CASE STUDY: Transforming the market for vaccines cold chain equipment

CHAI and partners are transforming the cold chain equipment market to increase access to affordable, optimal technology that is needed to protect about $1 billion worth of vaccines annually from damage due to exposure to freezing temperatures.

BACKGROUND

Immunization is widely recognized as one of the most cost-effective public health interventions, saving the lives of up to three million children every year[1]. Most vaccines must be stored and transported at temperatures of 2-8°C to maintain their potency. This supply chain is known as the "cold chain", and is the backbone of immunization programs worldwide. Cold chain equipment (CCE) includes a number of product categories: refrigerators, cold boxes, vaccine carriers and temperature-monitoring devices.

A recent study found that 37.1 percent of vaccines in low- and middle- income countries are exposed to harmful freezing temperatures while being stored in refrigerators[2]. This is concerning: the annual value of Gavi-funded vaccines as of 2017 was about $1.3 billion, of which about $1 billion were vaccines that would suffer irreversible loss of potency from exposure to freezing temperatures[3].

Starting in 2013, CHAI has worked to address this problem with support from Global Affairs Canada and the Bill & Melinda Gates Foundation. In order to support the over-arching objective of proliferating optimal cold chain in low- and middle-income countries, CHAI has looked to transform the market to increase the availability and affordability of optimal, "Grade A" freeze protected CCE, which eliminates all freezing temperatures from the vaccine storage area without any intervention on the part of the user, such as a healthcare worker.

THEORY OF CHANGE

Key suppliers in the vaccine refrigerator market for low- and middle- income countries can be motivated to introduce optimal products through the right regulatory and commercial incentives. These incentives – when complemented by steady, value-adding support with product design and supplier economics – can achieve optimal products at affordable prices. These affordable prices will enable wider scale-up of optimal products in low- and middle-income countries, resulting in improved protection of vaccine potency in supply chains.

IMPACT

CHAI's work with partners has transformed the refrigerator market for low- and middle-income countries: starting with just five optimal refrigerators from two suppliers in 2013, there are 59 optimal refrigerators from all eight prequalified suppliers as of Q4 2018. CHAI's partnership with a low-cost manufacturer has also resulted in seven optimal products being introduced in key, high-demand market segments, with all seven products being the lowest-cost in their respective segments.

KEY PARTNERS

Global Affairs Canada, The Bill & Melinda Gates Foundation, WHO PQS, Gavi, UNICEF SD, Pennsylvania State University

APPROACH

CHAI's assessment of the CCE market revealed a number of key barriers preventing the development of optimal products and their uptake in-country:

In 2013, the suppliers offering Grade A refrigerators were small companies with minimal market footprints and with significant challenges to growing their market share. These challenges were mainly due to the lack of in-country brand awareness, networks, and relationships that were key to achieving sales. Building this kind of foothold in-country would be a gradual process and would require significant, long-term investment of resources by these small companies. Therefore, to deliver rapid impact, it would be insufficient to rely solely on these suppliers. There was an immediate need for the larger, dominant companies with greater foothold and sales in-country to also offer Grade A products.

There were no incentives to compel the larger, dominant suppliers to invest in developing and offering Grade A refrigerators. Firstly, "Grade A freeze protection" was not even defined in the markets' standards, maintained by WHO's performance, quality, and safety (PQS) unit, i.e., *there were no regulatory incentives*. Secondly, there were no funding streams or procurements prioritizing Grade A characteristics, i.e., *there were no commercial incentives*.

To address the lack of regulatory incentives, CHAI partnered with WHO PQS. As an invited member of the PQS Working Group, CHAI led the development of freeze protection standards and a testing protocol for products; this also involved an research and development partnership with the Pennsylvania State University that yielded design guidance to upgrade existing sub-optimal refrigerators to Grade A.

To address the lack of commercial incentives, from Q4 2014 to Q2 2015, CHAI worked with Gavi, the Bill & Melinda Gates Foundation, and partners to conceptualize an innovative financing mechanism called the Cold Chain Equipment Optimization Platform[4] (CCEOP). Based on CHAI's inputs, the CCEOP was focused on Grade A products alone, thereby providing $250 million of funding over 5 years (2016-2021) to subsidize and incentivize countries to procure only Grade A refrigerators. The CCEOP was estimated to fund demand of approximately 150,000 refrigerators over 5 years for more than 50 Gavi-supported low-income countries.

Grade A refrigerators cost more than sub-optimal refrigerators, thereby creating the risk of countries reverting to procuring sub-optimal refrigerators without the subsidy from the CCEOP. CHAI sought to mitigate this risk by ensuring that suppliers would be able to offer Grade A refrigerators at affordable, yet sustainably profitable prices.

From 2013 to 2016, CHAI worked with smaller suppliers to achieve significant price reductions. This helped one of these suppliers win a lowest-bid tender in a low-income country in 2015. As a result, these price reductions also generated a catalytic effect on competitors' pricing strategies.

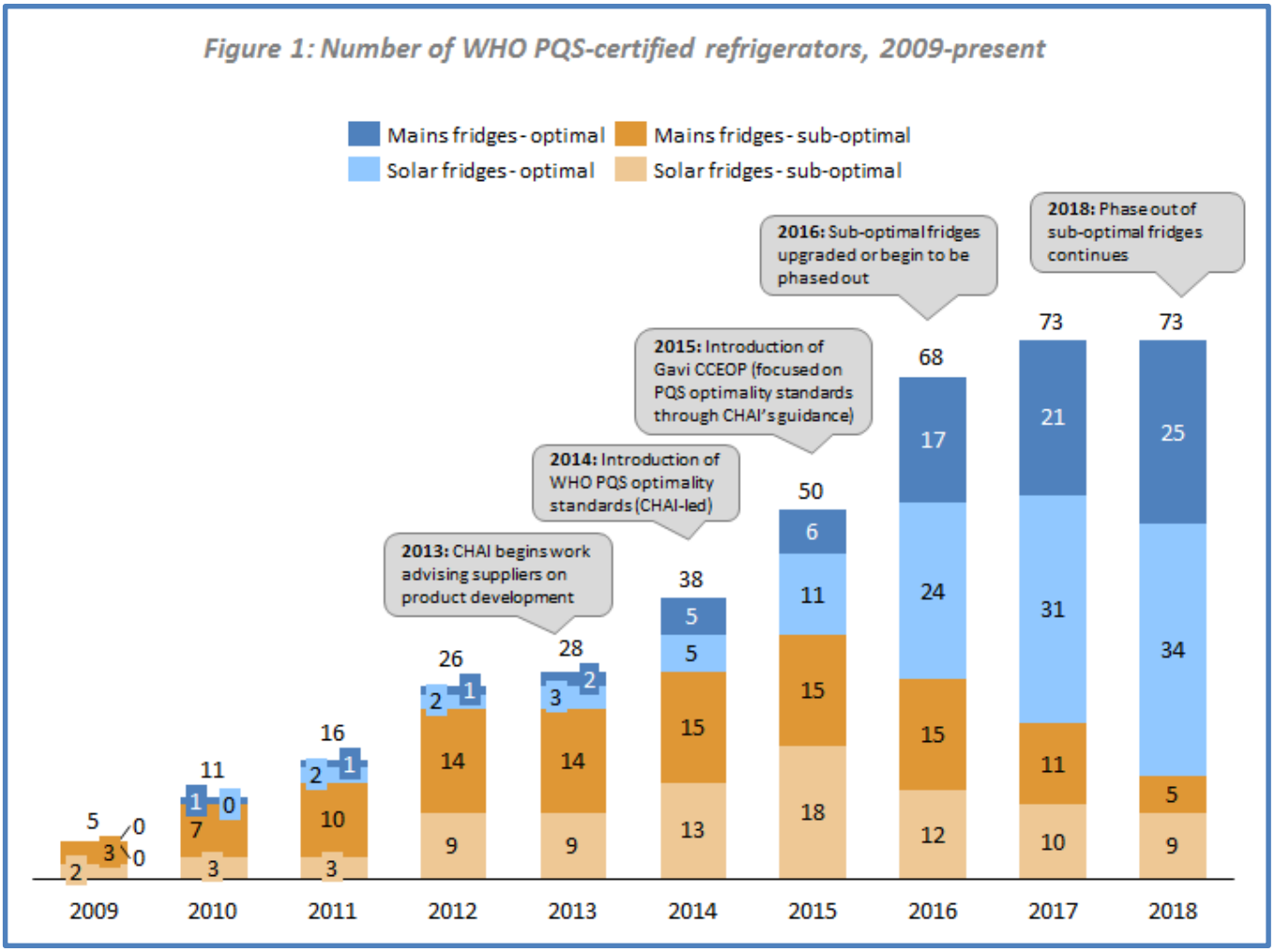
Building on the regulatory and commercial incentives as well as the catalytic price reductions, CHAI worked with a large, low-cost manufacturer

with a significant global footprint. At the request of this manufacturer, CHAI provided support that included: insights on strategic business planning and product prioritization, especially keeping in mind upcoming CCEOP-funded procurements; in-depth engineering and product design inputs to upgrade the sub-optimal product line to Grade A; key market intelligence (e.g., demand forecasts); and guidance about the WHO PQS certification process for new products.

IMPACT

Figure 1 illustrates the transformational impact of CHAI's work on the WHO PQS-certified refrigerator market. Starting with just five Grade A refrigerators (two plug-in mains-powered, three solar-powered) from two suppliers in 2013, the market has rapidly improved to offer a total of 59 Grade A refrigerators (25 mains-powered, 34 solar-powered) from all eight suppliers as of Q4 2018. In this time period, the number of sub-optimal refrigerators has also decreased thanks to the regulatory and commercial incentives in place for Grade A products: the number has dwindled from a peak of 33 sub-optimal refrigerators in 2015 to 14 products as of Q4 2018. This downward trend is expected to continue, with nearly all sub-optimal refrigerators expected to be phased out of the WHO PQS market in 2019.

Figure 1: Number of WHO PQS-certified refrigerators, 2009-present



CHAI's work with smaller, innovative manufacturers resulted in significant, catalytic price reductions up to 56 percent for upgraded products. In addition, CHAI's support to the larger, low-cost manufacturer helped to achieve market-entry of seven Grade A refrigerators (four solar-powered, three mains-powered), all in key, high-demand market segments. *Importantly, every one of these products was the lowest-priced in its segment by up to approximately 40 percent*. This manufacturer is now in a strong position to compete for future volumes, especially through the Gavi CCEOP.

FUTURE OUTLOOK

By the end of 2019, CHAI expects nearly all sub-optimal refrigerators to be phased out of the WHO PQS market. Simultaneously, procurements through the CCEOP have already commenced deployment of Grade A refrigerators across the 55 Gavi-eligible low- and middle-income countries, with about 20,000 of these refrigerators expected to be deployed across more than 20 countries by 2019. CHAI is closely supporting Gavi and UNICEF to accelerate the CCEOP and drive up the pace and scale-up of these procurements; this support has already contributed to reducing timelines from 21 months to about 11 months, with a further reduction to seven months being targeted.

Building on this impact, CHAI is exploring new approaches to more holistically address the total costs of ownership of CCE, including equipment price, deployment costs, and costs of operations & maintenance. Approaches being examined include direct contracting and pricing agreements with national/regional after-sales service companies as well as exploration of innovative leasing mechanisms.

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