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From Pilot Plan to Public Trust: Community Perceptions of a Dengue Vaccine Campaign in Iquitos, Peru

Emma B Ortega
eortega@tulane.edu

Tulane University
Samuel Aptekar
University of California, San Francisco
Lauren Nussbaum
Tulane University
Susan Y Mateo Lizarbe
Universidad Peruana Cayetano Heredia
Cristina Hidalgo
Prisma
E. Jennifer Ríos López
Prisma
Valerie A Paz Soldán
Tulane University

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Abstract

Background

A dengue vaccine has the potential to significantly reduce dengue transmission, severe disease, and mortality. In November 2024, Peru started to roll out the Qdenga (TAK-003) dengue vaccine for children ages 10–16 in four priority regions with historically high levels of dengue transmission. This qualitative study examines facilitators and barriers to the roll out of the Qdenga vaccine from parent and health provider and authority perspectives in Iquitos, Peru.

Methods

Six focus group discussions (FGDs) (n = 55) with parents of eligible children and four key informant interviews (KIIs) with Loreto Regional Health Department (GERESA) nursing coordinators were conducted in Iquitos. Recorded sessions were transcribed and analyzed using thematic analysis and organized using the Consolidated Framework for Implementation Research (CFIR). A complementary dataset from Piura was used to further contextualize the findings.

Results

Policy word choice created unintended implementation barriers, specifically the use of the term “pilot plan” in the technical guidance created distrust among many community members, who felt that their children were “guinea pigs” in a plan to test the safety and efficacy of a new vaccine. The centralized plan of a clinic-based strategy resulted in low uptake, so local health districts adapted their strategies to involve schools and door-to-door vaccination outreach, which ultimately led to the achievement of the first dose vaccination goal. Trust and convenience complemented each other, as participants reported high levels of trust in public health officials and appreciated the school and door-to-door based strategies.

Conclusions

In settings where transportation to health facilities is challenging and the community expresses hesitancy regarding vaccination programs, this study suggests that a robust, on-the-ground public health campaign that meets participants and their children where they are is an effective strategy for ensuring vaccine uptake. It also suggests the importance of local health facilities effectively adapting national vaccination campaign strategies to local settings.

Introduction

Dengue is a mosquito-borne disease caused by any of the four serotypes of the dengue virus (DENV). Globally, it causes higher rates of human morbidity and mortality than any other mosquito-borne virus. Roughly half of the world’s population lives in an area at risk for dengue transmission (1, 2). Dengue has been endemic in Peru since 1990 (3). Peru has recently experienced its largest dengue outbreaks on record, with 256,641 cases in 2023 and 280,242 cases in 2024 (4); dengue cases occurred in neighborhoods of Lima that historically had not reported cases (5). During the first seven months of the 2023 outbreak, which predominantly affected northwestern Peru, children ages 12–17 had the highest age-specific incidence, with 807 cases per 100,000 persons (5).

The clinical presentation of dengue ranges from a mild, self-limiting febrile illness to severe dengue, including hemorrhagic fever (DHF) and shock. The risk of severe dengue increases with subsequent infections from a different serotype (6). In dengue-endemic settings, exposure to dengue can begin in early childhood, and younger children have been found to exhibit more monotypic antibody profiles than older children and adults, consistent with less accumulated immunity to multiple DENV serotypes (7). In a hospital-based study in Nicaragua, the burden of disease and of severe dengue was found predominantly in infants (4–9 months) and younger children (5–9 years) compared with other age groups (8).

Traditionally, dengue prevention has centered around integrated vector control, which consists of adulticide and larvicide alongside the removal of larval habitats (9, 10). While integrated vector control can reduce DENV transmission, it does not eliminate infection risk, making vaccination an important complementary tool for reducing dengue infections and the risk of severe disease within comprehensive dengue prevention strategies (1). Vector control measures should be continued as part of a comprehensive strategy to reduce dengue transmission, but additional interventions–namely safe and effective vaccines–are essential for either preventing new infections or reducing the severity of disease among those who become infected. Dengvaxia became the first licensed dengue vaccine in 2015, but it increased the risk of severe dengue and hospitalization among seronegative individuals who were subsequently infected post vaccination (11). Production was halted in 2025 due to low global demand, partially due to complicated screening requirements and historical controversy (12, 13). There are currently three dengue vaccine candidates that are licensed or in advanced phase III clinical trials: Qdenga from the Takeda Pharmaceutical Company, Butantan-DV from Instituto Butantan, and V181 from Merck & Co (14).

Takeda manufactured and first licensed the Qdenga vaccine (TAK-003) in 2022, and it has since been approved in 40 countries (15). It is a two-dose vaccine series that is safe and effective for individuals regardless of their dengue seropositivity status (16). In October 2024, Peru received 445,500 doses of Qdenga vaccine through PAHO’s Revolving Fund (15, 17). The Peruvian Ministry of Health (MOH) created a guideline for the pilot vaccination plan (hereinafter “Pilot Plan,” given its original name in Spanish) to target populations at higher risk of infection (18). In November 2024, Peru began its rollout of the Qdenga vaccine for children ages 10–16 years in four states with historically high levels of dengue transmission: Loreto, Piura, Tumbes, and Ucayali. The MOH allocated 106,694 doses to Loreto, the state where Iquitos is located, to vaccinate a total of 53,347 children. Through primary and secondary level health facilities, the MOH assigned additional personnel to assist with the first round of vaccinations (18).

The purpose of this study is to qualitatively assess the perspectives of both parents and key public health authorities to identify the barriers and facilitators encountered during the Qdenga vaccine rollout in Loreto, Peru. Taking into consideration the failures associated with the Dengvaxia implementation and the global increase in vaccine hesitancy more broadly (13, 19, 20), this qualitative assessment presents significant research, policy, and programmatic implications.

Methods

Study Design. This qualitative study draws on (1) key informant interviews (KIIs) with health authorities and professionals and (2) focus group discussions (FGDs) with community members in Iquitos, Peru. We used thematic analysis to identify individual- and system-level barriers and facilitators of the implementation of Qdenga in Iquitos. We subsequently compared those findings with similar data from Piura to assess which themes were specific to Iquitos and which emerged in both implementation settings.

Study Site. With an approximate population of 465,455 people, Iquitos is the largest city in the Peruvian Amazon and the capital of the state of Loreto (21). Surrounded by rivers on three sides, Iquitos comprises four main districts – Iquitos, Punchana, San Juan Bautista, and Belen – which the Peruvian MOH further divides into 36 health districts. The classification of health facilities within these districts follows a tiered system depending on the resources available [Table 1].

Table 1
Health Facility Classifications in Iquitos, Peru.

Level	Facility Description	Vaccination Series Goal (22)
I-1	Basic health posts staffed by medical technicians and nurses without physicians or inpatient beds	0
I-2	Facility provides outpatient services with physicians but no inpatient beds	0
I-3	Facility offers short-stay observation beds and basic obstetrics care	21,554
I-4	Facility has small in-patient capacity and basic laboratory services;	28,793
II-1	Secondary level hospitals with a greater range of subspecialties and inpatient care	0
II-2		0
III-1	Tertiary level hospitals with intensive care units (ICUs) and advanced surgery capabilities	3,000
III-2		0

Vaccine Availability. Vaccine doses were delivered to nine I-3, I-4, and II-2 health facilities in Iquitos, which were purposely selected for administration given their capacity to provide care in the event of an adverse reaction (23).

Sampling and Recruitment Strategy. Focus Group Discussions. We purposively recruited FGD participants from three urban and one rural neighborhood in and around Iquitos in July and August 2025. Neighborhoods were selected based on their involvement with other ongoing studies led by members of the research team and their proximity to health facilities offering the dengue vaccination [Figure 1]. Eligible participants were adults aged 18 years or older who were the parent of at least one child aged 10–16 years and able to provide informed consent. The day before each FGD, a Peruvian nurse on the research team with extensive experience working in these neighborhoods (JR) recruited participants through door-to-door sampling. On the day of the FGD, she returned to the same households to remind eligible participants about the discussion. All participants provided verbal informed consent to participate and to have the session audio recorded. Prior to starting the discussions, members of the research team provided an information sheet about the study and reviewed the consent process with participants to allow for questions. The study covered transportation fees and provided light refreshments for all FGD participants. Another Peruvian research team member (CH), who is a midwife with experience working in these neighborhoods, facilitated all FGDs. Co-facilitators included the Peruvian nurse (EJRL) who recruited participants and two Spanish-speaking doctoral students, one Peruvian American (EBO) and one American (SA), both with prior research experience in Iquitos. All FGDs lasted approximately one hour.

Key Informant Interviews. We recruited four key informants for semi-structured interviews through purposive sampling based on contacts the research team had established within the Loreto Regional Health Department (GERESA for its initials in Spanish). These participants were regional level Ministry of Health (MOH) nursing coordinators who were personally involved in the Qdenga vaccine campaign. They provided their written informed consent to be interviewed and for interviews to be audio-recorded. The research team midwife (CH) and doctoral student (EBO) jointly conducted the four KIIs in July and August 2025. The semi-structured KII and FGD interview guides were developed with support from an experienced Peruvian American qualitative researcher (VAPS), who has conducted dengue research in Iquitos for more than 20 years, and were piloted prior to implementation [Supplemental Material 1].

Data Management and Analysis. We transcribed audio-recordings of all KIIs and FGDs in Iquitos using Sonix software (26). A native Spanish-speaking member of the research team then reviewed each transcript for quality control. We uploaded the cleaned transcripts from Iquitos into Quirkos software for coding (27). Three members of the research team (EBO, CH, SA) analyzed the transcripts with overlap to establish intercoder reliability. First, based on focus group and interview guides and previous literature, we developed a coding frame that included publicity of the vaccine (e.g., sources of vaccine information), access to the vaccine (e.g., knowing someone who had been vaccinated), and the vaccine's impact on participation in vector control activities (e.g., if vaccination changed household vector control practices). We then complemented this coding frame with the addition of new themes and codes as they arose inductively during the analysis, namely strategy adaptations.

Finally, we used the Consolidated Framework for Implementation Research (CFIR) to organize barriers and facilitators identified at each level of the Pilot Plan as it was implemented in Iquitos [Figure 2] (28). We grouped the findings into representative themes and placed these themes within the CFIR framework to locate the specific factors that influenced vaccination implementation at different levels of the process. Our findings are relevant to four out of the five CFIR levels: implementation process, health facility level, community level, and individual level. The fifth level, innovation, was described in the methods so we do not present findings in this domain. We recognize some topics within domains are cross-cutting; to avoid duplication we assigned each topic to the single domain judged most appropriate.

Secondary Complementary Data from Sullana, Piura. Concurrent with data collection and analysis in Iquitos, one of the researchers (SYML) independently conducted a qualitative study on vector control practices in Sullana, Piura. In January 2025, 12 FGDs with community members and 20 KIIs with healthcare personnel were conducted. Piura was also one of the sites selected for the Qdenga rollout, so while the focus of this study was on the adaptation and experiences of planning and implementing dengue vector control during the COVID-19 pandemic in Sullana, the dengue vaccine naturally arose in conversations as it was currently being rolled out. SYML identified and shared transcript sections in which Qdenga or dengue vaccination was discussed with the broader research team. These excerpts were subsequently analyzed by EBO, SA, and SYML using an inductive approach and examined in relation to themes emerging from the primary Iquitos analysis [Supplemental Material 2]. The secondary comparison was used to assess contextual perspectives, including which themes appeared specific to Iquitos and which were also observed in Piura. The full findings from this study will be published in a separate manuscript.

Positionality

This study was a collaborative effort between local researchers and graduate students from American universities living and working in Iquitos. The Principal Investigator (VAPS) is a Peruvian American social scientist who has worked with the research team in Iquitos for over 20 years on numerous dengue and human papillomavirus (HPV) projects. Research team members based in Iquitos are residents of the community (CH, EJRL). One graduate student is a Peruvian American doctoral candidate in public health (EBO) and the other is an American MD/PhD candidate in medical anthropology (SA). Both have lived in Peru for extended periods of time. In addition, because our study team nurse (EJRL) recruited FGD participants in neighborhoods where she had previously worked and is therefore known by community members, this may have increased some participants willingness to participate and may have influenced their decisions to share personal information. We conducted all interviews and discussions exclusively in Spanish, and with the intention of neutralizing bias and maximizing participant comfort, we ensured a local member of the research team moderated all discussions and reinforced that every point of view is important to hear during the informed consent.

Ethics statement. The study materials, including written and verbal informed consent forms, and FGD and interview guides, received approval from the Tulane University Social Behavioral Institutional Review Board (2023 – 1199) and the Prisma Institutional Research Ethics Committee, a Peruvian non-governmental organization.

Results

We conducted six FGDs, with 55 total participants, and four KIIs [Table 2]. All KII participants and most FGD participants (80%) were women. FGD participant ages ranged from 25–56, with a mean age of 40 years. We conducted four FGDs with participants from urban neighborhoods (Tupac and Punchana) and two FGDs with participants from a rural neighborhood (Rumococha). Many participants' children had received their first dose of the Qdenga vaccine between April and June 2025, prior to the FGDs, and were therefore in the waiting period before eligibility for the second dose.

Table 2
Focus Group Discussion Participant Characteristics

Focus Group (in chronological order)	Location	Number of Participants	Number of Women (%)	Age Range (Mean)
1	Punchana (urban)	6	0 (0%)	41–54 (46.8)
6	Punchana	8	7 (88%)	30–52 (40.4)
2	Tupac (urban)	10	10 (100%)	29–47 (37.9)
3	Tupac	10	10 (100%)	35–51 (35)
4	Rumococha (rural)	11	7 (64%)	35–56 (39.6)
5	Rumococha	10	10 (100%)	30–50 (41.5)
TOTAL		**55**	**44 (80%)**	**25–56 (39.7)**

Selected quotes are presented in Table 3; a complete quote analysis is available as a supplementary table [Supplemental Material 3].

Table 3
Themes Identified and Representative Quotes in English

Theme	Subcode	Quote
Implementation Process	Terminology: "Pilot Plan"	*Some people read "dengue pilot vaccination" and felt like they were being used as guinea pigs. Parents interpreted it that way too. "No, this is new, they're going to use us like guinea pigs. They're going to do it just like the COVID vaccine. They've tricked us," something like that. Just because of the word "pilot," which was poorly named. That's also why the parents were a bit resistant, though the vaccine itself isn't new. I'd explain to them: "No, sir, the vaccine is new in our country, but in other countries it's already being given, even to older adults." But once that idea gets into their heads, they're already stuck in that mindset, as we say. So it's hard to change their minds. (KII2)*
	Preparation Time	*I think it was very brief. The training took place—if I recall correctly—about three weeks before the launch, or perhaps even less. In other words, I believe the promotional period was simply too short; that is why parents were not informed. It sometimes takes time for information to reach everyone, for it to spread, and that was the limiting factor in this regard: specifically, the limited timeframe for disseminating the information (KII3)*
	Sponsored Brigades	*The brigade covered practically everywhere… we really covered the entire area. (KII3)*
Health Facility Level	Vaccination Location Changes	*According to the guidance, it was stipulated that the vaccine would be administered at the health facilities; however, as I mentioned, since we were not seeing any patient traffic, we had to devise alternative strategies. One of those strategies involved reaching out directly to specific areas within the local communities. (KII2)* *So I think that if, right from the very start, they had already had the plan of "let's go to educational institutions" and a complete team had gone I believe it would have worked better. (KII2)*
	Public Advertising	*There are [posters] only at the IPRESS centers where they're prioritized, at the I-3 and I-4 centers. In the communities, there aren't any, there's no publicity, but we do have those little posters that, when they come here, we used to give them, along with calendars, but they gave us those later. (KII2)*
Community Level	Trust in Health Authorities	*Because the doctor here informed us that it is possible and reliable. If he hadn't told me, if I hadn't been informed, I would have once again told them no. The conversation we had last time served as the push I needed to say yes—specifically when she stated that the vaccine is reliable. For that reason, I had my son vaccinated. (FG1)*
	Attitudes Towards Vector Control	*Because they're a nuisance and carry bacteria. It would be advisable for them to fumigate, perhaps every six months, or even continuously, so that we can also help prevent mosquitoes and keep them from bothering us too much. (FG3)*
	COVID-19 Experience	*They've focused more on the side effects, specifically, the potential adverse reactions, much in the same way things unfolded with COVID-19. They tended to focus more on the effects the vaccine might cause- I believe that is why so many parents have felt such apprehension. However, according to the training we received, there were no such side effects. Our primary concern has actually been how to provide care for a child when they arrive in an emergency situation and matters of that nature. (KII3)*
Individual Level	Missing Information	*That is why I say more information is needed: health personnel need to provide more information to the public. They say, "Everyone against dengue—get vaccinated," but they don't actually provide any information. (FG1)*
	Concurrent Vaccine Campaigns	*Well, actually, the dengue vaccine in the Loreto region went through a somewhat tedious process due to having to compete with other vaccines. We were administering the HPV vaccine at the time, so the dengue vaccine had to compete with it. (KII4)*
	Experience with Dengue	*I think since there have been cases of those outbreaks at the beginning of the year, people here have also started to worry and have come looking for it. (KII3)*

Implementation Process

The greatest challenge during the implementation process came in the form of terminology: the term "Plan Piloto" (Pilot Plan) created distrust. All interviewees and FGD participants said this term inspired widespread community mistrust because people believed that their children were the subjects of an experimental vaccine that had not yet been officially approved. The majority of participants reported suspicion that the Qdenga vaccine was being "piloted" on them before it was determined to be safe and effective. Specifically, FGD participants expressed feeling their children were "*conejillos de india*" (a local term for "guinea pigs") in the government's plan. Along with this terminology, the lack of information surrounding the rationale for Qdenga's age restrictions provided another source of suspicion. Notably, many participants discussed their concern with institutional experimentation by referencing personal and community experiences with the COVID-19 virus and vaccine, demonstrating that the mistrust and vaccine hesitancy heightened during the pandemic fostered continued suspicion around Qdenga. Very similar concerns and language also emerged in the Piura study, where health personnel described the association of the term "pilot" with community perceptions that the vaccine was experimental. Even several health personnel in Piura mentioned they would not vaccinate their own children with Qdenga due to concerns over institutional experimentation. Like in Iquitos, these participants often linked these suspicions with Qdenga to ongoing mistrust of the COVID-19 vaccine.

Another challenge during the implementation process involved preparation time and personnel. Participants involved in implementation in Iquitos reported that the planning period was too short and the preparation was inadequate. Only three weeks passed between the MOH's initial publication of its Pilot Plan and the date selected for GERESA to begin vaccine administration. GERESA key informants in Iquitos expressed concern over limited training sessions for staff and delays in receiving promotional materials, with one informant reporting her clinic did not receive physical flyers until two months after they had begun vaccinating. The short time frame also impacted the staff's ability to strategize and plan outreach events prior to the commencement of the vaccination campaign. For example, key informants in Iquitos described limited time to hold public educational meetings for families. These key informants cited limited preparation time as a potential cause of low initial turnout.

MOH-funded brigades made up of community health workers (CHWs) facilitated the achievement of the Qdenga vaccine target numbers for the first dose in Iquitos. In order to meet the dengue vaccination goal for the first dose, the MOH funded brigades of CHWs that local health facilities recruited and trained. Dedicated solely to the dengue vacicne campaign, the CHWs administered 20–30 doses per brigade per day to meet their goal, which key informants described as critical to reaching the first-dose target. KII participants reported that the MOH extended the contracts of the CHWs by a month due to their utility, but that once the contracts ended, they needed to return to a clinic-based strategy for administering the second doses.

Health Facility Level:

Local health facilities adapted their vaccination strategies to partner with educational institutions and to increase door-to-door outreach efforts to counter slow initial uptake. Initially, vaccination in Iquitos occurred exclusively at designated health facilities, requiring parents to bring their children to the clinic to get vaccinated. When this approach yielded a low initial turn-out, personnel at the health facilities adapted this approach to instead meet participants at their homes and schools rather than requiring them to travel to the health facility [Figure 3]. The newly contracted CHWs enabled this expansion of outreach efforts into schools and across door-to-door community visits. Several of the FGD participants cited this approach as critical for the completed rollout of the Qdenga vaccine, describing the additional support and trust between GERESA and the school administrators based on existing partnerships as essential elements to its success.

"We began going to schools because the vaccination efforts at our facilities were not working. Parents weren't showing up, and neither were the children. Sometimes the children would simply walk right past, or the outreach staff sent to recruit them would show up empty handed. All these issues emerged along the way; so we held a meeting with the GERESA management team and decided to change our strategy—specifically, to mobilize our efforts directly with the schools." (KII4)

Piura experienced similarly slow initial uptake, but health workers there attributed the slow pace to a different reason. The rollout of the vaccine in Piura began towards the end of November, which is an eventful month for children, with exams in December and a subsequent holiday and end of the school year. Health personnel in Piura considered the exam period and school closure a deterrant for busy parents asked to bring their children to the clinic for vaccination at the beginning of the campaign. Health workers in Piura also described low initial uptake with subsequent increase as a normal, expected course for vaccine rollouts, explaining attendance increases as more people hear of and become familiar with the vaccine from friends and family.

Communication also evolved as health facilities adapted their approach. Public messaging and advertising changed over the course of the campaign. The initial regional outreach policy in Loreto focused largely on social media messages and physical flyers in health facilities [Supplemental Material 4]; however, the printed promotional materials provided by the MOH arrived after the vaccination campaign began. Initially without promotional materials and facing low turnout from social media advertising, local health facilities began visiting neighborhoods with megaphones to share information about the vaccination campaign and meet with school administrators. Several KIIs emphasized the importance of this "on-the-ground" messaging for providing information to community members who had not previously heard about the Qdenga vaccine through social media or physical flyers. Nurses also utilized the 15-minute appointment window to vaccinate children in health facilities to address parent questions and concerns, which they hoped would allow valuable information to spread to community members who were unsure or unaware about dengue vaccination for their children.

Community Level:

The guidance and availability of door-to-door healthcare workers was a common source of trust in the Qdenga vaccine. In Iquitos, various public health outreach campaigns work with nurses, specialists, or contracted community members to perform door-to-door vaccinations, mosquito larval habitat surveillance, education, or research for other infectious diseases. As a common public health model in the city, FGD participants generally expressed confidence in home visits for the Qdenga vaccine, sometimes mentioning they knew the healthcare worker from prior neighborhood campaigns. Participants generally accepted the guidance offered during these door-to-door campaigns. Some participants shared that their sole reason for accepting the dengue vaccine was GERESA's recommendation, indicating a strong level of trust in door-to-door healthcare workers and public health outreach guidance from municipal health authorities.

"I haven't been afraid at all, not of dengue or COVID. I've gotten all the vaccines, and so have my daughters. So, I think what the Ministry provides for our own good is better than getting COVID. That's how I see it. I insist that my kids get vaccinated as soon as the vaccine arrives. I'm keeping an eye on that." (FG5)

Vaccinations within schools and homes accommodated to the parents' very busy work schedules. Most participants agreed that the convenient locations of the vaccination campaigns – the health facility coming to them rather than vice versa – were critical for their ability to vaccine their children.

"The first dose was administered there at the school, and later they came to find us at my house. My little boy received his first dose in November, and then they came to my home in March." (FG4)

General acceptance of local healthcare workers and public health guidance seemed to correspond to trust in school guidance and prior cooperation between the health facilities and the schools. Given that GERESA staff must receive permission from school administrators to conduct vaccination campaigns in schools, which occur regularly for other vaccines, some participants shared that the school's approval of the Qdenga vaccine added an additional level of assurance, indicating trust in the partnership between municipal health authorities and school administrations.

Even with the Qdenga vaccine, participants indicated that they would continue to allow public health staff into their homes to complete vector control activities, such as home inspection of larval habitats, larvicidal treatment of habitats, and mosquito fumigation. Specifically, because only a subset of the population was eligible for vaccination, parents understood that vector control was still required as other household members remained unvaccinated. Similarly, many

saw mosquitos not only as disease vectors, but also as everyday nuisances, which alone warrants vector control: *"If you are already vaccinated, it's more for prevention, come and fumigate so we can sleep soundly." (FG4).*

Those who expressed distrust in the Qdenga vaccine often cited the COVID-19 vaccine and personal experiences during the pandemic. In both Iquitos and Piura, participants repeatedly cited adverse reactions they associated with the COVID-19 vaccine when expressing hesitancy with the Qdenga vaccine. The specific reactions participants named included high fevers, cardiac problems, blood clots, vision impairments, and even death, expressing concern that these side effects would resurface with the Qdenga vaccine. Several participants reported the death of a family member due to the COVID-19 vaccine when discussing their hesitancy for the Qdenga vaccine. Some participants in Piura also mentioned microchips in the COVID-19 vaccine when discussing their hesitancy for Qdenga. Notably, those who expressed beneficial or neutral attitudes toward the COVID-19 vaccine appeared more likely to trust the official guidance of local health authorities regarding the Qdenga vaccine. Some participants reported that adequate information about Qdenga—namely its indication, adverse reaction profile, prior approval as safe and effective, and rationale for age restrictions—were effective or would be effective counterinformation against rumors circulated online, in the news, and among community members if delivered timely and widely.

Individual Level:

At the individual level, participants repeatedly reported that they wished they had received more information about the vaccine when they were introduced to it. Participants reported receiving a consent form from the school asking for parental permission to administer the Qdenga vaccine to their child with limited information: *"they only told us they were vaccinating against dengue, but they didn't explain anything to us." (FG3).* Most FGD participants knew the number of doses and the eligible age range, but nothing more. For example, most participants were unaware that the same Qdenga vaccine had been previously approved for administration in several other countries, including in South America. FGD participants frequently expressed that adequate education is an essential component of trust, specifically indicating that knowledge of the vaccine's purpose, side effects, dosage numbers, and contraindications are important factors for increasing confidence to vaccinate their children. Health personnel explained in the Iquitos KIIs that they hosted "charlas" (talks) at schools for parents to attend and learn about Qdenga, but they suspected a disconnect in communication between schools and parents because the "charlas" were sparsely attended in Iquitos; indeed, most parents in the Iquitos FGDs were unaware of their occurrence. In Piura, on the other hand, many of the parents in the FGDs attended "charlas" about the Qdenga vaccine at their children's schools, suggesting there was an error in communication between the two entities in Iquitos rather than disinterest by one group.

The co-occurrence of the Qdenga vaccine with other vaccination campaigns against yellow fever and HPV created confusion in some participants about the specificities of the dengue fever vaccine. This confusion became clear when several FGD participants reported that they had received the Qdenga vaccine the previous year, when it was not yet available in the country. Concerns about side effects from Qdenga also arose from reports of children experiencing severe adverse effects that were likely the result of another vaccine.

Although participants widely recognized dengue as a constant threat in their communities, prior experience did not translate into an immediate need for vaccination. Essentially all participants had prior experience with dengue fever, either personally or through someone they knew. Participants generally did not express urgency for the vaccine at the time of data collection, while some explained explicitly that dengue was not a high priority when it wasn't high season. But when asked if they would feel differently during an outbreak, multiple parents, including those who had not vaccinated their children, said an outbreak would motivate them to prioritize the Qdenga vaccine. Participants were generally quite aware of the ubiquity of dengue fever in the region. As one participant said:

"Here in our area, for instance, we have historically been a high-risk zone for dengue and malaria. We've seen cases of hemorrhagic dengue. That's precisely why the focus here is so intense, and why there is such widespread acceptance of the vaccine, for that very reason. That is why absolutely everyone is so happy that a dengue vaccine is available. Perhaps it will work to wipe out the disease entirely; or, at the very least, it helps us by offering some amount of prevention. That's why there is widespread acceptance here." (FG5)

Discussion

Loreto achieved the Pilot Plan's first-dose delivery target goal by administering all available first doses of the Qdenga vaccine in a seven month period. (22, 29). Using the CFIR framework, we aim to better understand which local implementation adaptations enabled the campaign to reach this goal and which implementation challenges needed to be overcome. Overall, our findings show that vaccination uptake in Iquitos was facilitated by adapting public health outreach campaigns away from solely health-facility-based administration toward delivery at schools and homes, leveraging general community trust in municipal health authorities and their partnerships with schools. Our data indicate that the barriers to Qdenga rollout in Iquitos included inadequate preparation time (30, 31) and communication, suspicious "pilot" terminology, limited vaccine information, and COVID-19–related vaccine hesitancy.

One of the major findings from this study is how policy terminology can become an implementation barrier. The use of the term "pilot" in a national policy document outlining the guidelines for vaccine pilot program generated an unintended distrust at the community level in both Iquitos and Piura, which required local health authorities to actively confront in their education outreach. Iquitos has a long history of door-to-door public health campaigns and general trust in municipal health authorities, which proved critical in increasing acceptance of Qdenga despite vaccine hesitancy stemming from official terminology, perceptions of COVID-19, and a lack of official information. However, in settings with a less robust tradition of door-to-door public health campaigns and lower community trust in municipal health authorities, these barriers may prove more impactful for overall vaccine uptake than they did in Iquitos.

There is an apparent discordance between the achievement of the first-dose goal in Iquitos alongside a widely reported lack of information and general community-level distrust of piloted vaccine campaigns. We suspect that high levels of trust in local health authorities and the direct benefit of public health outreach campaigns that met families where they are—in their homes and schools—were essential for overcoming existing hesitancy. Previous research identifies trust in health authorities and prior participation in school-based immunization programs as important variables for vaccine confidence (32–34). Further investigation may be useful in more clearly differentiating which levels, personnel, and guidance of the health facilities generate the most trust among community members, and how trust in local health authorities relates to national and international vaccination campaigns.

Our study found that schools functioned as vaccination sites, convenient access points, communication channels, and sources of trust, suggesting they are a feasible and effective place to vaccinate children in Iquitos. Compared to door-to-door vaccination efforts, which face the challenges of visiting homes while parents are away and requiring more human resources, schools allow CHWs to reliably access large populations in a single site. Door-to-door neighborhood visits and school outreach efforts have a long precedent in Iquitos as part of vaccination campaigns, including influenza, routine childhood immunizations, and the HPV vaccine (35). Previous research in other countries has shown school-based vaccination programs to be an effective way to increase vaccine coverage and reduce barriers to vaccine access, namely in primary care appointment costs, transportation costs, and lost income when parents need to miss work to bring their children to the facility (36–38). The contrasting experiences of the school "charlas" in Iquitos and Piura, with Piura schools receiving much higher attendance, suggest that school-based vaccination campaigns may require strong communication and partnership pathways between health authorities, schools, and parents to ensure school-based education reaches caregivers. To improve community socialization around the dengue vaccine and increase participation in "charlas" offered at schools or other information sessions, health officials may consider posting in school WhatsApp groups, which parents highlighted as essential communication channels in their social milieus. Some participants in Iquitos and Piura also recommended working through popular social media platforms such as Tik Tok.

In an under-resourced setting where parents cannot easily leave work and transportation costs are high, convenience was critical for Qdenga vaccination uptake. GERESA used health brigades only through the administration of the first dose, while the second doses were rolled out exclusively at health facilities. Although delivery of the allocated first doses reached 100%, only 73% of the second doses were administered by the end of the vaccine campaign (December 30, 2025) (22, 29), suggesting the gap in vaccination coverage may be addressed through school-based and door-to-door outreach strategies that reduce convenience barriers.

Misinformation, safety concerns, and public distrust of government health agencies during the COVID-19 pandemic have increased vaccine hesitancy and impacted routine childhood immunization more broadly (19, 20). During the first wave of COVID-19 in 2020, Iquitos and the nearby Amazonian city of Manaus, Brazil had the world's highest infection and mortality rates, providing crucial context for the widespread suspicion of vaccine indications and side effects we report here (39). This study suggests that the community-level trauma inflicted by the COVID-19 pandemic in Iquitos continues to affect community members' perspectives on vaccines. In contrast to many narratives of vaccine hesitancy in a post-COVID-19 environment, the data here show that hesitancy around the Qdenga vaccine in Iquitos and Piura did *not* correlate with general community mistrust in municipal health authorities, suggesting that vaccine hesitancy can arise independently of trust levels with official health sources. This study also suggests that COVID-19-related vaccine hesitancy may be counteracted by greater availability of official information about the vaccine, particularly through face-to-face interactions at schools and in homes, especially in settings like Iquitos where community members express general levels of trust in municipal healthcare authorities (19).

The original MOH communication plan was not effective in consistently informing parents, and inconsistent and sparse information about the Qdenga vaccine seems to have produced uncertainty, and perhaps complacency, among many parents. Limited information about the Qdenga vaccine also contributed to confusion with other vaccines, suggesting again the importance of more deliberate and comprehensive education efforts. Because there was an ongoing yellow fever outbreak and vaccination campaign in Peru at the time of data collection, and because the HPV vaccine targets similar age groups (9–18 years), educational efforts to distinguish between the variety of health information community members receive should be clarified (40).

These results give us insight into general levels of acceptance of the Qdenga vaccine and the reasons for that acceptance, but we cannot measure from qualitative data the overall degree of hesitancy that exists in the population. Furthermore, although Loreto surpassed its goal of vaccinating 53,347 children (29) there is no publicly available dataset that contains the total number of people offered the vaccine, which would serve as a denominator for Qdenga's acceptance rate. Without that figure, we cannot adequately access overall levels of Qdenga vaccine hesitancy in Iquitos or Piura. Further discussion with people who declined the Qdenga vaccine is needed to better understand all the factors involved in vaccine hesitancy. For example, several participants mentioned rejecting the vaccine at first and then subsequently accepting it, offering an opportunity to further analyze the reasons for initial hesitancy and eventual acceptance.

Limitations. Although this study provides important insight into the rollout of the Qdenga vaccine in Iquitos, it has several limitations. The qualitative nature of the data collection carries risk of social desirability bias. Participants may have used the session to ask questions and test theories around vaccines that they learned outside of public health settings, or they may have felt pressured into appeasing the researchers whom they regarded as public health professionals, although the variety of opinions voiced suggests that this bias was minimal. Initially, we planned to split FGDs by vaccine status to reduce this risk, but we eventually determined that gathering this information prior to consent could be an invasion of personal privacy. Additionally, these results are likely not generalizable to all implementation sites in Peru, considering the higher burden of dengue in Iquitos and the city's history vector control infrastructure. However, the secondary complementary data from Piura that shows very similar themes regarding pilot program experimentation, COVID-19 distrust, gaps in information, and the utility of school-based campaigns, suggesting these themes are not specific to Iquitos and therefore warrant further investigation to analyze potentially national trends. While the Piura data adds helpful context for analysis of the Iquitos themes, the sampling frame and study guides were not explicitly focused on the dengue vaccine, so these data may not capture the full range of community perceptions surrounding the Qdenga vaccine. Our results should still be considered a useful framework for the optimal rollout of future vaccines in other cities, particularly in countries just beginning uptake of a new vaccine.

Conclusion

Although there were challenges with the rollout of the Qdenga vaccine in Iquitos – distrust of pilot vaccination programs stemming from COVID-19, sparse initial information about Qdenga, delayed preparation, and slow initial uptake – the strong community trust in the public health system alongside the adaptive and community-driven outreach efforts by local health facilities contributed to the successful administration of all of the region's allotted first doses. Locally adapted, community-based public health efforts that reach community members where they are and adapt to their busy lives may help address structural barriers to vaccination. Expansions of the dengue vaccine rollout may benefit from incorporating community-based delivery, school partnerships, and local adaptation from the start, while ensuring adequate preparation time and clear communication about vaccine status, safety, and eligibility.

Abbreviations

DENV
Dengue virus
DHF
Dengue hemorrhagic fever
MOH
Ministry of Health
KII
Key informant interview
FGD
Focus group discussion
GERESA
Loreto Regional Health Department
CFIR
Consolidated Framework for Implementation Research
HPV
Human papillomavirus
CHW
Community health worker

Declarations

Ethics approval and consent to participate.

The study materials, including written and verbal informed consent forms, and FGD and interview guides, received approval from the Tulane University Social/Behavioral Institutional Review Board and the Prisma Institutional Research Ethics Committee, a Peruvian non-governmental organization.

Consent for publication.

Not applicable.

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Author Contribution

EBO and VAPS conceptualized the study and designed the original study protocol. EBO, SA, LN, SYML, CH, EJRL, and VAPS performed data collection. EBO, SA, CH, and SYML analyzed the data. EBO and SA drafted the manuscript and LN and VAPS made substantial edits. All authors read and approved the final manuscript.

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Data Availability

All FGD and KII transcripts were de-identified but may still contain information that could potentially be used to identify participants. Data is not publicly available, but SM2 contains numerous representative quotes for all themes presented in the article.

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Figures

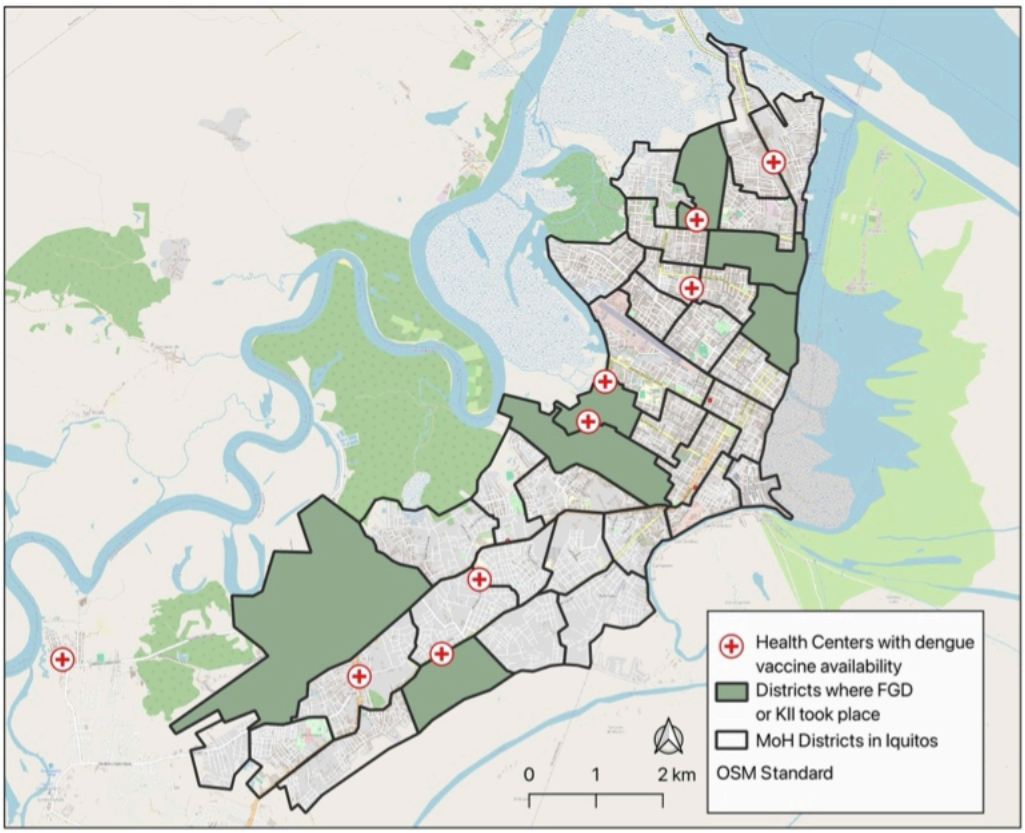


Figure 1

Map of Study Participant Locations. Adapted from the GERESA website (24). Map data copyrighted OpenStreetMap contributors and available from https://www.openstreetmap.org"(25)

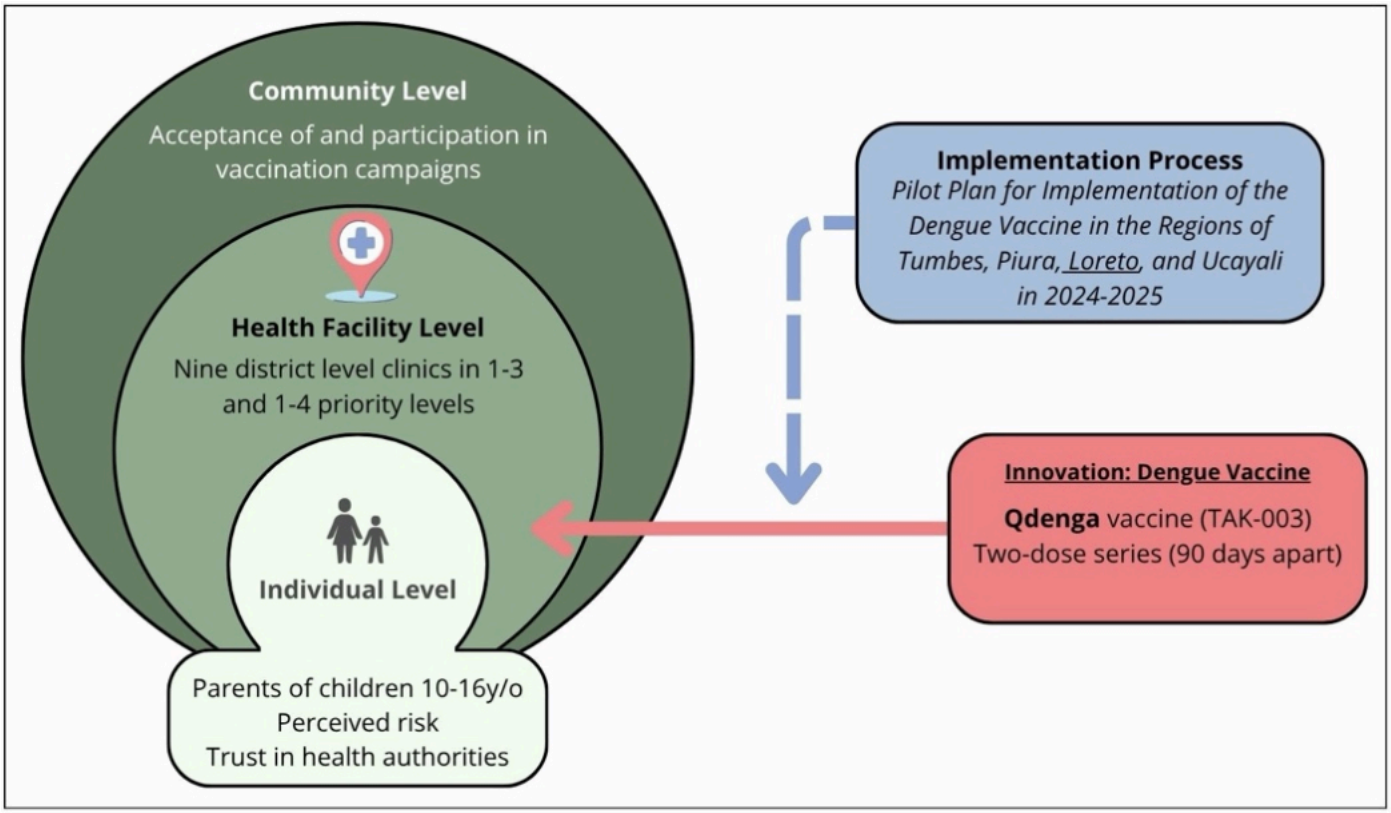


Figure 2

Dengue Vaccine Campaign Using the Consolidated Framework for Implementation Research (CFIR).

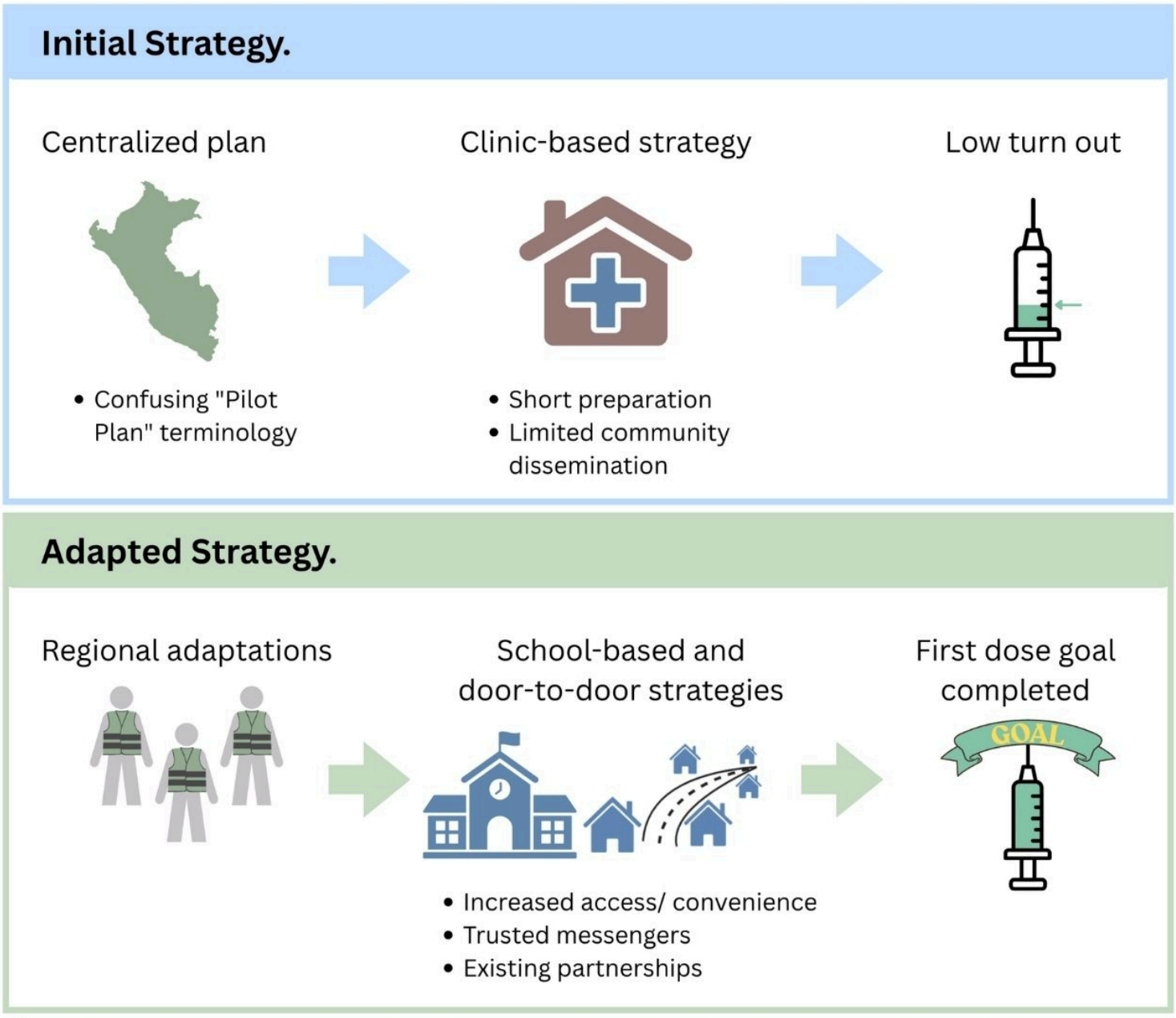


Figure 3

Adaptations of the Qdenga vaccine strategy in Iquitos.

Supplementary Files

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- SupplementalMaterials.docx