this challenge, PATH's Vietnam office, in conjunction with its partners, developed the Digital Immunization Registry (ImmReg) with the goals of:

- Increasing accuracy and timeliness of immunization records

- Improving the rate of on-time immunization

- Reducing the amount of time needed for reporting

ABOUT PATH

PATH is a global nonprofit that works to scale innovative health solutions. Founded in the 1970s, PATH works mostly in Africa and Asia, with a commitment to solving health challenges in maternal and child health, reproductive health, and infectious diseases. Specifically, PATH focuses on five platforms: vaccines, drugs, disease diagnostics, devices, and system and service innovations.

PATH's presence in Vietnam since the 1980s makes it the organization's longest in-country operation. PATH's work in Vietnam focuses on non-communicable diseases, tuberculosis, HIV, health system strengthening, and vaccines. Beyond the ImmReg program, PATH works with the Vietnamese government and other partners to bring vaccines to children in a number of ways such as: improving the vaccine cold chain using innovative refrigeration technology that does not require electricity, assisting local companies to produce and test the influenza vaccine and increasing coverage of the Hepatitis B birth dose vaccine.[8]

IMMREG:
A First of its Kind Digital Immunization Registry

PATH's ImmReg program is a software application that tracks women and children's immunization status, provides real-time data access and allows health workers to easily generate reports at the local and district levels. PATH's ImmReg program is the first digital system in Vietnam to tackle the challenge of tracking vaccination data. The system results in a significant time savings in comparison to the current paper-based system. For example, using the ImmReg system, health workers can generate reports in 2 minutes versus the typical 20 minutes with the paper-based system.[9] ImmReg also sends text message reminders to caretakers to bring their children into a health center for vaccinations, thereby improving immunization coverage and timeliness.

The table below shows the time health centers can save by using the ImmReg system compared to the paper-based system.

TIME SAVINGS WITH IMMREG

Activity:	Time: Paper-based System	Digital System
Generate reports at commune level	20 minutes	2 minutes
Generate reports at district level	15 minutes	1 minutes
Planning time to search vaccine records, prepare the list of vaccinations due and send paper-based reminders to parents about vaccinations	2 days	15 minutes

HOW IT WORKS

ImmReg is a digital immunization registry system that is executed through an easy-to-use web-based software application that users can access via a smart phone or computer to retrieve and enter data.

Steps:

Health workers register pregnant women and newborns in the ImmReg system via a smartphone or computer. Each child is assigned a unique identification number in the system.

The system automatically generates lists of children due for vaccinations and automatically sends a text message to caretakers to remind them to get their child vaccinated.

Caretakers bring the child in for vaccinations and health workers enter data on the vaccine, doses, and date delivered.
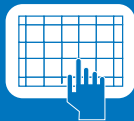
ImmReg provides the commune health worker with information about the types and amount of vaccines that the health center has on hand and that it needs to administer every month. These numbers are reported up to the district and province level and help health workers plan for adequate supplies of vaccines and avoid vaccine waste and shortages that are a result of reporting error and poor planning.

The system automatically produces reports that commune, district and provincial health managers are able to view in real time. These reports provide essential data for monitoring vaccine stocks and planning immunization coverage. Per MOH regulations, the health centers at the local, district and provincial levels still need to provide paper-based reports. The health centers that have adopted ImmReg simply print out the reports using ImmReg without having to produce the reports by hand.

IMMREG VALUE CHAIN

Donors/Investors	PATH	Technology Partners	MOH and Health Centers	Pregnant Women and Children
ROLE Organizations such as the WHO, Bill and Melinda Gates Foundation and UNF that provide funding possible to sustain ImmReg	PATH developed the proprietary software for the ImmReg program and also implemented and scaled the program	Partners who provided the required hardware and software to implement ImmReg, including MNOs that supply the mobile network	Local, district and provincial health centers and managers who are end-users of the ImmReg system	Beneficiaries of ImmReg, Recipients of healthcare information via SMS and vaccination reminders

The ImmReg value chain above demonstrates the role of various organizations that make ImmReg possible. The players that derive the most direct value from ImmReg are the health workers on the local level and managers at the district, provincial and national levels as well as the target audience of pregnant women and children. ImmReg is a superior alternative to the existing paper-based system for the following reasons:

- **More data:** ImmReg allows health workers to capture more data, such as the caretaker's mobile phone number, address and immunization location. This data allows the health worker to contact caretakers to remind them of upcoming vaccines.

- **Quality of data:** Data quality is improved because capturing information on a digital system reduces errors compared to a hand written paper-based system. ImmReg generates a more accurate list of children due for vaccination versus the manual system.

- **Report generation:** Managers are able to generate reports quickly and in real time, thereby reducing the workload burden. For reporting purposes, the system mirrors the same paper-based system to maintain consistent reporting at the provincial level. ImmReg can also generate reports that reflect individual cases rather than only reports that generate aggregate numbers. These types of reports are more accurate and help to avoid duplication when combining data from different communes or districts.

- **Preventing missed appointments:** For the vaccine recipient and caretakers, they are less likely to miss a vaccination due to the SMS reminders that ImmReg sends out, improving the immunization coverage and preventing life-threatening diseases.

- **Easy access:** Healthcare workers can easily access a child's vaccine history from any health center using the system.

"At first I was not happy about having to take so much time to learn a new system, but now that I know it, I like how much time I save. I would not want to go back to laboring over the ledgers for hours."

- Commune Health Center worker

IMMREG'S RETURN ON INVESTMENT

Throughout its history, PATH partnered with several organizations in order to fund and sustain the program. Its goal is to scale the system nationwide. At this time, ImmReg does not generate revenue. PATH's partners include: NEPI, Southern Region Expanded Programme on Immunization, Ben Tre Health Department, Ben Tre Provincial Preventive Medicine Centre, and nine district health centers. PATH's donors for this program include: the Bill and Melinda Gates Foundation, and the United Nations Foundation.

Based on ImmReg's rollout in Ben Tre province, the program cost total is USD 11,261 for one year. Software maintenance, operational costs and end-user training accounted for most of the costs. (See Cost Profile for ImmReg Over 1 Year pie chart.)

ImmReg's cost is justified by the opportunity it presents for time and cost savings. PATH estimates that the Vietnamese government could save up to USD 673,000 each year by switching to SMS reminders instead of paper-based reminders, when the ImmReg is scaled up nationwide.

COST PROFILE FOR IMMREG OVER 1 YEAR

Start up Cost 0%

TOT Training 11%

End-user Training 25%

Software Maintaince 37%

Operational Cost 27%
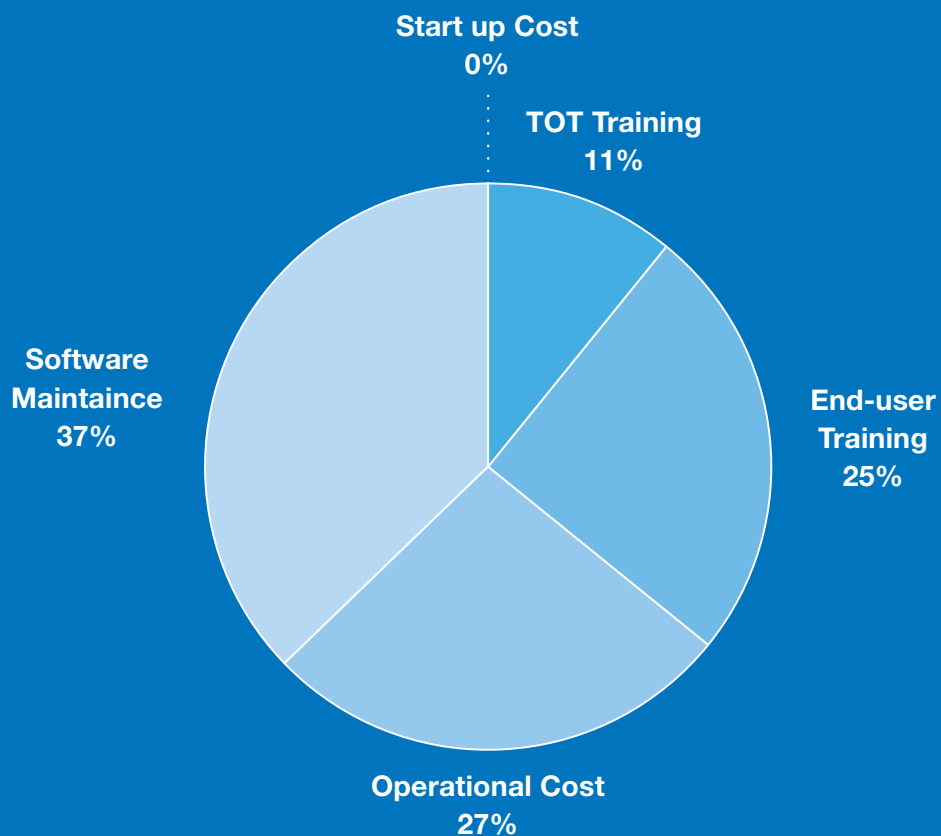
IMMREG'S SOCIAL IMPACT

An investment in the ImmReg system leads to direct impact on the daily operations of health centers and the health of children in Vietnam's Ben Tre province. Examples of ImmReg's impact are:[10]

- **Immunization coverage:** Full immunization rates of one-year-olds increased to 77.8% compared to 74.3% before the intervention.

- **On time vaccination:** The rate of on time vaccination increased approximately 10% to 14% for Penta and Oral Polio Vaccines. It is important that vaccines are administered on time for effectiveness.

- **Early Registration:** Because ImmReg targets pregnant women, newborns were registered on average 8.5 days after birth after the intervention compared to 33.4 days, before the intervention.

- **Workload Burden Reduction:** Health workers spent less time generating reports. At the local level, health workers now spend two minutes generating reports versus the previous 20 minutes. At the district and provincial levels, health workers now spend one minute versus the previous 15 minutes. Planning time[11] was also reduced from one to two days to 10 to 15 minutes. Health center workers can now spend more time on the patients.

ImmReg's tangible impact and success has led Ben Tre province to continue using ImmReg. Ben Tre's Health officials are committed to sustaining the program and have submitted a plan to get the budget approved for ImmReg.

PATH held a Dissemination Workshop in December 2015 for health officials from other provinces to share the results and impact of ImmReg in Ben Tre province. Many attendees expressed interest in pursuing ImmReg and will seek budget approval from their provinces.

CHALLENGES FOR SUSTAINABILITY

Although ImmReg's impact is clear, PATH continues to seek donor funding to ensure the program's sustainability. PATH has taken steps to address barriers to sustainability and the remaining concerns of potential funders and stakeholders:[12]

- **Lack of technology infrastructure:** In order for ImmReg's current model to be effective, health centers must have existing technology infrastructure such as computers and Internet. Not all health centers are equipped with the necessary technology to run ImmReg. PATH has advocated for more significant government investment in these types of technologies.

- **Staff turnover:** Staff turnover is high among health centers and could be a barrier to sustainability. PATH is able to set up a local level technical support team to train staff and provide technical support to counteract the high rate of staff turnover and ensure that the health centers can still implement ImmReg.

- **Commitment of national and provincial health leaders:** PATH is working to strengthen its relationship with the General Department of Preventive Medicines (GDPM), MOH in order to integrate the ImmReg system into the national health information system. The MOH operates on a top-down structure and any nationwide health initiative will need the MOH leadership and encouragement in order for it to be implemented on the local level.

- **High SMS Costs:** SMS costs are high, although ImmReg remains more cost effective compared to paper-based vaccination reminder notifications and record keeping. PATH has communicated the justification of SMS use and cost savings to the health centers.

> **PATH estimates that the Vietnamese government could save up to USD 673,000 each year by switching to SMS reminders instead of paper-invitations to remind parents about vaccinations.**

IWG GRANT

Prior to the ImmReg system, PATH worked with the World Health Organization (WHO) and other partners from 2010 to 2012 to build a program called *Optimize* which addressed challenges along the vaccine supply chain. ImmReg was one of three software programs that *Optimize* developed. PATH used lessons from *Optimize* to build the ImmReg system, including:

- **Collecting user feedback:** One of the reasons why PATH was successful was because it actively sought user feedback to understand the user's problems and the context in which they were using the software. They continued to collect their feedback even after *Optimize* ended. PATH incorporated the feedback into improving the ImmReg software. They were able add more functions based on user input.

- **Providing localized support:** It was a challenge for PATH staff to provide technical support remotely from Hanoi. PATH decided for the ImmReg program to locate directly in Ben Tre province in order to provide direct support to the end-users.

After one year, PATH was able to show successful results from its pilot and received an IWG grant from the United Nations Foundation. The purpose of the grant was to scale ImmReg in all nine districts of Ben Tre province, including training for technical support team and end-users of the digital immunization registry.

PATH started ImmReg in one district and has successfully scaled ImmReg up to 164 local health centers in nine districts across Ben Tre province and all nine districts in Ben Tre province continue to use ImmReg.[13] The Ben Tre Provincial Health Department is currently reviewing a proposal to allocate funds towards sustaining the ImmReg program, covering costs such as trainings, SMS fees, and technical support from PATH.[14]

IWG LESSONS LEARNED

Through the IWG grant program, PATH gained several lessons at both the macro and micro implementation levels from work associated with the grant program:[15]

- **Essential to obtain leadership support:** Support at the national level helped PATH start and expand the ImmReg program. PATH has built a strong relationship with the NEPI over its more than 30 year history in Vietnam. NEPI's commitment was essential to ensuring implementation success and the program's sustainability. In order to obtain buy-in from leaders, PATH had to show the challenges that health workers and end-users faced and how ImmReg could provide a solution.[16]

- **Help government plan:** As part of presenting a solution calculating the cost of scaling up the system helps government leaders to plan for expansion.

- **Raise awareness:** PATH needed to conduct ongoing communication and advocacy to inform leaders and health workers on the importance of switching from paper-based to digital systems.[17]

- **User feedback:** Through user feedback, PATH was able to learn important information about the usability of its program, such as that data entry via mobile phones is difficult because the screen is too small. PATH took these learnings into consideration as it iterated on the program.[18]

- **Standardize data inputs:** Standardized data inputs are critical to ensure the quality of reports generated by the system. Healthcare workers need to devote time to check the data for accuracy and completeness.

- **Behavior change among staff:** Strong commitment from healthcare leaders is important to help keep health workers motivated. Regular advocacy from leaders is critical in influencing health workers to switch from using a paper-based system to a computerized system.

- **Local technical support team is necessary:** Because staff turnover at healthcare centers is high, it is important to have local technical support that can continue to provide training for new healthcare workers in order to ensure the sustainability of the ImmReg system.

- **Continuous software changes required:** The NEPI makes changes to the national immunization program regularly. Each time these changes are made the ImmReg software needs to be updated; therefore, it is essential that PATH establishes a close working relationship between NEPI and software developer in order to quickly implement the changes. The more closely the software mirrors NEPI's requirements, the more useful it will be in terms of reporting and aggregating data.

- **Parents and caretakers frequently change their phone numbers:** Cheap phones and SIM cards in the Vietnamese mobile market mean that some caretakers change their phone numbers often. To accommodate for this, healthcare workers have to be vigilant about updating phone numbers every time a patient visits the health center.

EXPANDING IMMREG

The news of PATH's success in Ben Tre province has spread and other provinces have expressed interest in implementing ImmReg. PATH has already started to advocate for additional funding for expansion.[19] The strategy for growing new users will take two approaches:

1. **Geographic expansion:** PATH plans to expand to additional provinces from 2016 to 2017.

2. **Topic expansion:** ImmReg has the potential to reach more users by adapting its system to tackle challenges in other health areas. By 2017, PATH plans to upgrade the ImmReg system to include a nutrition module to track nutrition indicators for newborns to children up to five years old. It will work with the GDPM, the NEPI and Viettel, one of Vietnam's largest MNOs on the expansion.

CHALLENGES TO SCALING UP

Scaling at the national level and expanding ImmReg's content will be challenging. Some of the barriers that PATH anticipates include:

- **Time required for data entry:** One of the initial costs to starting the immunization registry is that two years' worth of data from immunization ledgers must be entered into the ImmReg software application. This requires a large time commitment from the health workers.

- **Limited training resources:** Some health workers have limited computer skills and experience using mobile phones. This means that PATH will have to continue providing technical support for these health workers or additional training to ensure that the software is being used. However, PATH has limited human resources to provide direct technical support to health centers. PATH will need a plan on how to efficiently train local staff and end-users at scale, and also how to implement remote technical support for the software.[21]

- **Technology investment:** Some health centers are not fully equipped with the technology needed to run the ImmReg software, such as computers, internet connections or mobile phones. The government will need to provide health centers with funds to procure the technology, cover training for staff to learn how to use the technology, as well as SMS fees.[22]
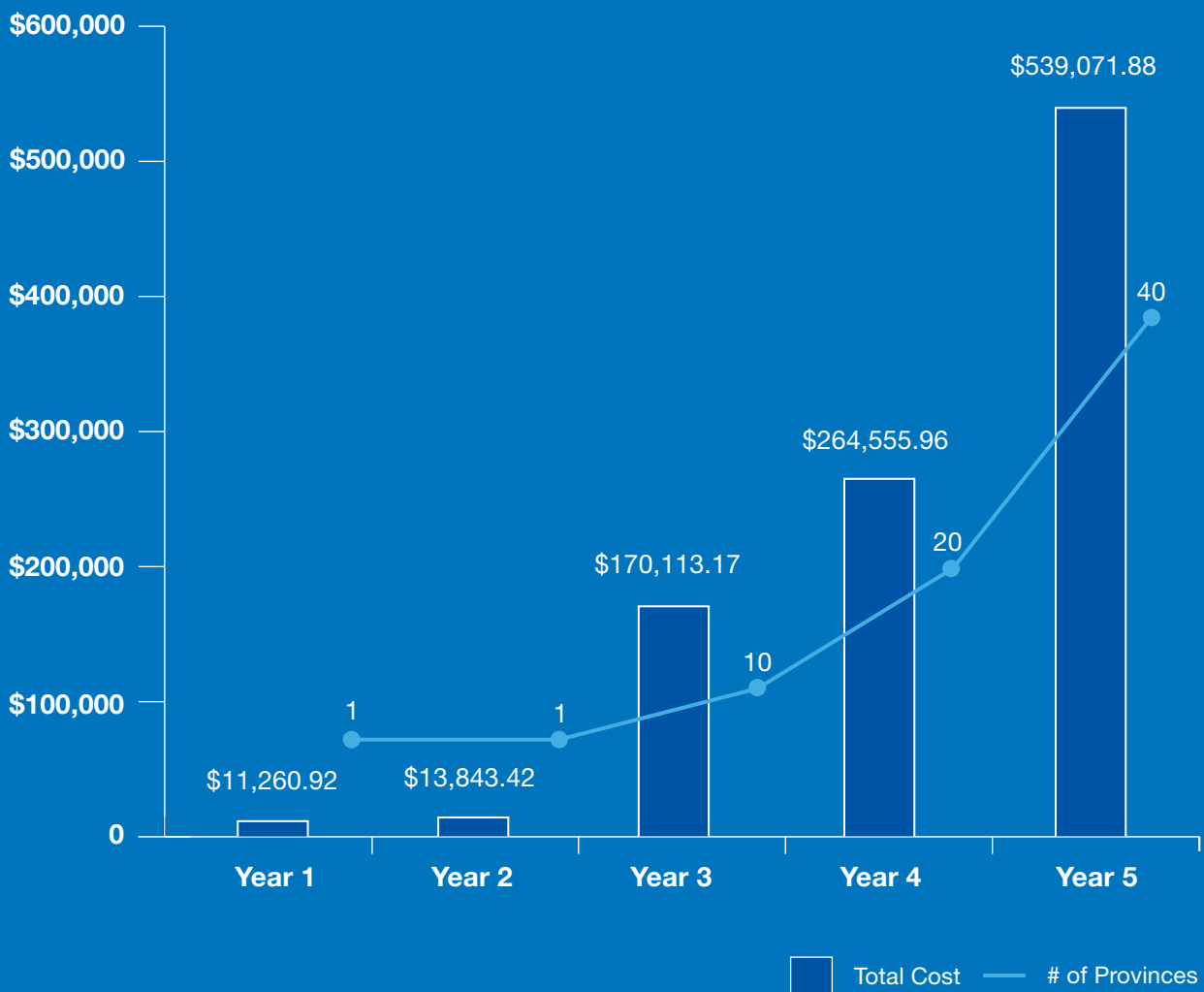
During a Dissemination Workshop held in December 2015, PATH invited national, provincial and regional EPI leaders to learn more about ImmReg. The leaders had expressed interest in implementing ImmReg at their locations, but would first need to submit a request for the software implementation to the Provincial Health Departments who would then allocate funding for ImmReg.[23] This workshop was an opportunity for PATH to show the leaders the time savings and improvement in data quality that they could gain from ImmReg as well as highlight the impact ImmReg has had on maternal and child health in Ben Tre province.
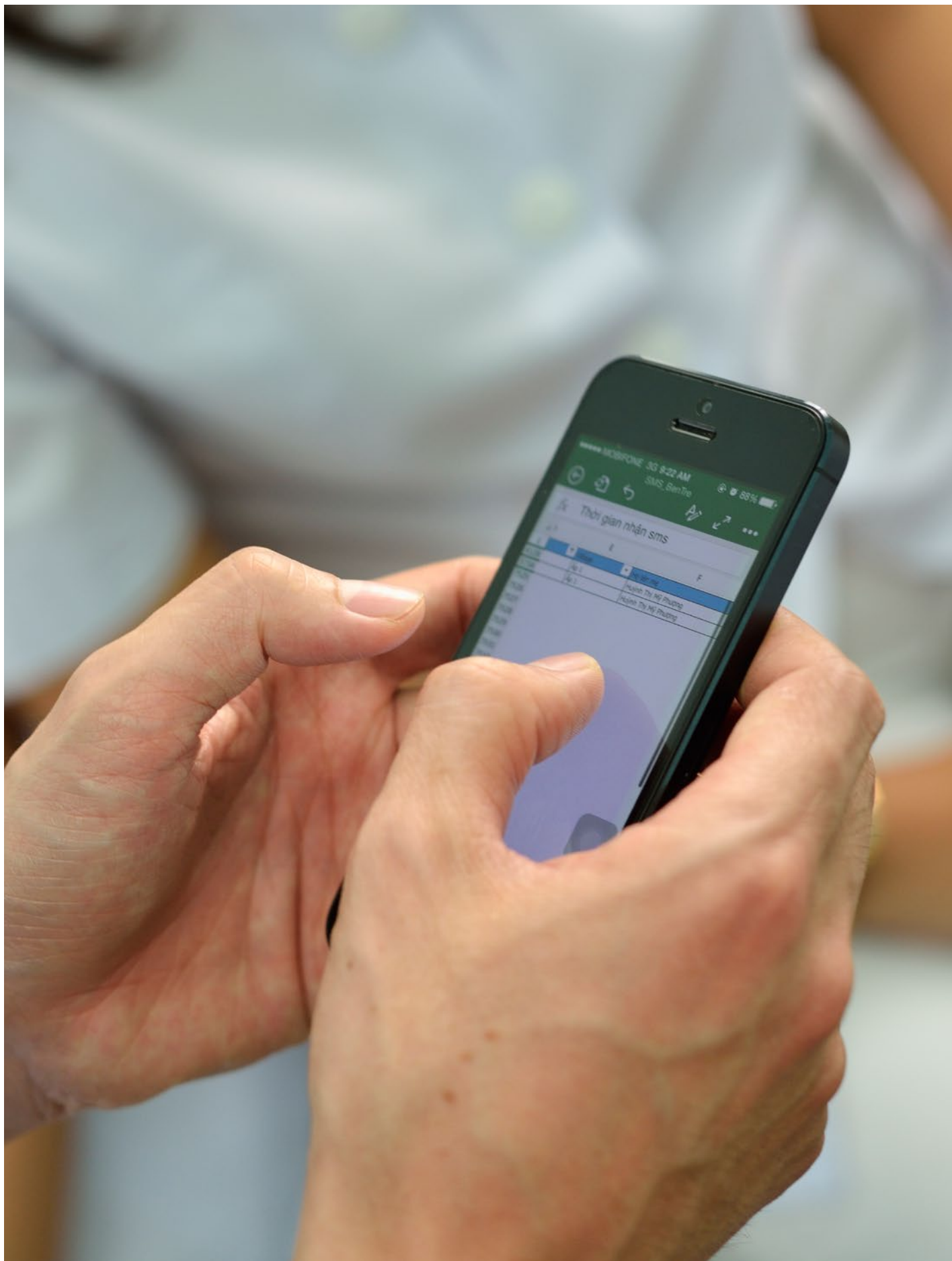
The Dissemination Workshop was an instrumental tool in educating other health leaders so that they can share the ImmReg impact data and build a case to allocate budget funds towards implementing ImmReg.

To scale the program nationwide, ImmReg would need to roll out ImmReg in an additional 40 provinces over the next five years, or almost two-thirds of the 63 provinces in Vietnam. Tackling all 63 provinces at this time would be difficult because some of the provinces are not properly equipped with the electric and telecommunications infrastructure necessary to run ImmReg. The cost to scale nationwide depends on the technological readiness of each health center. Many health centers may not be readily equipped with computers, mobile phones, printers or internet connections. Under the assumption that no new infrastructure would need to be installed and no staff salaries need to be provided for, the program could cost approximately USD 1 million over five years. If all of the centers require technology infrastructure, the cost could be as high as USD 6 million over five years.[24] Compare these costs to the potential USD 673,000 that the Vietnamese government could save nationally each year by moving from a paper-based reminder system to using SMS reminders. Below is a model that shows the costs of scaling to 40 provinces over five years using the assumption that 10 percent of the health centers need new technology equipment such as new computers, printers and an Internet connection.

IMMREG SCALE-UP COSTS OVER FIVE YEARS

	Year 1	Year 2	Year 3	Year 4	Year 5
Total Cost	$11,260.92	$13,843.42	$170,113.17	$264,555.96	$539,071.88
# of Provinces	1	1	10	20	40

Legend: Total Cost — # of Provinces

LOOKING FORWARD

The ImmReg system has proven to be successful at the local and provincial levels and it now has a chance to scale at the national level. ImmReg saves time and makes reporting more efficient so that health workers can focus more on implementing health care and the patients than administrative work. As more provinces adopt ImmReg's digital system and become accustomed to the benefits of the system, PATH Vietnam believes it is likely the MOH will remove policies requiring paper-based reporting, in favor of the digital system. More importantly, ImmReg's implementation at the national level could help to save lives as thousands more children could receive life-saving vaccines.

Beyond vaccines, PATH's ImmReg software can be applied to other health areas. PATH is already exploring options to apply the program to tackle challenges in nutrition for mothers and children. The PATH team plans to pilot this new expansion within one year.[25]

One potential project that could help propel ImmReg's growth on the national level is the GDPM's new digital initiative. The GDPM, with support from Viettel, a large Vietnamese mobile network operator (MNO), is developing a nationwide digital health system that aims to track not only vaccines, but also to track and report non-communicable and infectious diseases as well as several other healthcare topics. This platform is an ambitious, multi-year project. The GDPM and Viettel will be developing the technical infrastructure and software component of the project. PATH plans on sharing its experience and lessons developing ImmReg along with the source code so that GDPM can retain or absorb the ImmReg software. PATH is actively engaging with these partners to integrate their system with ImmReg and avoid duplicating efforts.[26]

ImmReg is an example of an mHealth solution that has managed to successfully demonstrate scale up from the district to province level. By showing that an investment in the ImmReg digital system can produce real cost savings for healthcare facilities, PATH creates a compelling financial argument that is attractive to donors, partners and investors. Most importantly, the results of the intervention had made a real difference in women and children's health in Ben Tre province. Lessons from PATH's experience in implementing, evaluating and measuring ImmReg's impact can be applied to help other mHealth programs scale.

ENDNOTES

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3   "WHO-UNICEF Estimates of DTP3 Coverage." *WHO-UNICEF Estimates of DTP3 Coverage.* World Health Organization, n.d. Web. 18 Feb. 2016. <http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragedtp3.html>.

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8   "PATH." *Vietnam.* PATH, n.d. Web. 18 Feb. 2016. <http://www.path.org/our-work/vietnam.php>.

9   Dao, Sang. "Interview with PATH." E-mail interview. 24 Jan. 2016.

10 PATH used both quantitative and qualitative research methods to conduct the impact study. In depth interviews were conducted with health workers and parents of children under one year old and pregnant women in order to gather information regarding the acceptability and feasibility of the software. PATH used a quantitative-based method to compare indicators pre and post-intervention.

11 Planning time includes time that the health center work spends on researching past years previous paper-based records to determine how many children need vaccines on immunization days, which vaccines are required and time spent writing paper invitations to parents to remind them to bring their children in for vaccinations.

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