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## INNOVATION

### Handwashing With a Water-Efficient Tap and Low-Cost Foaming Soap: The Povu Poa “Cool Foam” System in Kenya

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The new handwashing system, designed with end user input, features an economical foaming soap dispenser and a hygienic, water-efficient tap for use in household and institutional settings that lack reliable access to piped water. Cost of the soap and water needed for use is less than US\$0.10 per 100 handwash uses, compared with US\$0.20–\$0.44 for conventional handwashing stations used in Kenya.

Using an interactive and iterative design approach involving representative end users, we created a new handwashing system in Kiambu, Kenya, to make handwashing convenient and economical in areas without reliable piped water. The innovative and adaptable system, branded as Povu Poa (“Cool Foam” in Kiswahili), integrates a cost-effective foaming soap dispenser with a hygienic, water-frugal water tap in a secure and affordable design.

#### BACKGROUND

Handwashing with soap and water reduces the spread of respiratory and diarrheal disease, the 2 leading causes of death in children under 5 years old.<sup>1,2</sup> Studies estimate that handwashing with soap can reduce acute respiratory infections by 21% and the risk of diarrhea by 40%.<sup>3,4</sup>

In settings without piped water, refilling water containers and securing soap for handwashing requires constant user effort and expense, creating barriers to handwashing with soap. In Kenya, for example, 78% of the population lacks access to household piped water<sup>5</sup> and the prevalence of handwashing with soap after contact with feces is estimated to be 13%.<sup>6</sup>

People are more likely to wash their hands at critical times if they have a dedicated place with soap and

water.<sup>7</sup> Conventional handwashing stations in Kenya, such as a jug and basin (Figure 1A) or a bucket with a tap (Figure 1B), are prone to soap theft, are cumbersome and suboptimal, and are not water-efficient. Alternative handwashing systems aim to provide affordable, water-efficient, and dedicated locations for handwashing. For example, the “leaky tin” dispenses water from a hole near the base of a container when a person removes a plug, and the “tippy tap” dispenses water by tipping the container when a person pulls on the attached string lever or steps on a foot pedal. However, difficulties with soap provision and security remain. The dual tippy tap integrates separate containers for soapy water and rinse water into a single system to address these issues (Figure 1C).<sup>8,9</sup> The soapy water mixture, a 50:1 water-to-powdered soap ratio, increases the lifetime of the soap and is an effective cleansing agent.<sup>10</sup> Still, the dual tippy tap has several shortcomings: it can become unstable over time, it requires frequent maintenance, the metal components are prone to theft, and the hardware is not particularly attractive.

#### INNOVATION PROCESS

We began our design process by conducting in-depth interviews and focus group discussions with potential users in low-income, peri-urban areas of Kiambu, including household members in 5 households, students and teachers in 3 primary schools, and health care workers in 2 clinics. Users preferred hand washing systems that were easy to operate and refill with water, a tap that allowed them to control the flow of water, and a portable unit that they could store inside

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