

Stakeholder preferences regarding *Shigella* vaccines in Kenya

Assessing disease awareness and the value of prospective *Shigella* vaccines

Shigella is the leading bacterial cause of childhood diarrhea globally, resulting in more than 60,000 deaths and millions of hospitalizations each year.¹ It typically causes severe or bloody diarrhea (“dysentery”), and *Shigella* infections have long-term effects on growth and development, including severe malnutrition, stunting and metabolic disorders, as well as increased mortality from other infectious diseases.^{2,3,4} Additionally, there is strong evidence of increasing antimicrobial resistance (AMR) to *Shigella*,⁵ which is concerning because diarrhea from *Shigella* is not always bloody, often leading to misdiagnosis and inappropriate antibiotic use. No licensed *Shigella* vaccines currently exist, but several promising candidates in development, given as one or two doses between the ages of six months and one year, could become available in a few years. Given numerous competing disease prevention priorities in low- and middle-income countries (LMICs), input from key stakeholders is required to accurately understand and estimate country demand for *Shigella* vaccines. PATH conducted a series of studies and analyses to evaluate the public health value of potential *Shigella* vaccines and help inform decisions by international agencies, funders, vaccine developers, and national policymakers. This included a multi-country feasibility and acceptability study with **national stakeholders** and **healthcare providers** in Burkina Faso, Ghana, Kenya, Nepal, and Vietnam to identify preferences and priorities for future *Shigella* vaccines. This brief provides an overview of the study results, with a focus on Kenya. The Kenyatta National Hospital-University of Nairobi Ethics Research Committee and the Kenyan National Commission for Science, Technology & Innovation approved these study activities. (Manuscript will be submitted to a peer-reviewed journal.)



Key takeaways across all countries

- ◆ Study participants most frequently mentioned diarrhea as a key health concern for children younger than five years old. Though when asked to rate the severity of given health concerns, they rated related, longer-term issues—such as malnutrition, stunting, and increased risk of AMR—as very serious. Conversely, *Shigella* was not perceived as a critical health threat.
- ◆ Participants are willing to consider adding another vaccine to the immunization schedule, in theory. However, their interest in introducing a *Shigella* vaccine was tempered by a lower perceived burden of *Shigella* relative to other vaccine-preventable diseases and heightened concern about the number of concomitant injections children already receive.
- ◆ The overall priority of *Shigella* vaccines rose among participants as they were provided with progressively more country-specific information about the possibility of preventing longer-term issues related to *Shigella*, notably reducing AMR and stunting. While this was consistent across both participant groups, **healthcare providers** prioritized *Shigella* vaccines higher than **national stakeholders**.
- ◆ When asked to choose between different *Shigella* vaccine attributes, participants selected those with greater perceived community acceptability, with strong preferences for an oral vaccine and a *Shigella*-containing combination vaccine.

Kenya's spotlight

In Kenya, *Shigella* is estimated to be responsible for 209,000 cases of moderate-to-severe diarrhea and 590 deaths in children younger than five years old annually.⁶ Assumptions made for this study included that a *Shigella* vaccine, available in 2025 to 2030, would be 60 percent effective and could prevent 115,342 moderate-to-severe diarrhea cases, 15,400 stunting cases, and 315 deaths due to *Shigella* each year in children younger than five years in Kenya.⁷ In Kenya, 5 **national stakeholders** and 10 **healthcare providers** were interviewed.

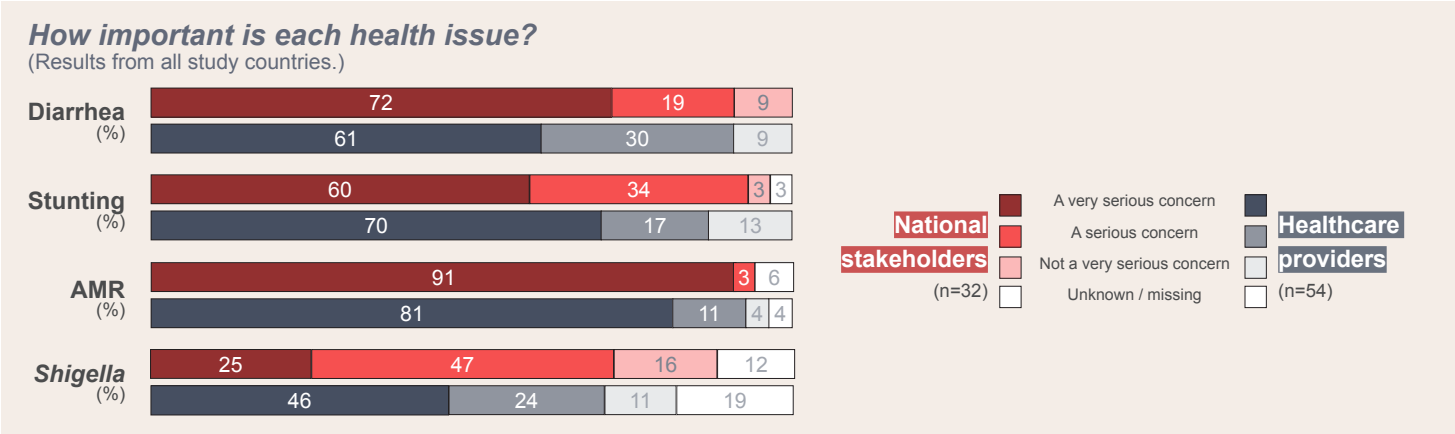
Methods

From October 2021 to August 2022, PATH worked with investigators in five countries to interview 32 **national stakeholders** and 54 **healthcare providers** to assess their health concerns and perceptions associated with prospective *Shigella* vaccines. Participants were asked about their prioritization of and preferred attributes for a *Shigella* vaccine after receiving progressively more information about the vaccine's potential impact in their country. **National stakeholders** were members of the Ministry of Health with roles in immunization policy making, programming or financing, diarrhea control, or nutrition policy making, or were considered policy influencers based on their role in public health. **Healthcare providers** were from facilities that provided immunization and were in charge of the facility or worked in immunization, diarrheal control, integrated management of childhood illnesses, or nutrition services.

Results

Findings from interviews with national stakeholders and healthcare providers provide important insights around three key questions.

Key Question 1: What health concerns do national stakeholders and healthcare providers prioritize?



When asked an open-ended question about the top health concerns for children younger than five years old, participants most frequently mentioned diarrhea. Reasons for this included that “hygiene practices are not up to date,” there are “major water issues” due to scarcity or pollution, or increases in population have led to “growing needs for sanitation.” Participants were subsequently asked about the importance of diarrhea, stunting, and AMR as health concerns in children. While around two-thirds cited diarrhea and stunting as a “very serious concern,” more than 80 percent of participants considered AMR a top health priority.

While both groups of participants perceived diarrhea, stunting, and AMR to be important health concerns, their reasoning differed slightly. National stakeholders tended to speak toward higher-level country indicators such as how long-term health impacts “affect the development of the country.” Healthcare providers situated their concern around inadequate or poor-quality care such as “patients can buy antibiotics on their own,” “self-medication at home,” or “parents fail to bring the child in very early,” which leads to “the child [being] weakened and vulnerable to all the other diseases.”

More than 90 percent of all participants had heard of Shigella, but perceived importance among the two groups varied. National stakeholders considered Shigella as largely already addressed through routine diarrhea programming, which reflected their lower prioritization of Shigella prevention compared to other diseases. Healthcare providers expressed stronger concerns about Shigella and viewed new vaccines as an opportunity to address existing challenges in delivering care. The greatest concerns related to Shigella overall were long-term issues like malnutrition, stunting, and the risk of AMR.

A call for improved surveillance

Results from this study indicate that all countries need more context-specific data, such as disease burden and improved diagnostic tools, to better understand the importance of Shigella specifically and the potential impact of a vaccine. When participants indicated that Shigella was a lower priority, they often mentioned this issue. Twelve participants emphasized the need for more data; one participant cited, “we don’t have [a] good surveillance system” specifically on Shigella burden. In addition, six participants called for improved availability of tools for diagnosing Shigella, for example, noting “there is no definite diagnosis of diarrhea at health facilities.”

Kenya’s spotlight

Participants in Kenya indicated a higher level of concern about diarrhea, but less concern about stunting and AMR, compared to other study countries.

How important is each health issue?

Health Issue (%)	National stakeholders (n=5)	Healthcare providers (n=10)
Diarrhea	100 (A very serious concern)	80 (A very serious concern), 20 (A serious concern)
Stunting	60 (A very serious concern), 40 (A serious concern)	50 (A very serious concern), 40 (A serious concern), 10 (Not a very serious concern)
AMR	60 (A very serious concern), 20 (A serious concern), 20 (Not a very serious concern)	70 (A very serious concern), 20 (A serious concern), 10 (Not a very serious concern)
Shigella	20 (A very serious concern), 60 (A serious concern), 20 (Not a very serious concern)	50 (A very serious concern), 20 (A serious concern), 20 (Not a very serious concern), 10 (Unknown / missing)

[Diarrhea] is a serious health concern because it accounts for a lot of morbidity and mortality in children under five years.

– Kenya healthcare provider

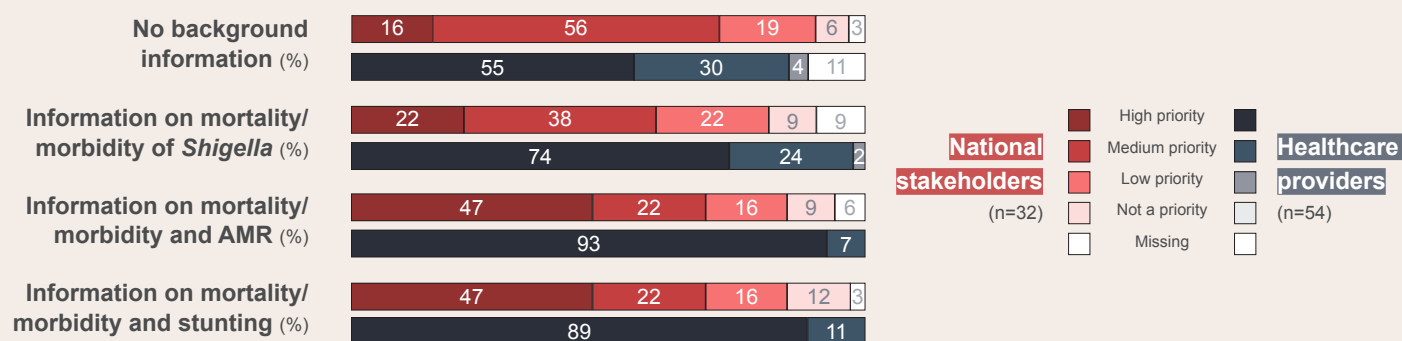
Right now we do not have the data on Shigella. I would say we put it at low priority because we do not have the numbers.

– Kenya national stakeholder

Key Question 2: What benefits would compel participants to prioritize introducing a *Shigella* vaccine?

What is the priority of a potential *Shigella* vaccine?

(Results from all study countries.)



Participants had an overall positive view of vaccines and indicated a willingness to consider new vaccine introductions if the benefits are compelling. However, with no additional information or burden data provided on *Shigella*, just 16 percent of **national stakeholders** cited *Shigella* vaccines as a high priority compared to 55 percent of **healthcare providers**. While estimates of *Shigella* diarrhea morbidity and mortality did not increase the priority of a *Shigella* vaccine for **national stakeholders**, information on potential vaccine impact on AMR and stunting prompted both groups to prioritize the vaccine more highly.

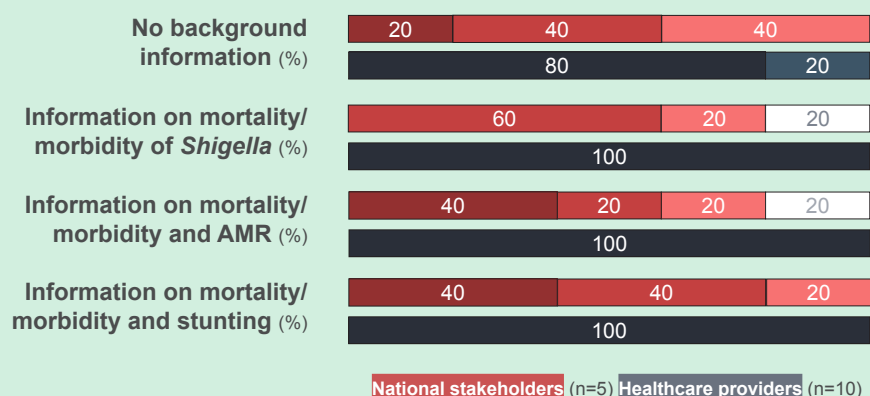
Across the study, one quarter of **national stakeholders** consistently considered *Shigella* vaccines as “low” or “not a” priority regardless of the potential additional benefits, due to competing health priorities in their countries and the perceived low disease burden of *Shigella*. **Healthcare providers** had a higher baseline prioritization and were less sensitive to additional vaccine benefits compared to **national stakeholders**, though they continued to cite concerns about adding more vaccines to the immunization schedule.

The differences in priority of *Shigella* vaccines among all participants are closely aligned with their perceptions of disease severity and broader vaccine benefits. Those who rated *Shigella* as a serious health concern and vaccines as a high priority attributed their prioritization to broad health impacts, citing it “decreases another disease burden” and “spares the loss of cognitive and physical impairments.” Prioritization only increased for many participants when impacts against stunting and especially AMR were added, reflecting the perceived severity or burden of these issues. When participants indicated a vaccine was not a priority, they cited the expected low impact, whether because the “burden of death [due to *Shigella*] was not large,” “antibiotic resistance is a very complicated story,” or “we have more pressing problems to deal with.”

Kenya's spotlight

In Kenya, the average prioritization of *Shigella* vaccines when given increasing information on potential vaccine impacts was similar among **national stakeholders** and was consistent, if a bit lower, compared to other study countries. Some were concerned about financing in light of the forthcoming Gavi transition. Among **healthcare providers**, however, prioritization was universally high for all potential impacts.

What is the priority of a potential *Shigella* vaccine?



I would think probably there are other more urgent vaccines. For example, in malaria-endemic areas, RTS,S vaccine for malaria is quite important.

— Kenya national stakeholder

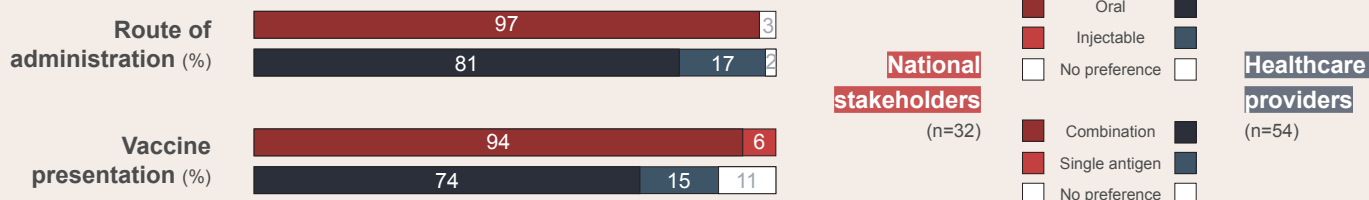
Despite the vaccines that we have, diarrhea is still among the top diseases that are killing our children. So, if we have a vaccine that can prevent diarrhea, then why not?

— Kenya healthcare provider

Key Question 3: What attributes affect participant willingness to introduce a *Shigella* vaccine?

Which vaccine attribute do you prefer?

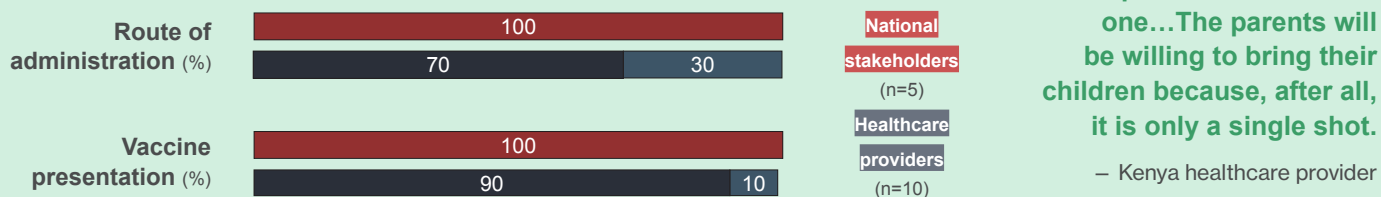
(Results from all study countries.)



When asked to choose which vaccine attributes would affect their willingness to introduce a *Shigella* vaccine, participants largely selected those with greater perceived community acceptability. Both **national stakeholders** and **healthcare providers** had a strong preference for an oral vaccine because “it reduces the number of shots” and “is less painful, therefore moms like it.” Most participants also preferred a combination vaccine that would protect against *Shigella* and at least one other pathogen “because you don’t have to prick multiple times,” which makes it “more acceptable.” Participants also indicated that both oral and combination vaccines have the additional benefit of being more convenient for health workers. A few **healthcare providers** preferred either a single injectable or single antigen vaccine, attributing their preference to concerns about vaccine efficacy, such as “the child may vomit [an oral vaccine].” Participants were also asked about how a series of other vaccine attributes (i.e., -20°C storage, lyophilization, single-dose packaging, booster-dose requirement) would affect their willingness to introduce a *Shigella* vaccine. These did not change participants’ interest in a vaccine substantively, except for -20°C cold chain storage, which was viewed as an insurmountable challenge. Findings were similar across all study countries.

Kenya’s spotlight

Which vaccine attribute do you prefer?



I would prefer the combined one... The parents will be willing to bring their children because, after all, it is only a single shot.

– Kenya healthcare provider

Conclusions and next steps

This study provides critical insights into country-level preferences for prospective *Shigella* vaccines and increases understanding of how **national stakeholders** and **healthcare providers** prioritize different attributes when making vaccine decisions. Compared to other countries, diarrhea was considered more concerning to participants in Kenya, as was *Shigella* for **national stakeholders**. Stunting and AMR were considered less concerning. Vaccine priority was mixed in Kenya—**national stakeholders** typically prioritized a *Shigella* vaccine similarly, if a bit lower, than their peers in other countries, but conversely, prioritization among **healthcare providers** was higher. It is important to note that preferences may shift over time due to multiple influencing factors, and may be different if or when licensed *Shigella* vaccines become available.

These results contribute to PATH’s broader effort to assess the public health value of potential *Shigella* vaccines. While there appears to be awareness of *Shigella* in the study countries, its prevention by vaccination is only a moderate priority. However, this prioritization increased when accounting for potential impact on reducing stunting and AMR or the inclusion of *Shigella* in a combination vaccine that also targets other pathogens of importance. The results also elucidate a need for improved *Shigella* surveillance within countries, as well as greater awareness of the global and local burden of *Shigella*, especially with respect to its role in stunting and AMR, and the potential impact that a vaccine could have in addressing these issues. These collective findings may help guide investment decisions by donors and vaccine developers to better meet LMIC needs, influence clinical trial designs, or help inform global policy guidance and national vaccine introduction decision-making in the future.

References

- Khalil IA, Troeger C, Blacker BF, et al. Morbidity and mortality due to *Shigella* and enterotoxigenic *Escherichia coli* diarrhoea: the Global Burden of Disease Study 1990–2016. *Lancet Infectious Diseases*. 2018;18(11):1229–40.
- Rogawski ET, Liu J, Platts-Mills JA, et al. Use of quantitative molecular diagnostic methods to investigate the effect of enteropathogen infections on linear growth in children in low-resource settings: longitudinal analysis of results from the MAL-ED cohort study. *Lancet Global Health*. 2018;6(12):e1319–28.
- Kotloff KL, Platts-Mills JA, Nasrin D, Roose A, Blackwelder WC, Levine MM. Global burden of diarrheal diseases among children in developing countries: Incidence, etiology, and insights from new molecular diagnostic techniques. *Vaccine*. 2017;35:6783–9.
- Platts-Mills JA, Babji S, Bodhidatta L, et al. Pathogen-specific burdens of community diarrhea in developing countries: A multisite birth cohort study (MAL-ED). *Lancet Global Health*. 2015; 3:e564–575.
- World Health Organization. WHO Preferred product characteristics for vaccines against *Shigella*. Available at: <https://www.who.int/publications/i/item/9789240036741>. Accessed 7 October 2022.
- Anderson JD, Bagamian KH, Muhib F, et al. Burden of enterotoxigenic *Escherichia coli* and *Shigella* non-fatal diarrhoeal infections in 79 low-income and lower middle-income countries: a modelling analysis. *Lancet Global Health*. 2019; 7(3):e321–e330.
- J. Anderson, personal communication, July 2021.