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## Design for Health: Human-Centered Design Looks to the Future

Guest Editors: Tracy Johnson, Shilpa Das, Nikki Tyler



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Cover caption: Indian women pilgrims drying their saris after a holy bath at Gangasagar, West Bengal, India. © 2015 Harjeet Singh Narang

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## EDITORIAL

# Design for Health: Human-Centered Design Looks to the Future

Tracy Johnson,<sup>a</sup> Shilpa Das,<sup>b</sup> Nikki Tyler<sup>c</sup>

## ■ INTRODUCTION

Before the coronavirus disease (COVID-19) pandemic, the global community had been cautiously approaching a new era in global health. Between 1990 and 2015, maternal mortality worldwide dropped by 44%.<sup>1</sup> Since 2000, the global under-5 mortality rate declined by 44%, new HIV cases decreased by 35%,<sup>2</sup> and the incidence rate of TB declined by 19%. However, even with this progress, the world had not been on track to achieve its Sustainable Development Goal targets, with inequity increasing.<sup>3</sup>

While the ripple effects of COVID-19 will take years, if not decades, to untangle, early data demonstrate its stark impact. As of April 2021, antenatal care visits fell by 43%, malaria diagnosis fell by 31%, and HIV testing dropped 41%.<sup>4</sup> COVID-19 has also highlighted the extent to which, even in the face of progress, longstanding societal inequities remain intact.<sup>5,6</sup>

COVID-19 has given global health practitioners yet another opportunity to radically rethink how we work and engage in global health moving forward. Trends like demographics, urbanization, slower and unequal economic growth, and climate change, all pose huge challenges. Our global health goals depend on our collective efforts to problem solve, strategically take risks, and quickly iterate/adapt to spur more impactful solutions.

Global health practitioners and designers alike recognize that real questions remain about the application and complementarity of design in global health.\* *Design for Health*—jointly led by the Bill & Melinda Gates Foundation and the U.S. Agency for International Development—brought together donors, designers, researchers, implementing partners, and country governments to explore these questions more fully. Members of this community came together in this special issue of *Global Health: Science and Practice* to build upon lessons from the use of design in global health, to distill and demystify the design methodology, and simultaneously open the conversation to perspectives and questions

that can generate change and new ideas to tackle the health crises of today and those on the horizon.

## ■ BUILDING A FOUNDATION

In the first 3 articles of this GHSP supplement, authors seek to lay a foundational understanding of design in global health.<sup>7–9</sup> The authors investigate multiple vital lenses of the field, including the definition of design, the foundation and integration of design into longstanding global health practices, and the potential for improved interdisciplinary collaboration. They pose questions such as: How do you clearly define an often misunderstood field? How do design and traditional global health practices better integrate to drive more people-centered and innovative solutions to health challenges? And how do we incorporate these solutions into our other practices? These authors help us better understand what design is and how it can play a role in achieving our common health sector and global ecosystem goals.

### Defining the Field

Mishra and Sandhu<sup>7</sup> give readers a perspective of what design is, show how it compares to other methodologies (including its value-add), and recommend a path forward where design is recognized as one of many essential approaches. Mishra and Sandhu<sup>7</sup> contend that design has increasingly gained recognition as an effective methodology to respond better to users' needs and wants. To global health practitioners accustomed to a more structured scientific process focused on testing hypotheses, the rapidly iterative nature of testing solutions directly with end users may make design feel arbitrary, uncomfortable, and unscientific. But the inherent tension between a structured scientific methodology and design methodology, as well as the collaborative design process—when used together—can create more sustainable and equitable outcomes. These outcomes can inform how a product or service can be best designed and introduced so that it fits within the larger system that we all live in. In this way, design is better able to take into consideration the cultural and societal norms that impact all of our behavior and decision making.

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\*As all design is human-centered, the authors use the terms design and human-centered design (HCD) interchangeably in this editorial and throughout the issue.

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When design first burst upon the global health scene, some design practitioners may have expressed overexuberance regarding its ability to solve entrenched problems of global health. Some design practitioners likely came into the global health setting with a less than thorough understanding of the global health field. Many came in overgeneralizing design's value by calling for a stronger emphasis on empathy. Yet, this overlooked the fact that many global health practitioners, if not the majority, had spent their careers empathizing with the struggles facing those populations for whom interventions had been designed. To overcome this potential misunderstanding, Andrawes et al.<sup>9</sup> extend:

*an invitation to both designers and public health professionals to join forces more openly and more often to bring together the plurality of expertise within public health and the practical, people-centered, problem-solving approaches of design.*

### Creating a Framework

LaFond and Cherney's<sup>8</sup> work to build a shared theory of change for human-centered design (HCD) outlines potential pathways of design's influence, articulating how HCD can

*... strengthen existing processes and introduce new processes for problem framing and solution generation and implementation by working in concert with stakeholders ...*

They demonstrate the related conditions of cause and effect, beginning with the influence of design on global health programming processes and interventions and ending with the specific ways in which design can help create the "preconditions" necessary for achieving the goals of the global health ecosystem. Recognizing that the field of HCD is still in the process of generating the evidence necessary to more fully illustrate the theory of change pathways, they offer this work as an invitation to the field to use, experiment with, and evolve this shared framework.

### Integrating the Solution

As our collaboration has matured, the Design for Health community is beginning to see how the productive tensions that Andrawes et al.<sup>9</sup> delineate—integrating explicit and implicit knowledge, challenging linearity with iteration, and enabling collective ownership of processes and solutions—can be a productive way forward for design and global health to come together. To harness the power of collaboration, design practitioners need

global health colleagues to act as guides to understand the complex political and regulatory environments in which the field operates. Global health practitioners need the ability of design to hold and make productive the inherent tensions that can result from an iterative process that draws on multiple perspectives and areas of expertise. The examples presented in the commentary illustrate how design can provide a sound scaffolding in interdisciplinary teams and build a helpful environment for more voices to be heard and considered. Design's generative nature enables a unique form of knowing and reasoning for problem solving and tackling complex sociocultural challenges.

## ■ DESIGN IN ACTION

The field action reports in this issue demonstrate that design relies upon rich user engagement and an iterative approach to help adapt solutions to different cultures, as well as national, regional, and local contexts while also democratizing and strengthening the practice of global health. Not all design projects are the same. Here, we highlight what design looks like when playing the role of "spark," as one "ingredient" in a larger whole, and when coming in as the foundation for a project "end-to-end."<sup>10</sup>

### Design as Spark

The Tijani et al.<sup>11</sup> article, an example of "design as spark," demonstrates how successful co-creation approaches can lead to successful outcomes. They discuss an outbreak management system at the Nigerian Institute of Medical Research drive-through center that seeks to improve data management within the country's current health information system. The authors propose that continued engagement of the relevant stakeholders throughout the process contributed to increased equity, sustainability, and long-term impact. The success of the system at the Institute's drive-through center also inspired the automation of processes for other test centers around Nigeria using a similar design process. Their report demonstrates how design methods can be applied as a light touch at the beginning or middle of a project to encourage new thinking, generate new concepts, or deliver a specific output as part of a larger program.

### Design as Ingredient

Bruns<sup>12</sup> discusses how HCD was an ingredient throughout a mixed-methods project by focusing on local advisory group members in South Africa as a key audience, making them integral to the

intervention's prototype successes from beginning to end. The project engaged members to ensure the prototypes/pilots that emerged were sustainable and desirable from the perspectives of both advisory group members and men living with HIV.<sup>12</sup> An advisory group provided valuable input at strategic points to allow changes in direction in real-time.

Bruns proposes that the design co-creation approach, focused on the untested and untreated "last mile men" with respect to the project's problem solving, enabled an empathy for at-risk men and their caregivers across the advisory group. This became a key HCD ingredient throughout development and piloting. This empathy allowed prototypes to be rapidly evaluated because the feasibility, viability, and desirability of all parties had been considered from the beginning. This case study exemplifies "design as ingredient" as the program used parts of the design process in conjunction with other approaches from the social and behavioral sciences such as quantitative and qualitative formative research, segmentation, and ethnography.

### End-to-End Approach

Employing successful co-creation is exemplified in CyberRwanda,<sup>13</sup> which was led by a multidisciplinary team of designers, public health experts, and evaluation specialists. From 2016–2019, the project deployed a youth-driven and youth-led design process with more than 600 Rwandan youth, caregivers, teachers, health care providers, and government stakeholders. CyberRwanda seeks to improve adolescent sexual and reproductive health outcomes through behavior change stories delivered via webcomics, a robust frequently-asked questions library, online ordering of health products, and a pharmacy/health facility locator, all of which provide integrated age-appropriate adolescent health and economic empowerment information and linkages to quality youth-friendly services. The Ippoliti et al. article<sup>13</sup> exemplifies what the Design for Health community terms "end-to-end." Using design in an end-to-end approach requires a full adoption of HCD methods throughout the solution development process including conducting design research to reveal new user insights relevant to the challenge or need; co-designing solutions in partnership with users or key stakeholders; gathering user feedback through prototyping and testing of ideas; and continually testing, refining, and evaluating the idea throughout implementation.

### Lessons Learned

Sharing lessons learned from integrating design in large-scale programming, Blynn et al.<sup>14</sup> highlight that in public health programs deploying HCD, the user (client, provider, or community) has agency in shaping more contextually appropriate solutions. They discuss how and why that is so through a reflection of 3 projects: V, an approach to empower women to increase uptake of HIV pre-exposure prophylaxis in South Africa and Zimbabwe; Adolescents 360, an effort focusing on behavior change among adolescent girls in Ethiopia; and Reimagining Technical Assistance, a design process to rethink public health technical assistance models in Nigeria and the Democratic Republic of the Congo. These projects engage users equitably from the outset as experts in a truly collaborative, participatory, and co-creation approach. Consistent use of such an approach from project conceptualization through implementation can engender "a virtuous cycle between co-creation, stakeholder buy-in, and quality of outputs."<sup>14</sup> To reap these benefits, projects integrating HCD must be scoped differently than traditional global health programs. They must also take a more inclusive approach throughout the project in contrast to the prescriptive approach in more traditional global health programming that may perpetuate the donor-recipient relationship leading to "fragmented insights and low commitment to the process and the solutions."<sup>14</sup>

### MULTIPLYING PATHS TO IMPACT

While strategies for measuring and evaluating efforts to improve human health are well-established and documented, the use of measurement in design-influenced global health programming remains a largely unexplored and much-discussed frontier. As design is increasingly integrated into global health practice, designers and global health practitioners are learning as they go how to integrate measurement into design and adapt traditional monitoring and evaluation approaches to design-influenced global health projects. There are inherent tensions in the way global health and design practitioners approach measurement. In their article, Heller et al.<sup>15</sup> make the case that measurement conducted during the design process can provide additional insights that help define appropriate products, services, and interventions, as well as additive learning and proof of concept that can be critical to risk reduction in investments and program implementation. The authors use 3 recent examples of design-influenced global health interventions to



illustrate how these tensions can be managed: Brilliance, a line of neonatal jaundice treatment devices; Adolescents 360, an effort focusing on behavior change among adolescent girls; and Group ANC, service design improvement for delivery of antenatal care. New approaches are required to successfully manage measurement across multidisciplinary teams, but with more transparency and greater understanding, the results have the potential to benefit global health interventions overall while optimizing the influence of design in this context.

## LOOKING TO THE FUTURE

We end this GHSP supplement by looking at what could be next for design. In the final article in this supplement, Chauhan et al.<sup>16</sup> discuss the use of health futures frameworks to better align incentives and strategies to improve the impact and effectiveness of global health efforts. The authors call on us to recognize that the “future is plastic” and outline the imaginary potential of design in shaping possible, plausible, and preferable futures for individuals, communities, and societies as a whole. To do so requires shifts in mindset and practice in both global health and design, with the global health sector evolving to bring greater focus to the health of ecologies over health care, and design practitioners becoming more open to new paradigms of life-centered design and speculative design.

This supplement seeks to demonstrate that the use of design is a tool that can be used to deliver impactful health interventions that center the person as a means to increase equity, access, and usability. Through examples and case studies, we seek to present a way forward for breaking through the status quo of both design and global health. We do this directly, by calling for design to be more fully integrated into the global public health discourse. And we do this indirectly, by creating a space for plural discourses of design for health. As is evidenced in this supplement, design, if done well, can place young and adult community members, service providers, and governments—across Ethiopia, Guatemala, Kenya, India, Nigeria, Tanzania, and Uganda—in the driver’s seat. Although the examples in this supplement draw heavily from programs in Africa, similar excellent human-centered design is ongoing across the world.

Yet, to achieve our global health goals, we must realize, as Mishra and Sandhu state<sup>7</sup>:

*In the toolbox of approaches to global health innovation, design is critical. This toolbox is an essential processes list, and design must be on the list. ...*

with design playing an accompanying role to other disciplines to strengthen collaboration as we all strive to reach global health goals. We hope that the work shared here can act as an inspiration to design and global health practitioners alike in building a shared collective vision of how design can advance and deepen health impact.

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## COMMENTARY

# Design Is an Essential Medicine

Pragya Mishra,<sup>a</sup> Jaspal S. Sandhu<sup>b,c</sup>

## Key Messages

- Design as a practice is well placed to address the need to innovate faster, improve collaboration, and scale solutions while considering the way people live their daily lives across the world.
- **Design for Health** views design as a craft and a discipline that applies a specific mindset and skillset to a creative problem-solving process.
- The unique value of design in global health can be understood through 3 advantages: framing—identifying the right problems to solve; intention—creating space to solve problems the right way; and collaboration—continually engaging communities and organizations as actual partners.
- A comparison of design to other common problem-solving approaches in global health illustrates key differences but also offers opportunities to integrate design with approaches such as participatory research, quality improvement, and sociobehavioral research.
- To tackle complex challenges like the ones global health faces, there is a need for public health products, programs, and interventions to better meet the needs of communities. In the toolbox of approaches to global health innovation, design is essential.

## INTRODUCTION

The coronavirus disease (COVID-19) pandemic has revealed a few truths about global health: the speed of innovation needs to improve; we need to work more effectively across silos; and we need to understand that global challenges require solutions that take into account local cultures, social systems, and structures for them to be truly successful. There have been unprecedented leaps in biomedical innovation, particularly with drug and vaccine development.<sup>1</sup> Despite challenges related to prevention and equitable access to resources, this pandemic has illustrated the capabilities of new innovation ecosystems, notably open innovation involving “purposive knowledge flows across organizational boundaries.”<sup>2</sup>

At once, the pandemic has unlocked new ways of collaborating and has exposed longstanding inequities in societies. Both of these are now a part of our working reality. This is an opportunity to radically rethink how we work in global public health, bringing with it the possibility to consider the role of design in this future world (Box 1).<sup>3</sup>

Design has increasingly gained recognition as a valuable approach to respond better to users’ needs and wants and to drive innovation. The Development Experience Clearinghouse (DEC) is a public repository of more than 200,000 documents from the U.S. Agency for International Development (USAID) spanning nearly 50 years.<sup>4</sup> Given the scale of USAID’s involvement in global health and development, this database offers the opportunity to examine time-based trends for the work that governments and large global players have been doing over the same period. Searching DEC for “human-centered design” (HCD) illustrates both how design has been a part of global health for more than a decade and how it has become more pervasive over time (Figure 1).

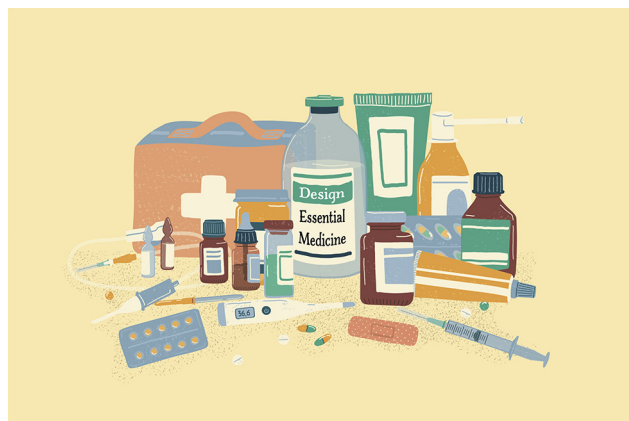
The natural compatibility between public health and design has been underappreciated during this time, deriving from common aims and values. Both design and global health are concerned with understanding complex and evolving systems. Both focus on groups or communities, rather than individuals. Consequently, both require an understanding of culture to be successful. Both are tasked with design decisions, often under considerable constraints, that must

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Design is an essential medicine. © Vector Point Studio/Shutterstock (modified)

### BOX 1. What Do We Mean by Design?

In this article, we use the term “design” as defined by the Design for Health community of practice:

Design is a craft and discipline that applies a specific mindset and skillset to a creative problem-solving process, enabling the development of informed, sensitive, inclusive, purposeful, appealing, and innovative solutions.<sup>3</sup>

The Design for Health community of practice, supported by the Bill & Melinda Gates Foundation and the Center for Innovation and Impact in the U.S. Agency for International Development’s Bureau for Global Health, includes global health practitioners, donors, nongovernmental organizations, design organizations, academics, and a cross-section of relevant experts from other disciplines that can help unpack the value design brings and how it can become a more integral part of global health. They state, “We embrace a broad definition of design, one that includes terms like human-centered design, service design, design thinking, and systems design.”

yield a substantial benefit. In this sense, both are concerned with the balance between cost and benefit and both require interdisciplinary collaboration.

As designers who have been working on different public health and global health challenges over the past 15 years, we believe that this is an important time for us to reflect on how design might and should function within global health. Design as a practice is well placed to address the need to innovate faster, improve collaboration, and scale solutions while considering the way people live their daily lives across the world. In this article, we examine what design means, how it can add value, and how it compares to other approaches in global health.

### ■ DEFINING DESIGN

Design can be hard to understand because design and HCD are used to mean different things by different individuals, teams, and organizations. In many cases, definitions of design are based on individual interpretations of what design is and the role of designers as they view it. Bazzano et al.<sup>5</sup>

have discussed this in their scoping review of design in global health:

*No widely accepted definition exists within the broader design community on the essential characteristics that make [design thinking]/HCD different from other design or participatory practices ... but rather varying definitions are used.*

Well before design or design thinking became common terms, experts from various fields—economics, academics, philosophy—articulated their ideas on creative problem solving. These ideas, in their essence, are a description of design thinking and process. In the mid-1950s, Buckminster Fuller created multidisciplinary design teams to tackle systemic failures. Fuller termed his approach, design science, as<sup>6</sup>:

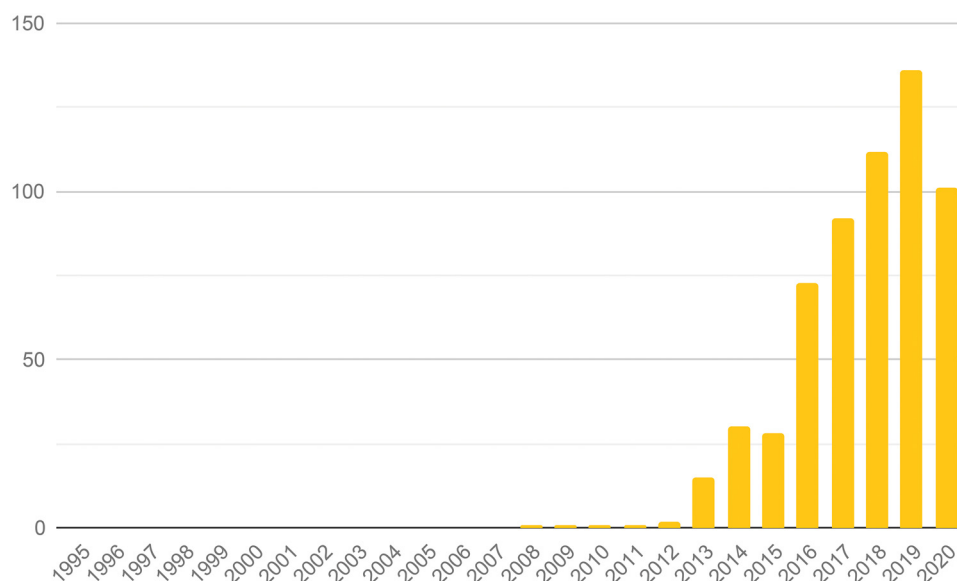
*the effective application of the principles of science to the conscious design of our total environment in order to help make the Earth’s finite resources meet the needs of all of humanity without disrupting the ecological processes of the planet.*

In 1958, the government of India invited Charles and Ray Eames to advise on the creation of a design

**Design has increasingly gained recognition as a valuable approach to respond better to users’ needs and wants and to drive innovation.**



**FIGURE 1.** Documents by Year Containing the Phrase “Human-Centered Design” From the U.S. Agency for International Development’s Development Experience Clearinghouse<sup>a</sup>



<sup>a</sup>This represents approximately 625 documents or about 0.5% of the documents between 2008 and 2020. The decrease in 2020 may be due to the effects of COVID-19, bias in the dataset (documents from 2020 may not yet been included in the same intensity as prior years), or (less likely) a decrease in design-related activities at the U.S. Agency for International Development.

institute to serve local small industries. Their recommendations took the form of “The India Report,”<sup>7</sup> in which they expressed the desire for an institute that trained individuals to tackle challenges by adopting an incremental problem-solving attitude. They illustrated this idea through the design of a *lota*, a simple vessel used in many Indian households. They noted that the *lota* had been perfected over generations with many individuals adding refinements, carefully considering 1 factor after the other over time—the optimum amount of liquid to be fetched, carried, poured, and stored in a prescribed set of circumstances, the possible materials of production, and the costs involved.

In 1969, Nobel laureate Herbert A. Simon described design as a science or way of thinking in his book, *Sciences of the Artificial*<sup>8</sup>:

*Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. The intellectual activity that produces material artifacts is no different fundamentally from the one that prescribes remedies for a sick patient or the one that devises a new sales plan for a company or a social welfare policy for a state.*

## ■ UNDERSTANDING THE DESIGN PROCESS

As for the process, researchers Don Koberg and Jim Bagnall, in their book from 1972, *The Universal Traveler: A Soft-Systems Guide to Creativity, Problem-Solving, and the Process of Reaching Goals*, used the analogy of traveling to describe a systematic approach to problem solving. They described a problem solver starting the journey by accepting a situation then moving to analyzing, defining, ideating, selecting, and implementing to end the journey at evaluating.<sup>9</sup>

These early interpretations of design processes have been more recently adopted and adapted by organizations and practitioners working in varied sectors, bringing with them their own practical experiences and unique ways of working within their organizations. Even the same organizations have often iterated on this process as their own practice has evolved from applying design methods to products, services, and now to complex systemic issues. At any given moment, an organization might have different ways of expressing its design process. We examine a few of these well-established models to better

**Design processes begin with research followed by iterative cycles of ideation and prototyping to converge on the most promising solutions.**

understand the various ways in which people have expressed the way that they think about design processes.

At a glance, these design processes may seem unique, but a closer inspection reveals more similarities than differences (Figure 2). They begin with research followed by iterative cycles of ideation and prototyping to eventually converge on the most promising solutions.

What value do the numerous variations of process add? Sometimes, there is not much difference. This has happened in other fields, such as quality improvement (QI). Walshe<sup>14</sup> describes many competing QI approaches as appearing to be different but having underlying similar approaches.

A closer look at Figure 2 shows that these selected processes begin to diverge in the concluding phases that focus on outcomes. The variations in each of these models reflect their adaptation to the needs of a specific organization or context. Their value lies in the fact that they are customized for specific purposes. For example, the Mayo Clinic's Center for Innovation defines its final phase as "transitioning." This is appropriate in their context where, as an in-house consultancy, they need to find the right team to own the outcomes and take them forward. But in the case of Medic Mobile which owns its outputs, they continue to "test" and "refine" ideas and develop them further as they implement and learn from them (Figure 2).

**As demand for design has grown, global health practitioners grapple with how to define design, apply it to their work, and demonstrate its potential impact.**

**Design identifies the right problems to solve by keeping the user and community perspectives at the center.**

### ■ THREE ADVANTAGES OF DESIGN

While an exploration of process can clarify what design is, it does not speak to how and why design can be beneficial to global health. However, each step of the design process brings clear advantages (Figure 3).

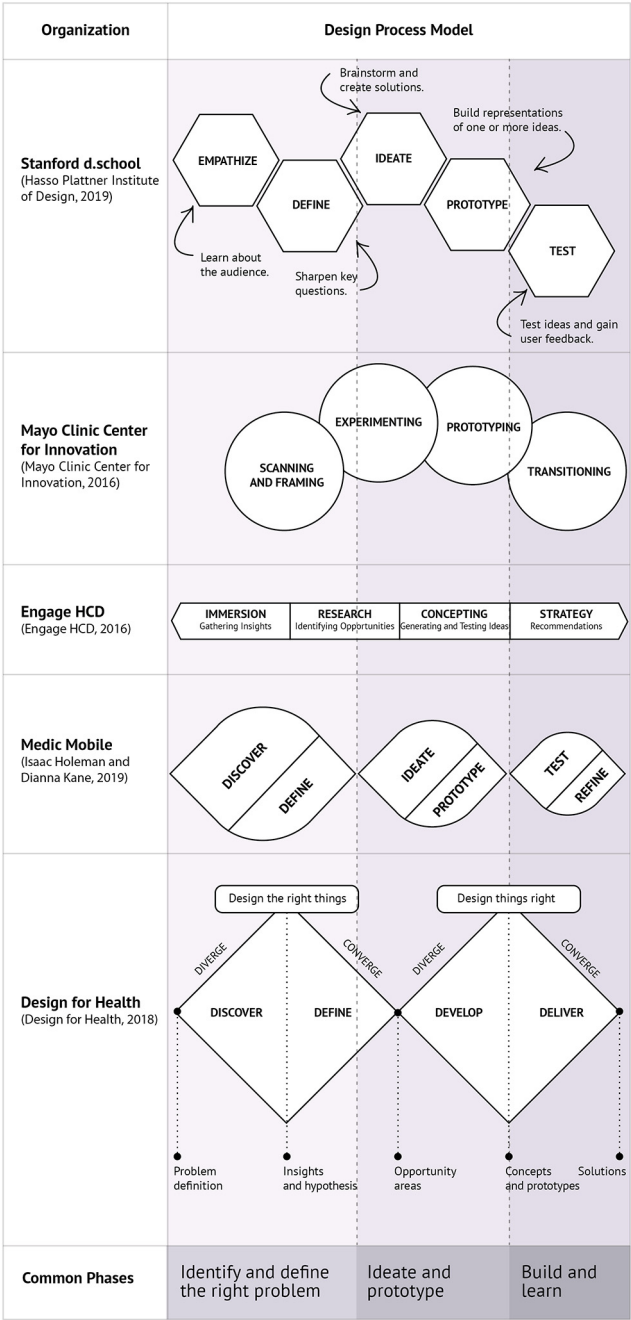
1. **Framing:** Design identifies the right problems to solve by keeping the user and community perspectives at the center. In the early stages of the design process, designers conduct research with different stakeholders in the ecosystem to gain a better understanding of a problem and the context in which it exists. This helps in designing the right things that are tailored to the needs of the community that the designers are working for.
2. **Intention:** Design creates space to solve problems the right way, including testing to learn.

The deliberate and thoughtful process of co-creating different ideas and testing them with communities, early and often, to eventually converge on the most effective solutions leads to designing things the right way, respecting the experiences, wants, needs, and priorities of communities. Such an approach that intentionally accounts for the needs of users and communities at each step of the process can help avoid potentially costly mistakes during implementation.

3. **Collaboration:** Design continually engages communities and organizations as actual partners throughout the design process. The iterative nature of design relies on continued inputs from the communities that designers are working for and from stakeholders such as technical experts from other disciplines they are working with. The true value of design is fully realized when multidisciplinary teams work with communities to identify their needs, co-create and test ideas, and facilitate decision making. This type of collaborative design process can lead to more sustainable and equitable outcomes because it takes into account how people live and respects their wants, needs, and cultural beliefs.

Within global health, as the demand for design has grown, practitioners have grappled with how to define design, effectively apply it to their work, and demonstrate its impact. To help address this, in 2017, the Bill & Melinda Gates Foundation and the Center for Innovation and Impact in USAID's Bureau for Global Health established Design for Health, a design-focused community of practice. Design for Health is how we as authors first came together. We also believe that the Design for Health framing has exceptional validity because so many organizations inside and outside of design have negotiated it. A notable analog to Design for Health is the Innovation Learning Network, which recognized the value of "cooperation" in sharing approaches to innovation in U.S. health care.<sup>15</sup> Design for Health views design as a craft and a discipline that applies a specific mindset and skillset to a creative problem-solving process. The design mindset focuses on engaging people early and throughout the process of developing solutions. Design also applies different skills to specific challenges, across different project stages. Individual designers typically possess a depth of knowledge in one or more design areas. Like all health care professionals who have a basic understanding of clinical practice, designers

FIGURE 2. Comparison and Synthesis of Selected Design Processes<sup>a</sup>



<sup>a</sup>Many other prominent models of design exist. We have chosen these 6 illustrative models to represent a breadth of organization types, and we have intentionally oversampled models from health care, global health, and global development. These models are from Hasso Plattner Institute of Design,<sup>10</sup> Mayo Clinic Center for Innovation,<sup>11</sup> EngageHCD,<sup>12</sup> Medic Mobile,<sup>13</sup> and Design for Health.<sup>3</sup> The authors are contributors to both EngageHCD (PM) and Design for Health (PM, JS).

**FIGURE 3.** Common Phases Seen in the Design Processes Mapped to the Advantages of Design

Common Phases	Identify and define the right problem	Ideate and prototype	Build and learn
Advantages of Design	<b>Framing</b> Identifying the right problems to solve by centering users and communities	<b>Intention</b> Creating space to solve problems the right way, including testing to learn	
	<b>Collaboration</b> Continually engaging communities and organizations as actual partners		

possess common skills in creative problem solving, visual thinking, and the craft of making things.<sup>3</sup>

While each design specialization—such as visual design or product design—has a different way of working, the creative process of design shares commonalities across specializations. Design for Health adopted the Double Diamond model<sup>16</sup> to illustrate these commonalities in the design process while mapping it to the way the global health community develops solutions—through research or implementation science and using the findings to develop and refine interventions that address global health challenges (Figure 4).<sup>3</sup>

■ **THE VALUE OF DESIGN IN GLOBAL HEALTH**

Global health typically deals with complex problems, involving numerous stakeholders working within long-established systems. In most cases, it also means working with limited budgets and resources that need to be used judiciously. These systems also bring with them systemic inequities based on ethnicity, race, gender, education, income, class, disability, geographic location, and sexual orientation that have been built in over time. These inequities, unless intentionally addressed, are reinforced or exacerbated. This makes it critical that the measure of success of any intervention today considers efforts made to advance equity. Successful interventions in global health also require breaking down complexity, innovative thinking, and the ability to give voice to diverse perspectives while working with limited resources. So, in this context, how can design add value?

The defining advantages that we outlined in the previous section: framing, identifying the right problems to solve; intention, creating space to solve problems the right way; and collaboration, continually engaging communities and organizations as actual partners also speak to the value of design. To examine the value of design further, we use these advantages to answer 3 questions that global health practitioners often ask us (Figure 5): (1) How is design different? (2) How is design a good investment? (3) How can design advance equity?

**How Is Design Different?**

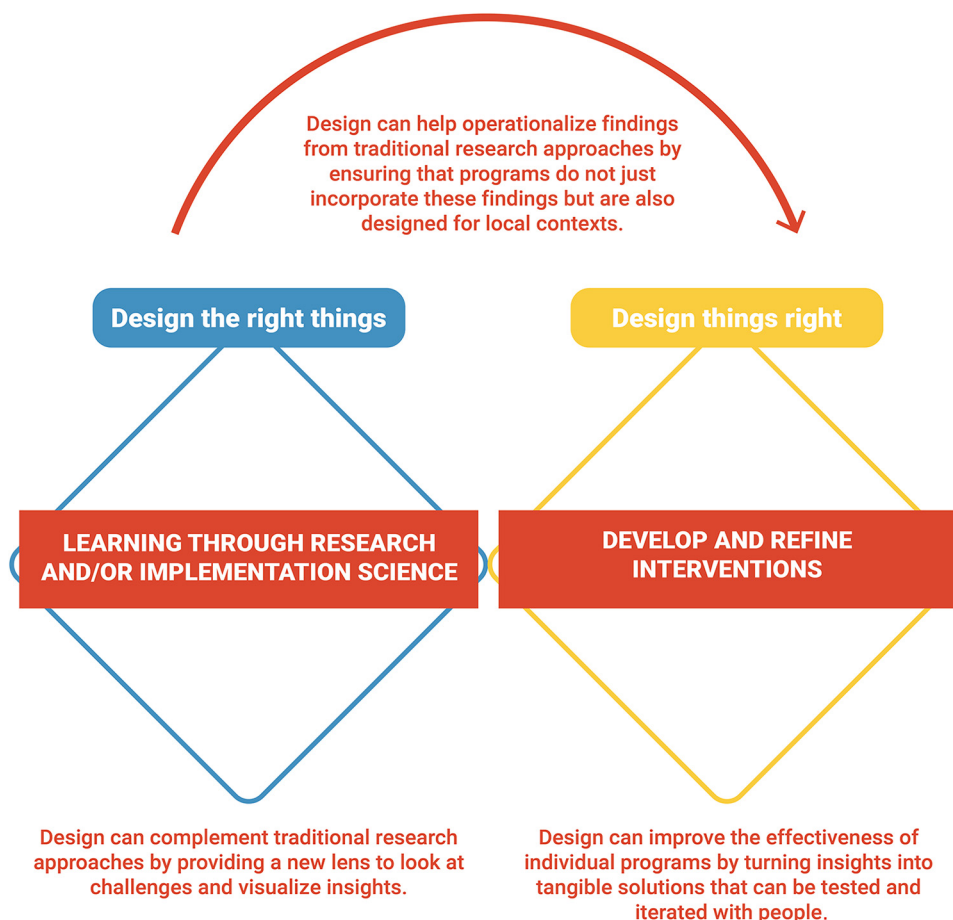
The benefits of using any approach can at least partly be attributed to its unique aspects. In the case of design in global health, design helps to frame complex issues simply, be intentional when experimenting with a range of possible solutions, and support meaningful collaboration across communities and disciplines.

**Simplifies Complexity**

Mani-Kandt and Robinson<sup>22</sup> found that successful HCD efforts in international development usually have a narrow problem or focus. Over the past 5 years, our respective work has explored complexity more deeply. Problems do not need to be narrow at the start. Design helps in breaking down daunting, complex issues into more tangible ones that are easier to analyze and solve. By using techniques such as data visualization, design can help surface patterns in the data that can otherwise be hidden, tell a compelling story by emphasizing key insights, and help make better decisions by focusing on what is most important. For example, designers often use

**Design in global health helps to simplify complexity, encourage experiments, and collaborate across disciplines.**



**FIGURE 4.** The Design Process in Global Health<sup>a</sup>

<sup>a</sup> As described by Design for Health.<sup>3</sup> The first cycle, which helps design the right things, starts with discovering the challenges and needs of the people and systems to design for and converge on opportunities to overcome these challenges and address these needs. The second cycle helps design things right by developing and testing ideas based on the opportunities identified in the first cycle and then converging on and delivering a solution. The model emphasizes testing and iteration, which helps weed out ineffective ideas and prioritize impactful, desirable, and sustainable ideas.

ecosystem maps and customer journey maps to effectively communicate complex systems by identifying the various stakeholders involved, the relationships that they share, and the bottlenecks in the system that need the most attention.

### **Encourages Experiments**

Design tools and methods like ideation and iterative prototyping allow teams to quickly and easily test and build on ideas, pivot toward new ones, and make decisions with the users in a manner that gives a sense of assurance at each stage of a project. This means that teams can move more confidently from their initial introduction to an issue to exploring and experimenting with a range

of possible solutions; surfacing new channels, touchpoints, and influences; and eventually converging on those solutions that show the most promise. This work often involves co-creation of prototypes with a core team and direct testing with users, as Paper-based Health Information Systems in Comprehensive Care did in developing tools to support decision making for health care workers in Côte d'Ivoire, Mozambique, and Nigeria.<sup>23</sup> These co-creation processes yield out-of-the-box thinking by engaging both designers and non-designers in the creative process. Meanwhile, direct testing with users provides rapid feedback and validation before moving to more extensive studies or direct implementation.

**FIGURE 5.** Nine Benefits of Design Organized by the 3 Defining Advantages of Framing, Intention, and Collaboration<sup>a</sup>

	Framing	Intention	Collaboration
How is design different?	Simplifies Complexity	Encourages Experiments	Collaborates Across Disciplines
How is design a good investment?	Solves the Right Problem	Lowers Investment Risk	Ensures Sustainability
How can design advance equity?	Introduce the User's Perspective	Redistribute Power	Achieve Equitable Outcomes

<sup>a</sup>These questions are derived from common questions about design that we and our colleagues have fielded from global health practitioners. Together, these benefits describe the value of design.

**Collaborates Across Disciplines**

Design supports a multidisciplinary approach to problem solving that can surface new perspectives and connect disparate insights across complex health systems. In a graduate-level course that one of the authors taught for 8 years—the first HCD course in public health—the first 100 students came from 26 distinct academic programs.<sup>24</sup> This type of diversity can lead to innovative solutions that otherwise might have been overlooked. Designers tend to collaborate with each other, different disciplines, and communities to generate ideas, test hypotheses, and create products and strategies. This cross-pollination can be a path to innovation as global health expertise combines with creative approaches and other disciplines.

**How Is Design a Good Investment?**

Often the scale of the challenges in global health combined with the fear of making costly mistakes results in teams being overly focused on either preventing errors or relying on tried and tested approaches, rather than on exploring new and innovative ways of tackling an issue. Design addresses this by focusing on the right problem to solve and reframing these challenges in new ways when useful. It lowers investment risk by prototyping, testing, and iterating solutions with communities and by ensuring stakeholders have real ownership of outputs making the solutions more resilient and sustainable.

**Solves the Right Problem**

Individuals, teams, and organizations can be highly effective at solving problems together. Unfortunately,

within and outside of global health, global health practitioners are often tasked with solving problems that do not necessarily address the needs, priorities, and wants of the communities they hope to solve for. Design not only provides an opportunity to understand old challenges in new ways but works with communities to identify the right problems that need to be solved. A significant aspect of a design effort may be focused on reframing a challenge where the question that a team starts with may not be the one that it arrives at. In Pathways, a portfolio of projects supported by the Bill & Melinda Gates Foundation, work with multiple design partners provided a novel understanding of the different risks, barriers, and access that women and girls face “in seeking improved health.”<sup>25</sup> Prior thinking was centered on biological and clinical perspectives and did not account for individual differences in risks, barriers, and access. This social vulnerability framework “reframes questions from a human-centered view,” elevating the real-life social and environmental influences that shape the unique experiences of women and girls. The Pathways framework has since provided input into Bill & Melinda Gates Foundation’s thinking related to maternal and child health. In reframing, as Pathways has done, the new question will consider the key priorities of the community, incorporate lessons from what has been tried, and scope the problem in a manner that also aligns with the existing strategies in global health.

**Lowers Investment Risk**

By listening to the community; using prototypes to test, fail fast, learn, and iterate with them; and

**Design addresses efforts to prevent errors by focusing on the right problem to solve and reframing these challenges in new ways when useful.**

empowering them to make decisions, design can reduce the time, effort, money, and other resources necessary to tackle a problem. Continually engaging the community and co-creating and validating ideas early and often through an iterative process improves the odds of developing solutions that are not only more innovative but can also reduce the risk of making big costly mistakes. An IBM study determined that its internal design thinking practice achieved a 301% return on investment through improved product outcomes, increased average product profits, and reduced risk of costly failures.<sup>26</sup> As Cherney et al.<sup>27</sup> wrote:

*As an added benefit, this approach increases confidence that chosen approaches will be accepted by their intended users at and long after launch.*

### Ensures Sustainability

Engaging the right group of stakeholders in the design process can lead not only to better innovation but also to real ownership over the product, program, service, or policy. This ownership is an important factor in the long-term sustainability of any solution to create “solutions that stick.”<sup>24</sup> Every solution will need to be implemented, supported, monitored, and improved over time. Adopting an approach that gives stakeholders a sense of ownership over solutions leads to higher uptake and hence more resilient and sustainable solutions.<sup>28</sup>

### How Can Design Advance Equity?

Inequities that exist in societies also manifest themselves in health care systems. At an institutional level, inequity can be supported by policies and practices, and at an individual level, they can take the form of unconscious bias. Such disparities can be hard to recognize and identify but have real and grave consequences for those who face them. Design can help advance equity by framing problems from a user or community perspective, intentionally redistributing power and shifting it toward communities, and collaborating with communities to enable outcomes that are also equitable.

### Introduce the User’s Perspective

Design helps view problems, products, or services more holistically through a health systems lens rather than viewing them through expertise or program silos. Bringing the focus to a user’s experience with a product or service helps teams prioritize and design solutions that consider the users’ experiences, wants, needs, motivations, and behaviors, as

well as other local cultural factors. In their Demand for Health Services Toolkit, United Nations Children’s Fund (UNICEF) describes the central importance of people<sup>29</sup>:

*Health programs are people programs. At every step of the way they involve people, from government officials to community health workers. Perhaps nowhere is the involvement of people more important than with users, or the people for whom programmes exist.*

It may sound obvious to include the perspectives and voices of users, but the continuous inclusion of users is not the norm in global health. Design offers a philosophy and framework for doing this. Solutions that meaningfully engage the user’s perspective can better fit into the context of users’ day-to-day lives and lead to better uptake and sustained use.

### Redistribute Power

One of the primary ways that design can enable equitable outcomes is by revealing existing inequities, questioning biases, and enabling the integration of community members affected by inequality and oppression as lived-experience experts to be part of the design and decision-making process. Design can facilitate the continued engagement of the community in the project process that goes beyond them being input providers rather than active participants in solving a problem. One example is the place-based initiative Best Babies Zone that sought to reduce inequities in infant mortality by engaging community innovators in leading the design process by both defining priorities and solving problems.<sup>30</sup> With such efforts, the power shifts from the “benefactor” (and a benefactor-led agenda) toward community-driven priorities that are guided by local needs, aspirations, opportunities, and outcomes.

### Achieve Equitable Outcomes

Design, when used well, can be a tool that empowers people to make decisions and not simply relegate them to being passive consumers of solutions that “experts” have developed. While design can enable equitable outcomes, designers should also be careful to ensure that it does not end up being another method by which existing power hierarchies are perpetuated further. By reducing the reliance on “efficiency” as the primary metric of measuring success and instead focusing on empowering communities to articulate their problems, generate solutions, and make decisions on the right solutions, design can facilitate better

**Continually engaging the community and co-creating and validating ideas early and often improves the odds of developing solutions that are more innovative and reduce the risk of making big costly mistakes.**

**Design can help advance equity by framing problems from a user or community perspective, intentionally redistributing power and shifting it toward communities, and collaborating with communities to enable outcomes that are also equitable.**

outcomes. It is equally important, and this goes well beyond design, that we work to support the most marginalized and least visible groups.<sup>29</sup>

In our experience working in global health, we have seen design bring these benefits to projects and initiatives when it has been set up to succeed. This means that as global health practitioners, along with acknowledging the value of design, we need to commit to positioning design on an equal footing with other disciplines. Design can provide value in global health, but we do not consider it to be the only approach available.

## ■ COMPARING PROBLEM-SOLVING APPROACHES

We expect that readers of this article will have varying levels of familiarity with design. At the same time, we expect most readers to have some exposure to approaches that may share purpose or techniques with design. This provides us with

the opportunity to describe design by understanding its relationship to these other problem-solving approaches.

In this universe of approaches to problem definition and problem solving, some may be considered complementary approaches to design (e.g., behavioral economics and data science) while others may be seen as alternative approaches that achieve similar ends. This is a fuzzy boundary. Additionally, while some are considered disciplines, others might be considered approaches or methods. Comparing these approaches is a complex, messy, and fraught exercise, which may explain why it has not been done comprehensively before. Pairwise comparisons have been made, but there remains a need to see the bigger picture. We are engaging in this activity precisely because there are limited comparisons like this in the literature. We recognize the danger in simplifying approaches for this comparison but believe the value to the global health community is paramount.

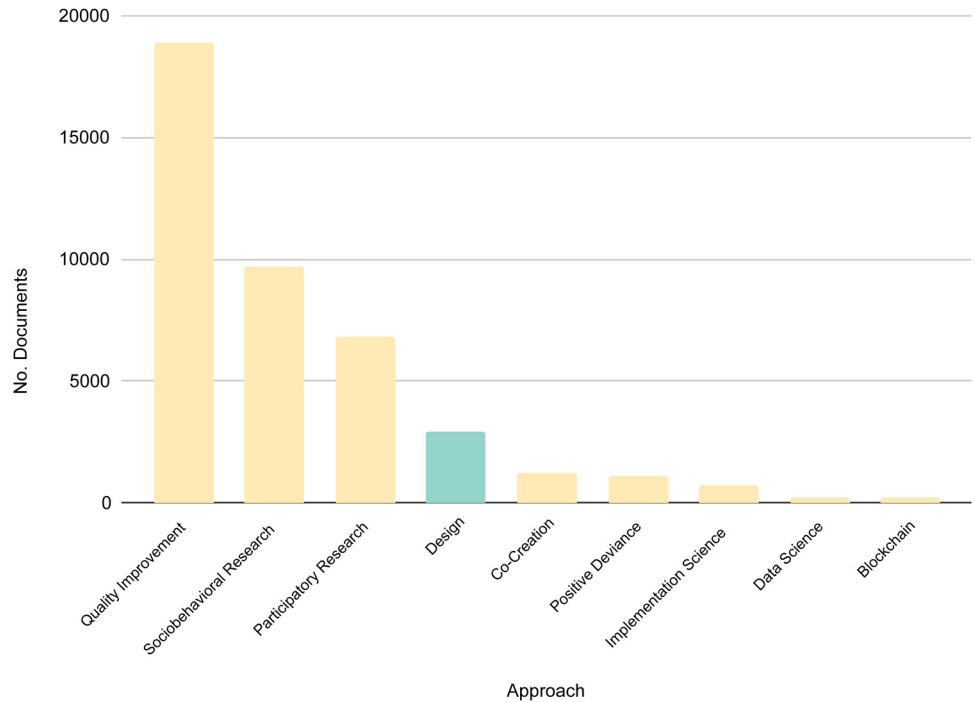
**TABLE.** Design Compared to 3 Approaches in Global Health

	Participatory Research	QI	Sociobehavioral Research	Design
Related terms and approaches	<ul style="list-style-type: none"> <li>• CBPR</li> <li>• Participatory action research</li> <li>• Youth participatory action research</li> </ul>	<ul style="list-style-type: none"> <li>• Lean</li> <li>• QI</li> <li>• Continuous QI</li> <li>• Performance improvement</li> <li>• TQM</li> <li>• PDSA</li> <li>• Six Sigma</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative research</li> <li>• Social-behavioral research</li> <li>• Formative research</li> <li>• Cultural anthropology</li> </ul>	<ul style="list-style-type: none"> <li>• HCD</li> <li>• Design thinking</li> <li>• User-centered design</li> </ul>
Framing	Partner with communities to define the problems that matter to them	Understand problems in context of existing systems and subsystems	Use qualitative research methods, sometimes ethnographic approaches; formally approach sampling, recruitment, data collection, analysis	Understand problems in context; use methods from qualitative research, with flexibility to adapt approaches
Intention	Generate research for future action; develop localized ownership and solutions	Improve existing systems using a continuous approach to testing and measurement	Provide inputs to program design or general knowledge	Fundamentally innovate, through creative processes and prototyping; sometimes improve existing systems
Collaboration	Partner with community members, establish long-term relationships	Identify teams within an existing organization or system	Create qualitative research teams, who sometimes immerse in a group or culture	Users may be partners, participants, or subjects in design; engagements are days or weeks, not months or years
Outputs	Research; community ownership of research; community capacity building	Measurably improved processes within existing systems	Peer-reviewed research; ethnographic accounts; program recommendations	Innovation in form of service, product, strategy
Citations and further reading	Chen et al. <sup>32</sup> Kia-Keating et al. <sup>33</sup>	Kachirskaia et al. <sup>34</sup> Ahn et al. <sup>35</sup>	Tolley <sup>36</sup> Design for Health, 2019 Complementary Approaches <sup>37</sup>	-

Abbreviations: CBPR, community-based participatory research; HCD, human-centered design; PDSA, plan-do-study-act; QI, quality improvement; TQM, total quality management.



**FIGURE 6.** Document Frequency of Key Approaches in the U.S. Agency for International Development’s Development Experience Clearinghouse, 1975–2020<sup>a</sup>



<sup>a</sup> For each approach, we conducted a keyword search over all the text of all documents, including synonyms, unique abbreviations, or adjacent approaches when appropriate.

In our analysis, we compared design to 3 broad approaches used in global health: participatory research, QI, and sociobehavioral research (Table). We decided to focus on these based on further exploration of the USAID DEC database (Figure 6).

These 3 approaches appeared in higher numbers than design-adjacent terms. Other candidates that we had considered, such as implementation science and positive deviance, do not appear as frequently, so we have omitted them from our comparison. This should not be interpreted as a judgment on their value. We have included related approaches when possible. This is not to suggest that they are all the same. In fact, there are discussions in many of these fields, as there are in design, to differentiate between approaches (e.g., lean versus QI).<sup>31</sup> However, there are similarities between design and these other approaches, which can confuse global health practitioners who are not immersed in any of these approaches. We aim to provide a sufficient description to allow the reader to understand critical differences among the families of approaches. It is not exhaustive.

## ■ THE PATH FORWARD: INTEGRATING APPROACHES

As design matures in public health, health care, and global health, we recognize an emerging pattern: design and nondesign practitioners alike see the opportunity to integrate design with other approaches.

Chen et al.<sup>32</sup> identify 5 specific approaches that community-based participatory research can borrow from design in developing a new project, including centering empathy and rapid prototyping. Kia-Keating et al.<sup>33</sup> have integrated community-based participatory research and HCD to address health disparities related to violence among Latinx youth in the United States. Notably, they adopted design-based approaches to idea generation. Kachirskia et al.<sup>34</sup> have discussed Kaiser’s approach to “fusing” performance improvement and HCD:

*Using HCD generates deeper engagement in PI efforts among Kaiser Permanente patients and family*

**We recognize an emerging pattern: design and nondesign practitioners alike see the opportunity to integrate design with other approaches.**

## BOX 2. Aravind: Embracing Design Mindsets and Approaches for 45 Years

We highlight the example of the Aravind Eye Care System to illustrate how the mindsets and principles of design are found within global health already if one only looks in the right places. Aravind, based in Madurai, Tamil Nadu, India has long been the global pioneer in providing no-cost and low-cost care to treat blindness. Founded in 1976 by Dr. V (G. Venkataswamy) and his family members, a group consisting of ophthalmologists, engineers, and managers, Aravind has now been innovating for nearly half a century. Today, they perform 500,000 surgeries annually, along with more than 4.5 million outpatient visits. Their clinical outcomes across these incredible patient volumes are so outstanding, that researchers, health care administrators, and clinicians have been making the learning pilgrimage to Madurai for decades. While Aravind did not explicitly frame their work as design, they have embraced the spirit of design in innovating services, products, and an entire health care system.<sup>17–19</sup> Since its inception, Aravind has expanded its direct services from cataract surgeries to all aspects of ophthalmic treatment and prevention. They have constantly innovated in service delivery, clinical workflows, financial models, technology for care provision, and product development. They have exported low-cost ophthalmic products that they have developed to more than 130 countries through their product development company Aurolab. Through the Lions-Aravind Institute for Community Ophthalmology (LAICO), they have provided technical assistance to more than 350 eye hospitals in more than 30 countries and trained eye care professionals from 80 countries<sup>20</sup>; (T. Ravilla, personal communication, August 30, 2021).

One central design mindset that Aravind has used across the organization and throughout its history is learning by doing.<sup>21</sup> Consider the case of the original eye screening camps that Aravind developed in the late 1970s. The compliance was less than 20%, meaning that less than 1 in 5 potential patients took advantage of the offer of free surgery. During these camps, staff learned of the many barriers that people in poverty and living in rural areas experience, including food, lodging, and transportation. These barriers should not be a surprise to those who work in global health, but it is how Aravind responded that sets them apart. Through a process of experimentation, they added services to directly address those barriers and increased yields to more than 90%. The learning-by-doing mindset is incomplete if it does not include a willingness to learn from unsuccessful experiments. Aravind did this, too. In the 1980s, they conducted surgeries in rural makeshift facilities. They could not achieve the quality of outcomes that define the organization, so they abandoned this strategy and redoubled efforts to connect rural patients to their centralized hospitals.

Aravind has worked continuously to understand the true barriers to accessing care (framing), they have tested and implemented new approaches that diverged from existing models (intention), and they have worked in deep partnership with the community to uphold their values of service to others (collaboration). Aravind's efforts highlight the possibility of design, especially when paired with a focus on systems and scale and embedded in a mission-driven organization. Aravind has exemplified that design can be embedded within global health organizations and suggests that there is real potential to further democratize design.

*members, who have expressed positive experiences of being involved in projects using HCD.*

Ahn et al.<sup>35</sup> conducted a study of health care leaders in the United States focused on the role of Lean in breakthrough improvement but found an unanticipated result:

*the value of [HCD] thinking, alone or as a complement to Lean management, in achieving breakthrough improvement in health care organizations.*

Tolley<sup>36</sup> poses the question directly in considering sociobehavioral research and design:

*Is it possible to draw on the strengths of each strategy to enhance user-centered research more generally?*

This suggests that continued blending of approaches will occur in global health and beyond. So, in addition to our observation that it **is** happening, we argue that it **should be** happening. It will be critical to understand and retain the unique values of different approaches in doing so; ensure that the methods and approach match the problem; and ensure that the approaches used have the appropriate time, space, and support to achieve successful outcomes to not be prematurely dismissed.

Integrating approaches may accelerate the inclusion of design in the toolkits of different

organizations. Experiences with the Aravind Eye Care System<sup>17–21</sup> (Box 2) and findings from ITAD<sup>22</sup> suggest that some organizations will be more equipped than others to adopt new approaches like design. Adaptive mindsets, supportive leadership, and flexible management are all keys to a more ready adoption of design.

There are other approaches that we have not discussed that often come up in our conversations about design in global health. Some of these are alternative approaches, some are complementary, and some fall in between. These approaches include user experience, positive deviance, systems thinking, collective impact, implementation science, social and behavior change, co-creation, market research, behavioral economics, and data science. Pairing design with other approaches such as these will unlock its greatest potential, as Johnson et al. wrote<sup>25</sup>:

*Integrating design with complementary disciplines ... amplifies the impact of design, providing a new lens into how the field of global health has traditionally designed solutions to some of its most intractable problems. However, this requires openness to new lessons from all the participants, and they must be prepared to build on them.*

Exploring how design might be integrated with various other approaches is beyond the scope

of this article. We can say that this integration is critical, not for design as a discipline, but rather for global health as a whole. Integration will ensure problem-solving approaches that match the challenges, stronger collaboration among global health practitioners, and a faster, more cost-effective path to people-centered innovation.

## CONCLUSION

In 1977, when the World Health Organization published its first essential drugs list,<sup>38</sup> now known as the Essential Medicines List (EML) with 212 medicines, it was hailed as a peaceful revolution in international public health.<sup>39</sup> Today, the EML includes 460 medicines and 80% of countries have a national essential medicines list based on the WHO EML. While many differences exist among these lists,<sup>40</sup> there is a common global approach to prioritizing and securing evidence-based medicines. This has enabled improved supply, higher product quality, improved cost management, and a higher quality of care.<sup>41</sup>

What has become increasingly apparent during these last 50 years is the parallel need for public health products, programs, and interventions to better meet the needs of communities. At times, an overemphasis on supply and access has ignored demand, which is rooted in the real, complex lives of people and families. A host of different approaches to innovation have emerged during the era of the EML, from social marketing to public-private partnerships to root-cause analysis. These are indispensable to global public health, but gaps remain in how we address global health challenges. These gaps are related to how people actually behave instead of how we think they should behave. COVID-19 has emphasized this disconnect. In the toolbox of approaches to global health innovation, design is critical. This toolbox is an essential processes list, and design must be on the list.

While the COVID-19 pandemic and our response to it have surfaced opportunities for design to be used more within the global health sector, the reality is that, for years and decades, there has been an abundance of pressing issues—climate change, urbanization, information epidemics, infectious disease, poverty, and inequity—that have continued to exert pressure on traditional approaches to global health challenges. It is incumbent on us as global health practitioners that we heed these warnings and reflect on how we can make a difference. Design is an essential medicine for global health at

this critical inflection point, so its practitioners must understand its indications for use.

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**Integrating design and global health approaches will ensure problem-solving approaches that match the challenges, stronger collaboration among global health practitioners, and a faster, more cost-effective path to people-centered innovation.**

\*Cuba was the first nation to create a basic medicines list in 1963, followed by Tanzania (1970) and Peru (1972).

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## COMMENTARY

# A Theory of Change for Guiding the Integration of Human-Centered Design Into Global Health Programming

Anne LaFond,<sup>a</sup> Montana Cherney<sup>b</sup>

## Key Messages

- Implementing partners, designers, and funders need tools and common language to increase the understanding and application of human-centered design (HCD) as an approach that enhances global health programming.
- To advance the integration of HCD and global health, designers and implementing partners should be able to articulate how HCD and global health practice can work together to support the achievement of health sector and global health ecosystem goals.

## ABSTRACT

The goal of this theory of change is to provide funders, implementing partners, and designers a tool to increase the understanding and application of human-centered design (HCD) as an approach that enhances global health programming. The theory of change also aims to communicate the potential for HCD to introduce new and disruptive mindsets, practices, and techniques to global health programming and to clarify HCD's potential value from the funding application process through to implementation. We seek to answer the key question: how do design and traditional global health practices and mindsets integrate to drive more people-centered, innovative solutions to health challenges and achieve common health sector and global health ecosystem goals?

## INTRODUCTION

Human-centered design (HCD) is an approach to problem framing and solution generation that has gained wide acceptance and delivered measurable impact in the private sector,<sup>\*,1-3</sup> but has only recently been applied in global health.<sup>4-8</sup> A body of experimentation and practice is emerging that delineates how HCD works on the ground, how HCD and health professionals are connecting their practices, and the benefits and challenges of integrating the 2 fields.<sup>9-10</sup> Yet, the theoretical pathways of the influence of design in health programming remain poorly articulated.

This article draws on recent experience and early efforts to explain the influence of HCD in health programming. In 2019, *Design for Health*<sup>11</sup> convened a group of global health and design practitioners to draft a theory of change (TOC) to convey the role of HCD in global health programming and its proposed contribution to realizing global health goals. Building on these early initiatives, we propose a second-generation TOC on the **integration** of HCD and global health programming for reflection and testing. This TOC intends to increase understanding of HCD and its application as an approach that brings new, often disruptive framing,

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\*In 2015, the Design Management Institute created a design value index, an attempt at measuring the value a good design and innovation process or culture can bring to a business. It found that, "Over the last 10 years design-led companies have maintained significant stock market advantage, outperforming the S&P by an extraordinary 211%."



**The theory of change aims to answer how do design and traditional global health practices and mindsets better integrate to drive more people-centered, innovative solutions to health challenges?**

mindsets, and practices in the sense that it challenges traditional ways of thinking and working, enhances program processes and effects, and promotes agency and self-determination in problem solving. The draft TOC also provides funders, implementing partners, and designers with a tool for communicating the influence of design in global health practices, and clarifying HCD's potential value, from human-centered problem framing, intervention design, and collaboration to implementation and evaluation of program impact. The TOC aims to answer how do design and traditional global health practices and mindsets better integrate to drive more people-centered, innovative solutions to health challenges and achieve common health sector and global health ecosystem goals?

## ■ RATIONALE FOR INTEGRATING HCD IN GLOBAL HEALTH

HCD in the health sector is defined as an iterative and participatory approach to building global health interventions that achieve health impact.<sup>11</sup> By placing people at the center during product, service, and program development and continuously testing and iterating solutions throughout the design and implementation process, HCD ensures that people's needs, desires, and contexts inform key decisions and that solutions are relevant, compelling, and tailored to specific contexts. Design is a craft and a discipline that applies a distinct mindset and skill set to a creative problem-solving process.<sup>11</sup> It can be applied differently, in terms of extent and intensity, depending on the challenges, timelines, and resources available, and therefore can serve numerous purposes. Design methods can be applied to help spark new ideas, thinking, and concepts; to deliver specific outputs as part of a larger program; as an "ingredient" in combination with other approaches across the program cycle; and as an end-to-end process, with the program scoped to match the design process, from informing program design to implementing solutions.<sup>11</sup>

We posit that more seamlessly integrating HCD skill sets and mindsets into global health programming has the potential to strengthen global health actors' capabilities and practices and enable them to adopt new, often catalytic approaches and solutions. By activating 3 core tenets of design—multidisciplinary collaboration, centering on people in their contexts, and creativity and iteration—HCD contributes to the realization of health sector investment goals: improved population health and improved health systems performance.<sup>11–14</sup> In

addition, we propose that integration of HCD also has the potential to enable the global health ecosystem to work in ways that enhance equity and inclusion and create greater openness to innovation and new ways of programming.<sup>5,15</sup> Based on the first TOC iteration and recent experience applying HCD in global health, we describe in the next-generation TOC 2 theoretical pathways of change associated with the integration of HCD in global health programming.

## ■ THE THEORY OF CHANGE

This (draft) TOC illustrates the influence of HCD in global health in 2 related domains: the health sector and the global health ecosystem. It outlines the pathways to achieving health sector and global health ecosystem goals that emanate from the influence of HCD in global health programming. The TOC articulates how HCD can strengthen existing processes and introduce new approaches to problem framing and the generation and implementation of solutions, working in concert with stakeholders such as health service clients, providers, managers, and funders to improve health as well as the institutions that frame, direct, and manage investment and priorities in health sectors in low resource settings. As the field has not yet generated a large body of evidence to inform the logic of these pathways, we have drawn on collective experience and expert consultation in developing the TOC. We hope that articulating these pathways invites testing and interrogation to advance understanding of this topic, offers teams the opportunity to continue to apply and evolve a common framework using a shared language, and increases and strengthens the evidence.

### **Framing the 2 Pathways of Change: Goals, Preconditions, and Outcomes of Integrating HCD**

At the core of the TOC are universally accepted health sector goals shared among global health and HCD practitioners: improved health system performance and improved population health.<sup>16–19</sup> The value of integrating HCD must be assessed against its contribution to achieving these fundamental aims of health investment in low-resource settings. The TOC asserts that when HCD is integrated into global health programming, it can improve the likelihood of realizing these goals. In the second pathway, the TOC further posits at the goal level that HCD not only helps to strengthen systems and improve health, it also influences the global health ecosystem that encompasses the health

**HCD contributes to the realization of health sector investment goals: improved population health; improved health systems performance; and increased equity, inclusion, and innovation in the global health ecosystem.**

sector by integrating program processes and products that enhance equity and inclusion, thereby strengthening traditional ways of working. For example, HCD helps to build capacity among individuals and within communities to play a more active role in their care experiences and stimulates ecosystem openness to innovation, collaboration, and human-centered programming and investment practices. These 2 theoretical pathways of change intersect and may occur simultaneously but advance at different rates of change. As experience integrating HCD in the health sector grows it builds momentum for change in the global health ecosystem.<sup>20–24</sup>

Moving from the bottom to the top of the TOC (Figure), the TOC consists of related layers of cause and effect, beginning with HCD's influence on global health programming processes and intervention shaping, which is represented as **HCD inputs** to the programming process and the **outputs and outcomes of practicing HCD**. In the subsequent upper layers, the TOC illustrates how HCD operates along 2 pathways (the health sector and the global health ecosystem) to help create some of the necessary conditions for realizing health sector and ecosystem goals, which are

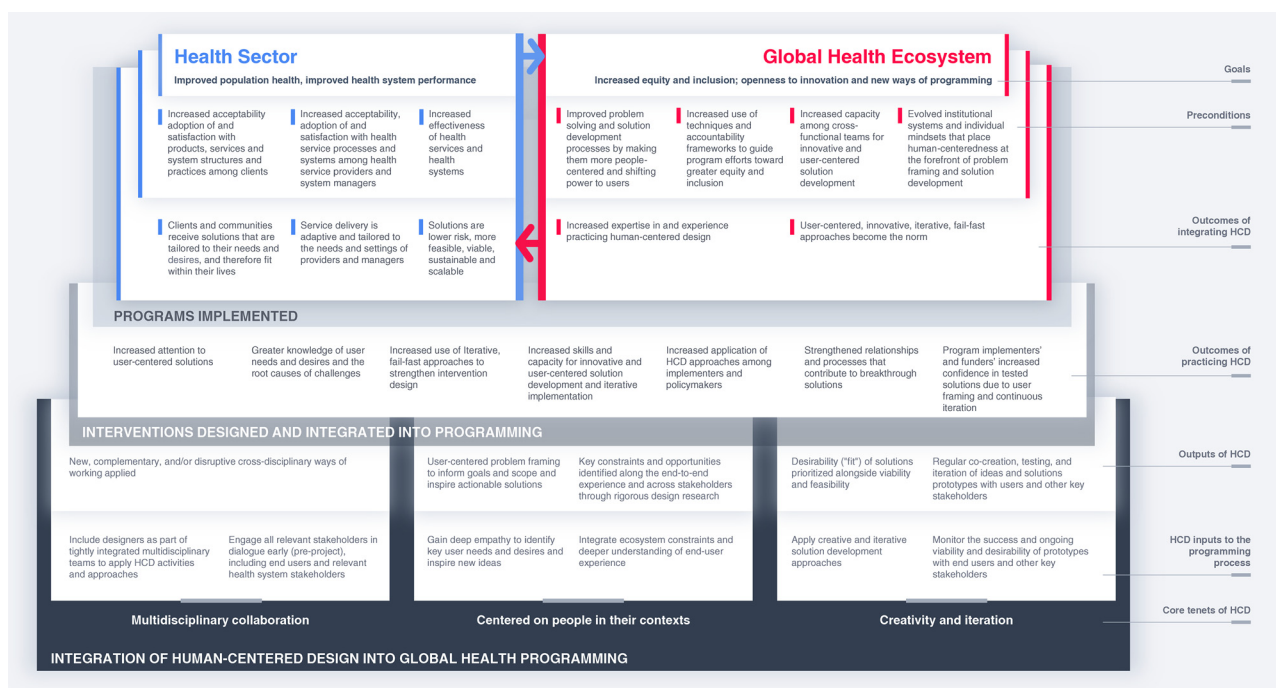
represented as the **outcomes of integrating HCD** and **preconditions**. There are, of course, many other preconditions for achieving these goals, but for this discussion, we focus on preconditions linked to the integration of HCD in global health programming. The 2 pathways of influence of HCD on global health are related and mutually reinforcing. We discuss each pathway separately below, describe how HCD works in practice, and how it can drive impact and change.

As stated earlier, the design process can be applied differently depending on the challenges, timelines, and resources available, and therefore can serve numerous purposes. HCD enhances traditional global health programming approaches and introduces new ways of thinking and working as a consequence of its 3 core tenets<sup>11–14</sup>:

- Engagement of multidisciplinary teams (including end users and health system stakeholders) in problem framing and the co-creation of solutions
- Centering of users' needs, desires, and contexts and identification of ecosystem constraints
- Use of cycles of creative and iterative solution development and the testing and monitoring

**HCD enhances traditional global health programming approaches and introduces new ways of thinking and working.**

**FIGURE.** A Theory of Change for Guiding the Integration of Human-Centered Design Into Global Health Programming



of the desirability and viability of solutions for end users and key stakeholders

## ■ HCD IN PRACTICE: ENHANCING INTERVENTION DESIGN AND IMPLEMENTATION

### Inputs and Outcomes of Practicing HCD

In practice, HCD is typically introduced at an early stage of problem framing and exploration, guiding a process of user-centered solution development and testing that generates 1 or more products, services, or interventions as components of the overall program.

Many HCD activities and approaches (**HCD inputs** at the bottom of the [Figure](#)), such as strengthening cross-disciplinary collaboration and user involvement in intervention design, complement existing health program planning practices. Others, such as introducing phases of early-stage user insight generation and testing and adapting solutions before full-scale implementation, often challenge accepted practices such as rigid adherence to program designs agreed on at the point of initial funding. To illustrate how HCD influences global health programming, the [Figure](#) groups the inputs according to the 3 core tenets of HCD: multidisciplinary collaboration, centering on people in their contexts, and creativity and iteration.<sup>11–14</sup>

The core HCD tenet of **multidisciplinary collaboration** posits that the practices of creating tightly integrated multidisciplinary teams that apply HCD activities and approaches and engaging all relevant stakeholders early introduces new collaborative and cross-disciplinary ways of working. In fact, incorporating a broader set of stakeholders in the conversation from the start can help teams to identify and overlay the needs and desires of a broader group of stakeholders and enhance community engagement.<sup>25–26</sup> It also helps to ensure that discomfort or concerns between stakeholders that might arise in solution development are acknowledged and addressed early.

The second tenet, framing problems and generating solutions **centered on people in their contexts** is at the heart of HCD. While global health practitioners have taken a people-centered approach for decades, design borrows from approaches like ethnography and psychology and brings new dimensions that complement and enhance traditional approaches and particular attention to individual identities and lived experience that is often missing in global health programming.<sup>27–28</sup> Using desirability and fit as their compass, designers invite end users to

describe not just what they need, but what they *want*, and how what they want can best fit into their lives.

At the outset of a project that integrates HCD, the team often conducts design research to gain a deeper understanding of and empathy with users in their contexts; identify their needs, desires, and contexts; and inspire new ideas for solving a health challenge or achieving a health goal by looking at their experience in an integrated manner rather than assuming that health decisions are made in isolation of other factors.<sup>29</sup> Another way that design ushers in new layers of understanding to the problem-framing process is by using creative storytelling tools to illustrate constraints and opportunities along the end-to-end user experience and across the broad ecosystem of stakeholders. These tools, including personas, journey maps, and ecosystem maps, offer teams more relatable, often visual, ways to help align stakeholders by employing new ways of becoming aware of users' experiences and the interconnections between stakeholders.

**Creativity and iteration**, the third core tenet of HCD, borrows largely from tools and approaches widely employed in the private sector in which users and other stakeholders collaborate on the development of solutions and engage in divergent and convergent thinking processes.<sup>30</sup> Creativity is at the heart of HCD's open-minded exploration and generation of ideas to deepen understanding of problems and their root causes, followed by facilitated discussions and processes like prototyping (i.e., iterative, fail-fast testing, and adapting) to optimize the selection of solutions.<sup>31</sup> Ongoing involvement of users—from brainstorming to codesigning and prototyping—helps to ensure that the desirability and fit of solutions are prioritized alongside viability and feasibility.<sup>32–33</sup>

The **outcomes of practicing HCD** take the form of greater knowledge and prioritization of users' needs and contexts, strengthened relationships and multidisciplinary partnerships in health sector programming, and increased use of iterative, prototyping cycles. Designing not just for but *with* users and monitoring the success, viability, and desirability of prototypes with end users and other stakeholders throughout solution development help to increase implementers' and funders' confidence in solutions. Additional outcomes of program planners' and implementers' ongoing engagement in HCD include the evolution of human-centered mindsets over time in these actors, an increased capacity for innovative and iterative solution development and implementation,

**Global health practitioners have taken a people-centered approach for decades, but design complements and enhances traditional approaches and brings attention to individual identities and lived experience that is often missing in global health programming.**



and a greater willingness to apply HCD along with traditional health programming practices.

## The Outcomes of Integrating HCD: 2 Pathways

HCD inputs come together during project planning to produce products, interventions, services, and strategies that have been tested with users in their context and that can become small or large components of overall health sector investments whether HCD is used as a spark, ingredient, or end-to-end.<sup>11</sup> Integrating HCD also introduces program managers and participants to new skills, practices, and mindsets that prioritize human-centered programming and creative problem solving. Over time, as HCD processes are repeatedly applied, the new skills and practices can reorient program planners' approaches to intervention design and implementation and increase individuals' and communities' sense of agency.<sup>8,34</sup>

The upper 3 layers of the [Figure](#) (**goals, preconditions, and outcomes of integrating HCD**) delineate the outcomes of implementing HCD-influenced programs and integrating HCD-influenced processes into global health practice. The health sector pathway on the left side focuses on the key outcomes of tailoring and de-risking interventions, while the global health ecosystem pathway on the right emphasizes orienting investment toward users and user agency and innovation.

### ■ HEALTH SECTOR PATHWAY

When HCD is integrated into global health programming, clients and communities receive solutions tailored to their needs and health service and behavior change interventions are carefully aligned with providers' and managers' needs and settings. The design process helps teams to shape and implement interventions that better meet the needs and desires of users and stakeholders across the health system, reducing risk and optimizing the likelihood that the desired behaviors, products, and services will be adopted and accepted.<sup>11,35</sup> As such, HCD helps to create the following important **preconditions** for achieving health sector goals:

1. Increased **acceptability and adoption of and satisfaction with** global health products, services, system structures, and practices **among clients**
2. Increased **acceptability and adoption of and satisfaction with** health service processes and systems **among health service**

**providers and system managers** (i.e., key system actors)

3. Increased **effectiveness of health services and health systems** (i.e., solutions that work for people in their context and meet standards for accessibility, availability, quality, affordability, and desirability)

## Preconditions: Acceptability, Adoption, and Satisfaction

One of the key benefits of integrating HCD is that design processes can help to shape a product or service to increase its desirability in the eyes of the client and drive acceptance, adoption, and satisfaction—critical elements in improving health and health systems performance. HCD can also help tailor services, delivery settings, and processes so they are more acceptable to service managers and providers, which increases the likelihood of adoption and continued use of the service delivery practices. In both cases, the user (i.e., the person who seeks better health or the actor in the system who contributes to better health) is paramount in the design process. In fact, in **the early stages of HCD-led intervention/project design**, the desirability of the product, intervention, or service takes precedence over other considerations like cost and efficiency to drive **acceptability and adoption**. The user's perspective continues to be a critical success factor throughout solution development and implementation, with desirability one of the key metrics that guide design decisions.<sup>36</sup> Designers posit that if people are not motivated to use a service or do not feel successful, rewarded, or delighted when they practice a health-promoting act or service, they are not likely to become a steadfast "customer" of the service or doer of the behavior.

By exploring how those involved in a health service experience it from end to end of the journey, HCD also helps to reveal ways to improve health service delivery. Design processes manage the conflicting user concerns that often arise and refine possible solutions through iterative prototyping cycles with users. HCD tailors solutions to users' contexts, needs, and aspirations by collaborating closely with end users—clients, community members, health care workers, and other health system stakeholders—to enhance "fit" and acceptability. In this manner, HCD seeks to disrupt traditional program planning by prioritizing users' needs and desires early in problem framing and later, before widespread implementation, by testing the feasibility of introducing and sustaining

**The design process helps shape and implement interventions that better meet the needs and desires of users and stakeholders across the health system, optimizing the likelihood that the desired behaviors, products, and services will be adopted and accepted.**

the solution in the community or health system context.

### Precondition: Effectiveness of Solutions

Beyond improved product or service uptake, applying HCD approaches can enhance the overall intervention strategy used to define and deliver a product or service or introduce health-seeking or health-positive behaviors. By designing and testing for feasibility and viability, the other key metrics that guide design decisions, HCD processes reduce the risk of failure of an intervention as a whole thus enhancing the likelihood of success. A design-influenced approach embodying substantial user engagement in problem framing, solution generation, and iterative testing and adapting increases the likelihood that program managers will identify implementation challenges and needs early on.<sup>37</sup> It provides them with a more nuanced understanding of the feasibility of implementation in a specific context, helping to avoid costly, late-stage learning about the fit between the intervention and the health system or community context. For example, prototyping delivery strategies, partnerships, and cost-recovery mechanisms in different settings with different population segments increases confidence in the design of an intervention, its implementation trajectory, and its potential for success.

## ■ GLOBAL HEALTH ECOSYSTEM PATHWAY

Introducing and enhancing HCD's people-centered, collaborative practices provides opportunities to enhance global health ecosystem structures and practices. This includes advancing actors' ability and willingness to apply creativity and innovation in developing health interventions and to focus on increasing equity and inclusion in the health sector.<sup>5</sup> With respect to innovation, the global health field is somewhat resistant to creative problem-solving approaches, including the strategy of "failing fast" to find solutions that fit.

HCD enables global health actors to experiment with new ways of working that incorporate a learning and testing framework, which can disrupt or enhance existing practices.<sup>25</sup> Conversely, HCD can also benefit from decades of global health experience and rigor assessing feasibility requirements and evaluating program effectiveness—experiences that are needed to ensure that HCD-influenced solutions are adapted for system sustainability and scale-up. The fields of global health and HCD also share a commitment to equity and

inclusion that make them good allies, and HCD introduces additional techniques for integrating inclusive practices during intervention design and implementation.

As HCD is integrated more systematically in health programming, it is beginning to blend with traditional processes to create critical preconditions for system-level adoption of new approaches to intervention design and collaboration. HCD also helps to position the ecosystem to achieve greater equity and inclusion in its practices and its outcomes.<sup>5</sup> At the ecosystem level, HCD contributes to the following **preconditions** for greater equity, inclusion, and innovation:

- Improved problem-solving and solution development processes as a result of making the processes more people-centered and shifting power to users
- Increased use of accountability techniques and frameworks to guide program efforts toward greater equity and inclusion
- Increased capacity of cross-functional teams to employ innovative, user-centered solution development, including openness to adapting solutions and systems to sustain or improve impact
- Evolved institutional systems and mindsets of funders, implementers, and other health system stakeholders that place human centeredness at the forefront of problem framing and solution development

## ■ CONCLUSION

This TOC illustrates pathways to achieving key health sector and global health ecosystem goals that emanate from the influence of HCD on health programming processes, such as problem framing, defining solutions and interventions, and implementing solutions that are tailored to users' needs, desires, and contexts. The TOC also depicts the role of HCD in reorienting the mindsets and actions of donors, program developers, health program managers, and service providers toward creative, people-centered, iterative approaches grounded in learning.

Typically, TOCs focus on a specific intervention or program. This TOC seeks to articulate and evolve an understanding of broader global health programming practices. We hope to engage a community of funders, implementing partners, and designers in a dialogue about the integration of HCD and global health. Most importantly, we aspire to create a common framework and language



to answer the question: how do design and traditional global health practices and mindsets integrate to drive more people-centered, innovative solutions to health challenges and achieve common health sector and global health ecosystem goals?

We encourage funders, global health practitioners, designers, and evaluators to use this TOC to:

- Introduce and explain key HCD processes in the context of global health programming and articulate its influence pathways
- Increase understanding of and enhance alignment on how HCD can complement traditional approaches to achieving health sector and global health ecosystem goals, thereby optimizing collaboration between designers and global health practitioners
- Develop framing and metrics to track the integration of HCD into global health programming
- Test the pathways of change and generate evidence on the process and outcomes of integrating HCD into global health programming

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## COMMENTARY

# Complexity in Health: Can Design Help Support Interdisciplinary Solutions?

Ledia Andrewes,<sup>a</sup> Tracy Johnson,<sup>b</sup> Michael Coleman<sup>c</sup>

## Key Messages

- The collaborative nature of design practices is well-suited to creating the conditions for productively integrating varied disciplines to solve challenging problems in global health.
- The tensions that can arise from merging different disciplines and approaches within public health and beyond, rather than hinder progress, can be surfaced for stronger solutions to emerge.
- We explore 3 productive tensions that result from integrating global health and design:
  1. Integrating explicit and implicit knowledge
  2. Challenging linearity with iteration
  3. Enabling collective ownership of processes and solutions
- For these tensions to be productive, design and global health practitioners must do more to be open and adapt to the heritage of other disciplines; both those that have always played a role in global health and those that are just beginning to garner attention in the field.
- Designers can do more to establish early that they are not there to replace but rather to “accompany” other disciplines through collaboration.

## INTRODUCTION

Global public health programming has become increasingly complex. Overlapping investments aim at developing health policy, extending the reach of supply chains, supporting more effective service delivery, and addressing demand-related barriers to improve health. Whether it's vaccine hesitancy, antimicrobial resistance, or health care worker motivation, there is an increasing recognition that many of the problems facing the global health field have human behavioral

dimensions that are often poorly understood or addressed. While this recognition has driven many global health program strategists to increasingly integrate qualitative and participatory approaches in program design as well as mixed methods for evaluation, a premium continues to be placed on global health professionals with substantive expertise—often biomedical and heavily quantitative—over the experiential and contextual insights that emerge from direct engagement with end users.

There is general agreement that the global coronavirus disease (COVID-19) pandemic has exposed and accentuated entrenched social inequities, revealing once again how vulnerable population groups—whether based on gender, disability, age, ethnicity, or geography, among others—are disproportionately affected.<sup>1</sup> The Bill & Melinda Gates Foundation's 2020 Goalkeepers Report summarized this concept well<sup>2</sup>:

*In the blink of an eye, a health crisis became an economic crisis, a food crisis, a housing crisis, a political crisis. Everything collided with everything else.*

Health is contextual—social, cultural, and behavioral—and the difficulties of taking into account more upstream systemic and social considerations have required global health programming to focus downstream, on individual behavior change and individual drivers of seeking, adopting, and adhering to treatment.<sup>3</sup>

The potential value of integrating varied disciplines to bring new insights and solutions to complex challenges is well-accepted in principle in global health. We argue in this commentary that more can be done. Drawing on the concepts and expertise of different disciplines does not automatically make a project interdisciplinary. True **interdisciplinarity** involves integrating information, concepts, tools, and rules that are used or produced by different disciplines on a particular subject. One might think about it less as forming a band and more as forming an orchestra where the musicians trade instruments. Yet, as we discuss in more detail, greater clarity on what the effective integration of disciplines looks like is needed. A clear and replicable process to support exactly how disciplinary boundaries can be minimized would help teams to identify unique solutions necessary for engaging the social, political, economic, and behavioral foundations that determine population health.<sup>4–6</sup> Interdisciplinary

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**The collaborative focus of design can strengthen interdisciplinary ways of working in complex settings by creating the conditions for multiple voices to be heard, considered, and effectively integrated into problem-solving approaches.**

**Simply drawing on the concepts of different disciplines does not automatically make a project interdisciplinary.**

practice is hard work, demanding “constant explanation, adaptation and scientific readjustment” from all practitioners involved—from those engaged in project planning to research and to problem solving.<sup>7</sup>

Design practices are inherently collaborative. The process, mindset, and approach put end users and their context at the center. Design practices encourage shared understanding among diverse areas of expertise and experience. Individuals, communities, and organizations are active partners in the design and implementation of solutions. This collaborative focus of design can strengthen interdisciplinary ways of working in complex settings by creating the conditions for multiple voices to be heard, considered, and effectively integrated into problem-solving approaches. For the value of design to be optimized, designers can do more to establish early that they are not there to replace but rather to accompany other disciplines through collaboration. In this commentary, we argue that design can create a neutral space and provide a proven process for interdisciplinarity in global public health.

## ■ MAKING THE CASE FOR INTERDISCIPLINARITY

*This landscape in all its beauty, sometimes gentle, sometimes terrible, cannot be seen fully by any one of the occupants of the room. Indeed, it cannot be known fully by a whole generation of men [and women]. Explorers of each generation travel into its unknown recesses and, with luck, return to share their discoveries with us. So the life of the new room would go on—thought, reflection, contemplation—as the explorers bring back their discoveries to share with the room’s occupants. This landscape that we gaze on and try to understand is an epic portion of the human experience. —Mead<sup>8</sup>*

Mead’s plea for a “new room” in that “vast and rambling” house called science reminds us that the landscape of inquiry and problem solving cannot be seen fully by any one discipline. Recognizing that complex problems are not so neatly organized within disciplinary demarcations, the field of global health has sought to work in more interdisciplinary ways throughout its history, although not without some challenges. Embracing interdisciplinarity requires a shift among practitioners to overcome disciplinary specificities, including temporal conflicts in data collection and analysis, the requirements of institutional and disciplinary affiliations, and contrasting theoretical frameworks and methodologies. When successfully overcome, experts can bridge disciplinary divides, propel the collective effort to address the multifactorial drivers of health

problems, and together identify new levers for change. Moreover, the unique knowledge that emerges from the dissolution of disciplinary boundaries is essential for addressing imperatives such as equity in human health.

Interdisciplinary training in medical schools, for example, is increasingly encouraged for specialists to consider the needs of patients more holistically. An overly specialized approach can miss valuable insight from the connections between symptoms.<sup>9</sup> In global health, it is also common for specialists to come together to share expertise, knowledge, and skills to positively impact individual and societal health outcomes.

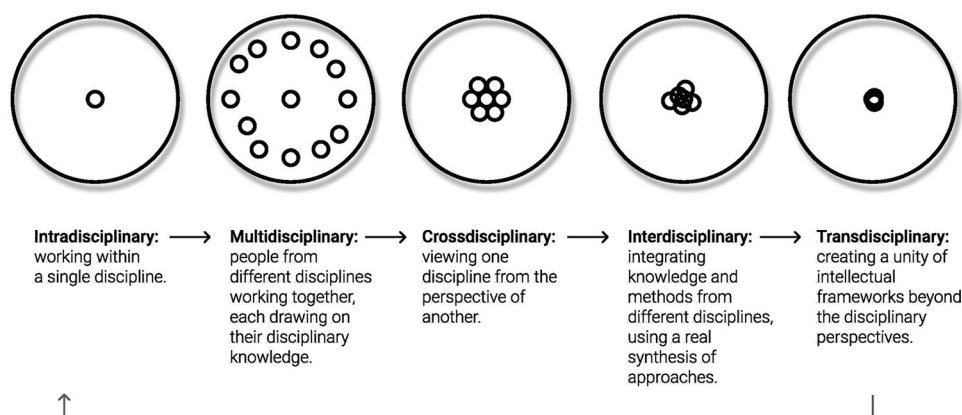
The case for interdisciplinary teamwork is to enable the integration of knowledge that supports a more thorough understanding of the whole picture, what Marilyn Stember calls the “holistic complex of interrelationships.”<sup>10</sup> There is no doubt that specialization along with widening the aperture of what is considered expertise has brought great strides in advancing the field of global health. Yet when navigating some complex problems, it demands not only harnessing diverse skills and knowledge but also blending disciplinary boundaries toward a common goal.

As the drive for specialists to come together to impact individual and societal health outcomes grows, so too have the range of terms used to characterize collaborative working arrangements between practitioners from different disciplines. Terms such as intradisciplinary, multidisciplinary, crossdisciplinary, interdisciplinary, and transdisciplinary are used to refer to both different types of teams and different processes within them (Figure). Yet, these terms are often unclear as to how they distinguish between different degrees of collaboration and knowledge integration.

Stember offers an overview of the different degrees of collaboration and knowledge integration within or across disciplines.<sup>10</sup> Along the spectrum of intra- to transdisciplinary, one can see the range: from **maintaining** intellectual frameworks from a single discipline, to **considering** other disciplinary points of view, to **collaborating** with different disciplines, to **integrating and synthesizing** knowledge from other disciplines, and finally to **unifying** intellectual frameworks beyond disciplinary boundaries.

Given the number of terms to describe this process of working together, it is understandable that as practitioners, we are not always able to fully reflect on the processes to achieve such collaboration. However, simply drawing on the concepts of different disciplines does not automatically



**FIGURE.** Degrees of Knowledge Integration Within or Across Disciplines<sup>a</sup><sup>a</sup> Adapted from Stember.<sup>10</sup>

make a project interdisciplinary. Going beyond just assembling different types of knowledge, interdisciplinarity is a critical stance in the effort to produce a whole that is greater than the sum of the parts. With interdisciplinarity, practitioners seek out the complexity of interrelationships and integrate the contributions of other disciplines into their own. They do this in ways that dissolve traditional boundaries and open space for new insights and solutions to emerge.<sup>11</sup>

Interdisciplinarity within global health projects has been questioned before.<sup>5</sup> On the far end of the spectrum is what some have termed “best-practicitis”<sup>12</sup>—a top-down, “plan and control” approach that more immediately responds to the needs of aid organizations. The argument here is that the development system relies more heavily on practitioners looking for the single right answer rather than a set of diverse solutions, spending more time trying to do things right than determining if they are doing the right things, and creating “how-to” guides and off-the-shelf toolkits that take precedence over attempts to change ways of working through deeper interaction and dialogue.

One does not need to embrace the concept of “best-practicitis” to agree that the global development system has struggled to incorporate more adaptive and integrative approaches, and in so doing has unintentionally reinforced the traditional linearity of problem definition, solution identification, implementation, and evaluation.<sup>12</sup> Heterogeneous forms of evidence present methodological challenges that perhaps unintentionally reduce willingness to use experiential and relational methods.<sup>13</sup>

More established definitions of success have predominantly fixated on speed, scale, costs, and other critical quantifiable indicators such as intervention coverage and mortality. While these are essential features that the global health field rightly relies upon to ensure that the appropriate standards of quality, safety, and do no harm are met, this approach has conditioned many practitioners to adopt quantitative-heavy practices from their technical areas of expertise, which then perpetuate top-down cultures of procedural quantification and reporting.<sup>14</sup> This model of impact is not well-suited to accounting for how people’s experiences of the world and their health shape their knowledge and behavior. Design processes that support the co-construction of knowledge can complement traditional processes with the addition of more holistic and diverse forms of evidence. This complementarity can support practitioners to navigate global health challenges that require a deeper understanding of how to design interventions that take into greater account the complexity of human behavior.

## ■ DESIGN AS A FACILITATOR OF INTERDISCIPLINARITY

There is general agreement that interdisciplinarity practices can add value to the complex challenges facing global public health.<sup>4,5</sup> Yet, as Kivits et al. ask, how do we do this?<sup>7</sup>

We contend that design is well-suited to creating the conditions for multiple voices to be heard, considered, and more fully integrated when problem

**Design is well-suited to creating the conditions for multiple voices to be heard, considered, and more fully integrated when problem solving in interdisciplinary teams.**



solving in interdisciplinary teams. The generative nature of design practices brings a unique form for problem solving. In the last few decades, the design field has expanded its role from shaping a product for a human to shaping relationships between humans in a system.<sup>15</sup> This role increasingly includes interdisciplinary inquiry that tackles complex sociocultural challenges.<sup>14</sup>

Design practices can offer experiential and relational ways for looking, listening, sharing, and learning. The collaborative nature of design practices can provide strong guide rails for effectively bringing varied disciplines together to solve problems at different levels of magnification, focus, and interpretation—from the historical context to social norms and right down to the decision point. In settings where various disciplines come together for the common purpose of improving health, design processes reconceptualize social needs by illuminating the why and the how of human behavior and offering collaborative spaces for imaginative solutions.<sup>16</sup> As many of the articles in this Supplement issue discuss, designers are increasingly expected to operate in ways that bring in more systems thinking, visualize problems and make conceptual ideas concrete, gather and mediate diverse stakeholders, and give prominence to the voice of the people behind particular global health challenges.<sup>14</sup> By supporting action that starts from people's agency and relationships, design practices can offer a more human-centered practice for interdisciplinary working.

The need to articulate design's place among technical experts was foreseen by Richard Buchanan as he addressed the Design Educators Forum of South Africa in 2000<sup>17</sup>:

*Our bigger challenge is to explain why design is different from other "subject-based" disciplines, how it integrates knowledge from many other disciplines, and how it turns theoretical understanding in other disciplines into valuable products that can have great impact on society.*

Now, 20 years later, the need for design to distinguish and establish itself alongside subject-based disciplines that he highlighted has yet to be addressed. This articulation is needed if design is to effectively contribute to global health by creating space and a process for knowledge integration from many disciplines.

Design efforts in the international development, global health, and social innovation spaces have had a long history of embracing multiple disciplines in their practice. Bannon emphasizes that design research and practice have evolved thanks to

influences from human factors and human-computer interaction, the methodological contributions of anthropologists and sociologists, organizational information systems research, user-centered design, participatory design, and the more craft-oriented design professions.<sup>18</sup> Design efforts focused on social innovation,<sup>19</sup> international development,<sup>20–22</sup> and global health<sup>23,24</sup> continue to push the potential for interdisciplinary practice in new directions.

These trends shed some light on why a growing number of institutions have either sought out partners to contribute design expertise or have started to build internal design capacity of their own.<sup>25</sup> Design practices are supporting the shift toward working cultures that allow for integration across the many disciplines devoted to an understanding of human behavior and human values.<sup>26</sup> For some, integration comes with risks, such as the risk of design practices being reduced to a toolkit approach that can lead to known or obvious conclusions or overweighting individual views at the risk of alienating others.<sup>27–30</sup> Furthermore, some design practices have been critiqued for not routinely adhering to ethical research requirements to protect research subjects and their data, which are common practices in the social sciences.<sup>28</sup>

The contrasting methodologies of different disciplines highlight tensions between their respective ways of working. However, rather than see these tensions as impediments, some design practices can treat them as fertile ground to push beyond institutionalized expectations of a solution and to open a space for new opportunities that can lead to creative solutions that are more suited to addressing the messy complexity of people's expectations, behaviors, needs, and wants related to their health. Bazzano et al. state the<sup>31</sup>:

*central tenets of design thinking research, like iteration, tolerance for ambiguity, pivots, and rapid prototyping, are inherently at odds with some prevailing processes in health and biomedicine, particularly public health, where hypothesis-driven research is the norm.*

Design practices can foster greater interdisciplinarity by harnessing such tensions. We explore 3 productive tensions that result from integrating global health and design: (1) integrating explicit and implicit knowledge, (2) challenging linearity with iteration, and (3) enabling collective ownership of processes and solutions.

**Some design practices can treat tensions that arise between disciplines as fertile ground to push beyond institutionalized expectations of a solution.**

## ■ HARNESSING PRODUCTIVE TENSIONS BETWEEN DESIGN AND GLOBAL HEALTH

### Productive Tension 1: Integrating Explicit and Implicit Knowledge

In many disciplines, knowledge is often seen as taking an explicit form: things that are written down, defined, categorized, systematized, or quantified. In contrast, knowledge in design is often seen as tacit and implicit: rather than something to be articulated, knowledge exists as embodied in people's behaviors. Design practices seek to challenge the argument that knowledge **only** counts when it is objective, scientific, statistically valid, or considered "best-practice." It broadens what constitutes knowledge, including the experience of end users and others. Knowledge that emerges from research and observation generated through standardized (mainly quantitative) methods tends to be valued over other types of knowledge that uses qualitative, participatory, and observational techniques that by nature can be adapted as the research questions evolve. This can create tension with design practices that tend to prioritize relational and tacit types of knowledge derived more directly from the end users' points of view and which consider this type of knowledge a necessary component in addressing public health challenges.

In a project to redesign the strategy for national public health insurance in Kenya, a design-led approach was chosen by the World Bank Group and the Kenyan Government's National Hospital Insurance Fund (NHIF) to determine how NHIF could better meet the needs and preferences of the informally employed to achieve greater health insurance uptake and retention. During the 5-month design process, more than 124 people were involved, including 84 citizens, 22 NHIF managers and staff, and 18 stakeholders from health service delivery organizations. The interdisciplinary team comprised 2 designers, 1 sociologist, 1 health economist, 1 marketing specialist, and 1 community mobilizer.\*

Initially, the various actors involved "labeled" the citizens involved in the project differently.

- The project's funder labeled them **recipients or beneficiaries**.
- The NHIF and the marketing specialist on the team considered them **customers**.

- The sociologist perceived them as **research informants**.
- The designers saw them as **service-users** and **co-designers**.

As the project progressed, the designers challenged the role of citizens as passive recipients or informants in the eyes of others by inviting citizens to join design workshops as codesigners of possible future scenarios alongside policy makers, NHIF implementers, and the interdisciplinary project team. One of the global health specialists responsible for funding the project shared how design practices<sup>24</sup>:

*...highlighted the issues from a lived experience perspective and codified the project in the language used by real people. —Participant working for a funding agency*

The more participatory emphasis of the design process led the way for a diverse team of project stakeholders to ascribe greater value to the citizens' tacit knowledge and lived experience. In this case, design succeeded in helping the global health specialist reach her particular goal<sup>24</sup>:

*What I've been trying to push is how do we understand users even before we get into defining what the problem is. ... [this organization] is no different to other places in this regard, we've made a decision ahead of time, what are the problems. —Participant working for a funding agency*

Unfortunately, there was no formal evaluation of whether the solutions proposed through this project increased access to insurance by the informal sector. However, the participants from the World Bank and NHIF senior managers credited the design-led process that guided the work to change the minds of internal NHIF stakeholders on what they needed to "solve for" as an organization and to foster more interdisciplinary collaboration among previously competitive project teams.

This expansion of what constituted knowledge went beyond traditional disciplinary boundaries such that rather than starting with a technical solution, design practices helped ensure project parameters were grounded in a deeper understanding of how people's experiences shape their consciousness and drive their health-related behaviors. However, this process can invite ambiguity into projects, and forcing people to engage with more ambiguity than they are used to creates tension. Asking experts to re-examine, reconsider,

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**The more participatory emphasis of the design process led the way for a diverse team of project stakeholders to ascribe greater value to the citizens' tacit knowledge and lived experience.**

\*The team undertook exploratory design research, which received ethics approval from the Africa Medical Research Foundation (AMREF) ethics and scientific review committee (approval number ESRC P168/2015).

and blend their knowledge with that of others requires trust and a willingness to explore a problem anew. Specialists who have been working in their space for many years can feel their expertise is being shifted from the center to the periphery.

Experience-based and visual design practices can situate the knowledge of users and collaborators in dynamic ways for others to consider again. Visual design practices can bring clarity to diverse teams on otherwise complex and unfamiliar concepts. By turning complex information into sketches, models, and interactive role-plays, such design artifacts embody knowledge that is not as easily communicated using tables, words, and numbers. Many global health practitioners often stop at this point, seeing the role of design to fulfill that communication function. But design's value comes in its ability to challenge assumptions based on technical expertise alone and instead to create opportunities for explicit knowledge to blend with user perspectives and other types of tacit knowledge. Design practices can further support practitioners in acknowledging where their knowledge sits in relation to others and facilitating teams to collectively move beyond any unrecognized biases.<sup>32,33</sup> Resituating a type of knowledge in relation to others enables practitioners to build on the tradition of participatory methods in global health and relate to beneficiaries less as subjects of inquiry and more as collaborators in the desired change.

### Productive Tension 2: Challenging Linearity With Iteration

Many approaches suggested for effectively navigating complex problems contradict what can be a fairly rigid and linear process of problem definition, solution identification, implementation, and evaluation.<sup>12,34</sup> While such linear processes can be efficient, they have proven less effective in complex situations where problem definition remains an ongoing, open, and critical reflection throughout the project, rather than just an upfront phase. In contrast to a linear-thinking, single-solution approach born of analysis, an iterative design approach is flexible in nature, continuously skeptical as to the definition of the problem itself, opportunistic in its generation of solutions, and almost obsessed with introducing creative options and experimentation. Such an approach challenges the notion that there is 1 pathway to change. Instead, it acknowledges that dynamic problem

solving involves regular cycles of learning and experimentation to reach a solution.<sup>35</sup> Given the pace of funding cycles that drive for more rapid solution development, a tension arises with design practices that can insist on longer processes of iteratively working through the complexity of the problems.<sup>†</sup>

For people who seek the certainty of externally structured, well-defined problems, iterative design processes have the potential to create discomfort for people who are not used to them. Take, for example, a 5-day design sprint/workshop in Zimbabwe that aimed to use mixed-methods, segmentation-based insights to generate innovative ideas and early prototypes to address poor uptake of voluntary medical male circumcision (VMMC) services. There were approximately 40 people in the sprint/workshop, including policy representatives from the Ministry of Health, practitioners from partner organizations with various technical and programmatic backgrounds, and current and potential clients of VMMC services.

One of the project sponsors reflected afterward on how challenging it was for her to let go of control. This was particularly the case with **unproven** activities the design team used to push participants into a more creative space when generating ideas. For example, an activity provided participants with several rounds of unrealistic scenario prompts that started with “what if...” or “imagine if...” for them to generate more novel ideas. The different ideas were rotated around the room, and participants were invited to build upon those that were generated by others. These less “evidence-based” methods and more creative scenario-based methods to generate additional ideas were difficult for this project implementer to accept on day 2. By day 5, the implementer declared the week as a significant success as it pushed teams to think creatively, work in more interdisciplinary ways, and develop new prototypes that could be further tested and developed.

At the same time, there were moments during the week that the project implementer felt nervous and questioned whether bringing in a design team was a mistake. This implementer shared with an author<sup>24</sup>:

*The approach is the approach, I still can't cope with the chaos part of it, but the approach is the approach.*  
—Implementer involved in the project

<sup>†</sup>Plan-Do-Study-Act and adaptive management approaches are attempting to bring similar iterative working styles into global health practice. These efforts are emergent and perhaps would be a fruitful avenue for collaboration with design.

**An iterative design approach challenges the notion that there is one pathway to change.**

This discomfort usually occurs when diverse teams are forced to engage with the ambiguity, disorder, and messiness of integrating each other's knowledge and ideas. Design practices can help global health practitioners navigate ambiguity and open deliberative and adaptive spaces for new possibilities to emerge.<sup>36</sup> This occurs through experiential and speculative processes, such as ideation and prototyping, that support interdisciplinary teams in maintaining the “parallel lines of thought” necessary for integrating analytical and creative perspectives<sup>37</sup> and the “double vision” that helps a designer be both learner and creator.<sup>38</sup>

This movement between the different activities associated with learning, analyzing, and doing are critical characteristics of design when seeking interdisciplinary solutions because answering the wrong question or answering the right question poorly is increasingly costly in complex settings.<sup>39</sup> However, designers need to negotiate a balance between practices that are human-centered and messy and practices that are predictable, bounded, and meet the institutional and project needs. Despite the aspirations and expectations of some, design practices do not always offer implementers immediate answers to complex problems. Sometimes, as they did in this situation, they provide new and welcome ways of collaboratively navigating intractable problems that persist with no obvious solutions.

### Productive Tension 3: Enabling Collective Ownership of Processes and Solutions

Many global health practitioners are inspired by the sense of possibility that emerges when a community adopts a solution as their own. The global Ebola virus disease and COVID-19 pandemics have demonstrated that to achieve impact and scale solutions that are sustainable over time, global health practitioners must design solutions **with** local communities and not simply **for** them. What constitutes collective ownership can be difficult to clearly define within projects that involve diverse stakeholders with varied agendas. At the same time, there is a growing consensus that enabling collective ownership<sup>40</sup>:

*...demands genuine interactions, creating enabling conditions and spaces for incremental changes, and building shared values.*

The collaborative nature of design practices supports interdisciplinary work by creating spaces that call for the exchange of values-based ideas and nurture a greater sense of collective ownership. Designers can provide a structure for continuous

interdisciplinary collaboration by (1) bringing in dialogue-based design methods, (2) stimulating the creativity and ideas of collaborators, and (3) enabling collaborators to bring in their material and intellectual culture.<sup>41</sup> This suggests that practicing design in interdisciplinary settings can require additional skillsets as designers are also required to be fluent in balancing multiple participant ideas<sup>42,43</sup>; addressing “changing roles of power” in groups<sup>44</sup>; and developing contextually adapted methods for diverse participants to contribute throughout a process.<sup>45</sup> Design practices that seek to integrate multiple (and sometimes contradictory) viewpoints that are centered around the end user experience can come into tension with a more multidisciplinary approach in global health—an approach that often includes more perspectives but can unknowingly maintain disciplinary boundaries and undervalue user experience.

In the previously mentioned project seeking to redesign a citizen-centered public health insurance service in Kenya, senior NHIF managers, who would eventually implement the service, determined that collective ownership was critical to the project's success. Through a series of ethnographic activities and design workshops, stakeholders across different organizational departments, external providers, and citizens from different regions came together to provide unique insights into current challenges and future possibilities associated with such a service. Over time, a culture of reciprocity and knowledge exchange developed, which ultimately created a sense of co-ownership in the final service. One of the key project sponsors reflected on their experience with the design process<sup>24</sup>:

*I found that in this way you are able to involve all the stakeholders, and you look at the situation from all the angles... for me, that was the key thing.*  
—Implementer perspective

The strategy that was developed was holistic in that it did not only provide the required changes in communications and messaging toward the informally employed but also covered a more holistic set of required changes. These ranged from institutional reforms for improved service quality by health care providers and the need for new financial models to support more vulnerable groups. Although it was design practices that helped to build bridges and collective ownership across different stakeholder groups, it was the commitment of individual stakeholders that was foundational to the implementation of the strategy's recommendations.

**Design practices can help global health practitioners navigate ambiguity and open deliberative and adaptive spaces for new possibilities to emerge.**



## CONCLUSION

This commentary is an invitation to both designers and public health professionals to join forces more openly and more often to bring together the plurality of expertise within public health and the practical, people-centered, problem-solving approaches of design. For design to genuinely harness interdisciplinary solutions, it requires that practitioners of both design and global health reflect on their respective contributions to the bounded nature of global health programs.

Design will not solve all the problems we are grappling with as a global health community. Where design can contribute is with its convening power and ability to productively bring interdisciplinary teams together toward a common goal. As the articles in this Supplement issue demonstrate, when done well, design can create space for the blending of ideas untethered to narrow communities of practice, academic process, pressures, and tradition. This is an exciting opportunity to expand our definition of knowledge, embrace iteration, and foster collective ownership. Design practices can provide a people-centered framework to make the most of the diverse disciplines and expertise within public health so that they are better able to flourish collectively, creatively, and productively, such that true interdisciplinarity can be harnessed to tackle the toughest global health challenges we face.

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## FIELD ACTION REPORT

# Improving Data Integrity in Public Health: A Case Study of an Outbreak Management System in Nigeria

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## Key Finding

The design of an outbreak management system to automate and streamline data collection and validation at drive-through COVID-19 test centers ensured the fast and efficient data and sample collection and ensured that all data that were collected were accurate and complete.

## Key Implication

Integrating the automated data collection system within the current health information system in Nigeria will help address the challenge of inaccurate, incomplete, and invalid health care data being collected and stored and improve the health system's capacity to respond to public health emergencies, such as COVID-19.

## ABSTRACT

The completeness and accuracy of data in the Nigerian health care system is a challenge. Studies have shown that the data quality, and by extension data integrity, has been suboptimal and thus poses a barrier to strengthening service delivery. This article showcases how the design process sparked the concept for an intervention to improve the integrity of public health data being collected in Nigeria.

In collaboration with the Nigerian Institute of Medical Research (NIMR) and Lifebank, the Co-creation Hub team conducted formative research with the coronavirus disease (COVID-19) test center managers at NIMR. The insights informed the development of the features for an outbreak management system. These features were refined through an iterative process of development and continuous feedback from the end users.

NIMR reported an improvement in its data collection process and data integrity. They reported that (1) almost all data collection by the test center was now automated, thereby minimizing the proportion of inaccurate and repeat entry in comparison to data collected in other parts of the same center; (2) the auto-validation feature of the system ensured that all required fields of a patient's information were completed and verified, thereby ensuring 100% data completeness; and (3) the validation and verification feature ensured that patients' contact information was validated. The integration of this intervention into the current health information system ensures an improvement in the accuracy and validity of health care data being collected and stored.

## BACKGROUND

Studies have shown that one of the most important factors in improving service delivery in health care is the quality of data.<sup>1</sup> Data are a fundamental part of health care delivery and can be used for government planning and resource management and allocation. Therefore, maintaining the integrity of health care data—the accuracy, completeness, and validity of health care data being collected and stored—is integral to quality health care provision.

Over the years, health care facilities in low- and middle-income countries like Nigeria have struggled to maintain complete, accurate, and valid patient data. This challenge can be attributed to factors such as inadequate manpower, lack of technical knowledge, and an increasing volume of patients.<sup>2</sup>

With the coronavirus disease (COVID-19) pandemic rapidly crossing borders and spreading across countries

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and continents, leading to the death of millions of people and hospitalization of more, health systems were overwhelmed across the globe. The novelty of COVID-19 drove an urgency in the process of collecting, assessing, and analyzing all available data to gather insight on the scope and scale of the pandemic while also providing insight into how the disease is spreading and the impact of interventions in place to manage the pandemic. Thus, the need for collecting and maintaining quality data has become even more important.

To support Nigeria's COVID-19 testing capacity, the Nigerian Institute of Medical Research (NIMR) established a drive-through test center<sup>3</sup> in Lagos, Nigeria, to conduct free testing. The test center can process sample collection at a quicker pace, thereby allowing a higher number of cases to be tested daily in addition to other local clinics. The data collected at the test center as well as from other sources were to be evaluated for research and to inform policies for managing the pandemic,<sup>4</sup> therefore, the data had to be of high quality.

In April 2020, Co-creation Hub (CcHUB) embarked on a collaborative research and development project with NIMR and Lifebank, a health care technology and logistics company, to study the test center's data collection system, identify gaps, and find ways to support or strengthen the test center's data collection capacity with the use of design and technology. The team used a human-centered design (HCD) approach to understand the problem and co-create a viable solution to this challenge.

During the past decade, there has been an increasing adoption and integration of design thinking and practices in development initiatives, particularly in global health programming.<sup>5</sup> The Design for Health<sup>6</sup> community—launched by the Bill & Melinda Gates Foundation and the Center for Innovation and Impact in the United States Agency for International Development's (USAID) Bureau for Global Health—defined 3 models by which design methods and mindsets can be applied to developing global health solutions: spark, ingredient, or end-to-end.

In this article, we discuss how we used design as a “spark” of inspiration to reframe the understanding of the existing data-related problems at the test center, develop new ideas and innovations, and push boundaries to think differently.

## ■ USING DESIGN AS THE SPARK

In Nigeria, health care processes have historically been using paper-based systems, and the mindset

around rethinking the use of technology posed a big barrier when thinking about solving problems. COVID-19 presented an unprecedented challenge for data collection and its use in decision making due to the disease's novel nature, the speed and scale of the necessary pandemic response, and the existing data integrity issues. Initially, the center was using a paper-based record system, which raised questions about the data integrity and quality.

The spark of inspiration for Co-creation Hub's collaboration with the Nigerian Institute of Medical Research (NIMR) on improving data integrity came from NimCure, a project conducted in 2018 with NIMR<sup>3</sup> to develop a digital tool to support TB data management and promote adherence to TB therapy.

Research findings showed that individuals were providing inaccurate data on paper forms, leading to the inability to track patients who tested positive for TB. The most troubling example of the TB's system's inefficiency was when 2 patients who had both tested positive for TB could not be contacted with their test results due to inaccurate contact information. These 2 confirmed and contagious TB cases could not be reached either for treatment or for isolation due to poor data collection at the registration point.

This observation inspired the team to further explore the challenges with data collection and management process for TB patients. The team engaged with key stakeholders in the design process, which allowed the value generated to convince the stakeholders to rethink the way they collected data and how to improve that process.

To avoid similar data integrity issues, especially as new patients were recruited for the Nimcure medical trial, the design process was expanded to accommodate a reconstruction of the directly observed treatment center's data collection system, thereby strengthening the integrity of data collected.

This system would later become the basis for first developing digital form at the COVID-19 test center to improve data collection and data integrity and later the outbreak management system to improve sample collection and management.

## ■ OUR DESIGN APPROACH

### Discovery

Beginning in February 2020, during the discovery stage, a team from Co-creation Hub (CcHUB) focused on observing and understanding the initial data collection problems at the drive-through center, as well as framing and reframing the problem given all the information gathered during this

**We discuss how we used design as a “spark” of inspiration to reframe the understanding of the existing data-related problems at the test center, develop new ideas and innovations, and push boundaries to think differently.**

stage. Although the center was using an early format of a digital form, the team identified issues related to lack of prioritization, lack of accountability, a lack of direct consequence for inaccurate data, and misinterpretation of existing data. Additionally, because of a lack of quality control and limited workforces, the data integrity issues were amplified in dealing with the pandemic.

By starting with understanding what we did not know at the test center and what existing knowledge we had based on our experience with NimCure,<sup>7</sup> we could reframe the problem around data integrity issues and ask whether these issues could be addressed by improving the initial digital form so that it enforced data entry compliance and quality control and providing a feedback mechanism

so health care workers could understand the importance of quality data.

### Data Collection

In March and April 2020, our research and observations showed that the most prominent data integrity issues at the test center were accuracy, validity, and completeness (Table 1).<sup>8</sup> These elements of data integrity became the primary indicators for measuring the success of the intervention. Interviews with NIMR personnel and review of the test center's historic data helped to identify some specific instances of data integrity issues such as missing, incomplete, or inaccurate data. In some cases, inaccurate data, such as wrong addresses and phone numbers, were entered. In cases in which the addresses and phone numbers

**TABLE 1.** Co-Creation Hub Research and Observations Conducted at Nigerian Institute of Medical Research on Data Collection and Data Integrity

Method	When	How	Outcome
Guided tour and observation	February 2020 Before the first solution	The NIMR team led 2 members of the CcHUB team on a guided tour of the facility, and their entire data collection process was observed.	Identification of gaps and inconsistencies with the data collection and management process.
Secondary research	February 2020 At the inception of the new identified challenge (Improving the integrity of data collected)	The team explored recent publications, news articles, and case studies that focused on health care data management to identify some common challenges, approaches, and theories.	An understanding of the most important elements of data integrity in health care.
Observation	March 2020 During and after the secondary research	The team (CcHUB and Lifebank) spent more time at the NIMR facility to explore their data collection and management process.	Identification of other inconsistencies with the data collection and management process.
Process mapping	April 2020 Before the drive-through COVID-19 test center	A co-creation session was held with the NIMR team to brainstorm on developing the process of operation for the drive-through COVID-19 test center that was to be based within the NIMR facility.	Process flow of the operations of the test center.
Co-creation sessions	April 2020 Before the drive-through COVID-19 test center	A series of subsequent co-creation sessions were held with members of both the NIMR and Lifebank administrative team. There were 5 virtual brainstorming sessions where participants co-created potential ideas for how to automate the process of the operation at the COVID-19 test center.	Up to 20 automation feature ideas that addressed data quality, crowd management, ease of communication, and many other administrative issues.
Survey and behavioral study	August-September 2020 After the launch of the COVID-19 test center and the digital system	The team conducted behavioral research in April to provide guidance for health administrators and policy makers on the factors that enhance the effective utilization of structures and platforms for service delivery. The study included 566 patients who had been invited for a COVID-19 test through the digital platform.	Unpublished data The findings also contributed to further development of the solution.

Abbreviations: CcHUB, Co-creation Hub; COVID-19, coronavirus disease; NIMR, Nigerian Institute of Medical Research.



were correct, there were an overwhelming number of inconsistencies in the format in which they were stored.

We conducted secondary research and a literature review to gather information on the characteristics of data integrity, how they apply to health care data, and the history of data integrity issues in health care. We aimed to identify whether these characteristics and issues applied to the test center's data collection system and if measures were in place to strengthen data collection where it was weak (Table 2).

## Design

In April 2020, we used the insights gathered from the discovery stage, found themes in the data, and used co-creation workshops together with stakeholders to design a solution that is relevant, applicable, and sustainable.

The Co-creation Hub's NimCure experience encouraged the team to use the HCD approach to engage key stakeholders early in the co-creation process for an outbreak management system (Table 3).

The engagement of the relevant stakeholders early in the design process contributed to increased equity, sustainability, and long-term impact by ensuring there is a strong buy-in and ownership from key stakeholders, especially the patients, public health facilities, and government institutions. An HCD approach puts the end users at the center of the process and solution. Engaging stakeholders allowed an easy entry point to apply the NimCure model to COVID-19 test center,

which is usually a difficult step in the process. The design process was the spark that allowed the ecosystem players to use design and technology to find solutions during the COVID-19 pandemic.

The team at NIMR was engaged through a series of virtual co-creation sessions to brainstorm ideas on how to maximize the efficiency of the test center and ensure data integrity. Co-creation workshops also were held with a mix of the stakeholders to allow for diverse perspectives when deep diving into the problem that exists and potential solutions for it. In addition, each idea was run through storyboarding exercises that allowed for evaluation of the idea according to design principles, desirability, feasibility, and viability. These sessions allowed for various tweaks on the technology so that the different layers in the solution were deeply thought about, linked, and improved on. The entire journey from testing to reporting test results and allowing for tracing was thought about as an entire experience rather than parts in a silo.

Identifying the specific data integrity problems that existed at the test center sparked the design process to improve the digital form for registering patients before getting tested to ensure that only accurate, valid, and complete data were collected by including key features such as repeat or related-case flagging, phone number verification, and address validation. Additionally, the experience of the successful implementation of the digital form for NimCure allowed stakeholders to easily see and understand the need for data integrity and automated data collection.

**The engagement of the relevant stakeholders early in the design process contributed to increased equity, sustainability, and long-term impact by ensuring there is a strong buy-in and ownership from key stakeholders.**

**TABLE 2.** Characteristics of Data Integrity Considered as They Relate to the NIMR COVID-19 Test Center

Characteristics	Definition
Completeness	Completeness refers to the availability of all relevant and required information. For example, a patient's first and last name and address are required, but the middle initial and state or origin are optional. Data can be complete even if optional data are missing.
Accuracy	The degree to which data correctly describes the real world object or event being described. In the case of TB cases, the phone numbers provided did not reflect the patients' phone numbers in the real world and as such were not accurate.
Timeliness	Timeliness considers how up-to-date the information is and how well it can be used for real-time reporting. The need to still transcribe data collected on paper forms at the point of registration creates a delay in real-time reporting.
Validity	Validity measures whether a value conforms to a preset standard, format, or syntax. Patient information like gender, weight, test results, etc. can easily be recorded with the wrong syntax. For example, recording weight in tons as opposed to pounds.
Uniqueness	Uniqueness is a measure of duplication of items in a data set. This measures how often 1 or more patients have had their data duplicated and listed as a separate entity.
Security	The protection of a patient's data against unauthorized access or corruption is necessary to ensure data integrity. Specific patient data like test results and first line addresses are critical and need to be protected from unauthorized access.

**TABLE 3.** Relevant Stakeholders Engaged in the Human-Centered Design Approach of a Digital System in Nigeria

Stakeholder	
Patients	This included any suspected or high-risk persons who may be experiencing symptoms of the virus or may have been in contact with confirmed or probable cases and want to get tested or are required to get tested.
Health Facilities and Test Center Administrators	These were either specialized COVID-19 test centers or general health care facilities that have the capacity to run a significantly high number of tests daily to receive insights from other health care administrators that may benefit the solution focused on COVID-19. A key stakeholder in this category is NIMR, and in the case of this project, they provide all the necessary testing tools and infrastructure required to run the drive-through test center. NIMR personnel also served as the center administrators and lab managers. The role of the center administrators was to manage the drive-through system and oversee the collection of test samples. The lab managers were NIMR scientists responsible for running the tests, validating, and reporting results to the relevant authorities.
Lifebank	Health care technology and logistics company that is known for applying technology in solving health care problems. Lifebank took on the role of digital platform administrators and managed activities such as contacting patients, sending invites, while also supervising the use of the platform by other stakeholders (NIMR and patients) during the design process. As delivery partners for the test center, it was essential to engage NIMR and Lifebank teams in the design process, particularly in brainstorming sessions and product testing to encourage their buy-in and drive equity.
Government Institutions and Policy Makers	Timely and accurate data is critical in aiding government institutions better make strategic and timely decisions regarding the pandemic. The NCDC is the country's public health institute responsible for the preparedness, detection, and response to infectious disease outbreaks and public health emergencies. As Nigeria's foremost public health institute, data on all tests conducted daily were reported to NCDC representatives on the ground. Insights gathered from this data helped to coordinate national public health responses and policy making. The NCDC personnel were indirectly engaged through our partnership with NIMR to understand the most important data types and formats to them.
The Research Community and the General Public	The importance of accurate, complete, and timely data for research in public health cannot be underestimated as the insight gathered by the research community contributes to the body of knowledge available for the general public and policy makers. The system strengthens the integrity of data collected and analyzed by researchers which will, in turn, ensure accurate insights and better understanding and management of the pandemic.

Abbreviations: COVID-19, coronavirus disease; NCDC, Nigeria Center for Disease Control; NIMR, Nigerian Institute of Medical Research.

**By automating and streamlining data collection, the outbreak management system makes it easier and faster to manage data.**

The result of these design sessions inspired the idea for the NIMR staff to allow automated digital data collection and testing sample management at the drive-through center. This center became the first test center in Lagos state with automated data collection. The COVID-19 drive-through test center was unique from the NimCure TB directly observed treatment center because during the pandemic more patients took the initiative to get tested compared to the patients being referred to the test center by primary health care physicians. With COVID-19 being a highly contagious disease, there was an urgency in communicating the test results, and all test results had to be shared with the Nigerian Center for Disease Control daily.

## ■ THE OUTBREAK MANAGEMENT SYSTEM

The design approach inspired the deployment of an automated data collection and management system based on the one used for NimCure for TB management. Through the engagement of all the relevant stakeholders during multiple rounds of iteration, this simple solution evolved into a

practical digitized data management system that promotes data integrity and helps test centers more efficiently manage data.

**Unique value proposition:** By automating and streamlining data collection, the outbreak management system makes it easier and faster to manage data. The system retrieves information on demography, symptoms, pre-existing conditions, recent contact, and travel history to identify and triage high-risk cases that require testing. Some of the system's key features are described here.

1. **Case reporting form:** People who think that they might have the virus and want to get tested can communicate their symptoms and request to be tested by completing an online digital form. Prospective patients submit the form to allow necessary information to be gathered faster and recorded more accurately.
2. **Triaging/eligibility indication:** The system automates the screening and triaging process based on the Nigerian Center for Disease Control case criteria to ensure that test centers' capacity and resources are directed first toward cases with the highest risk level.

Screenshot of case reporting digital form co-created with Co-creation Hub and Lifebank in collaboration with the Nigerian Institute of Medical Research for the COVID-19 drive-through test center.

3. **Phone number verification:** This feature runs every phone number submitted on the platform through a nationwide database to confirm existence and validity.
4. **Address validation:** Using Google maps application programming interface, the system can validate every address provided to confirm that they indeed exist on the map.
5. **Access control:** The classification of users with specific privileges helps maintain data protection by ensuring data can only be accessed and modified by appropriate and qualified users.
6. **Privacy:** A unique identification code ensures the privacy of patients' data.
7. **Contact tracing data:** The system collects a list of persons that each case may have been in recent contact with in the past to understand how the individual contracted the virus as well as who they may have been in contact with since the possible contracting point. These data are collected to support contact tracing for positive patients.

8. **Duplicate entry restriction:** Repeat or duplicate entries are detected and restricted based on name, phone number, email, and date of birth. This helps to ensure that all submissions are unique to a specific individual and that patients cannot make multiple submissions.

Other features that were included during iteration were: test invitations, appointment scheduling, and result reporting.

## RESULTS

In August 2020, the outbreak management system was tested with NIMR. By December 2020, the system had processed more than 30,000 reports with more than 75% of these reports considered eligible for testing based on their symptoms. With the use of this system, the test center has reported it is easier to collect and verify data, send appointment invitations to come to the center at a specific time, and report results, as well as faster to conduct center administrative processes.

According to NIMR, the system has significantly improved the quality of and use of the data collected through the test center, which is helping address the issue of data integrity. They have recorded improvements in confidentiality, completeness, accuracy, consistency, validity, and security of all data related to COVID-19 tests at the drive-through test center (Table 4).

The success of the system at the NIMR drive-through center has also inspired the automation of processes for other test centers around the country using HCD. The process was applied to engage stakeholders in other locations to deploy the solution for different test centers based on their mode of operation.

**Simple Testing with Lagos University Teaching Hospital:** The success of automating the drive-through test center inspired the automation of the Lagos University Teaching Hospital walk-in COVID-19 test center, which launched September 2020.

**Self-Testing with Lifebank:** The outbreak management system has also inspired the development of a self-testing kit. This version of the system enables the assignment of cases to select delivery persons who then deliver marked test kits to the patient's address. In addition, the features also enable the management of a chain of laboratories and test centers by assigning test samples to them, receiving results, and sending them to patients.

**Surveillance Visits with Ondo State COVID-19 Rapid Response Center:** Similar to the self-testing framework, new COVID-19

cases are assigned to surveillance experts who then visit the patients to confirm, record symptoms, and collect test samples. The system is currently being used to manage the center's data collection, transfer, and other administrative processes from reporting via call centers to laboratory management.

## ■ LESSONS LEARNED

### Engaging Stakeholders Facilitates Adoption and Diffusion of the System

The adoption of this system by the stakeholders has evolved from the early stage with the management of TB patients to COVID-19 testing. In many health facilities in Nigeria, paper records and forms are used to collect and store patient data, and the introduction of the digital form took a bit of adjustment. However, one strategic decision that was made to hasten the diffusion and adoption process was the intense engagement of stakeholders in the design process. As mentioned earlier, representatives of each stakeholder group were part of the co-creation sessions and were able to collectively design features that added more value for each group, thereby making the platform beneficial for them. Also, co-creating with the end users, the NIMR and Lifebank teams contributed to increasing equity and buy-in on the importance of proper usage of the platform. After deploying the solution, we conducted some training sessions to

**TABLE 4.** Early Results of Using the Digital System on Data Integrity in Lagos, Nigeria

Characteristics	Feature	Result
Completeness and consistency	Form validation	The platform has been able to achieve 100% completeness on all required fields.
Accuracy	Address validation	91% of all addresses (location) entered on the platform were validated. They all contain the state, local government area, and area details; and can be located on Google maps.
	Phone number validation and SMS communications	The platform was able to validate and verify 100% of all phone numbers.
Security and privacy	Strict access control	The platform has strict user access levels that allow us to ensure that only physicians and lab managers have access to test results.
	Data anonymization	To protect the patient's privacy, their data are anonymized for users who do not require them. For example, those who run tests and upload results do not have access to the patients' personal information.
Timeliness	Real-time data collection and delivery	All data collected are made available on the dashboard in real-time with no delays.
Validity	Duplicate entries restriction	At the launch of the system, the platform received 75% unique submissions. However, after introducing the duplicate entry restriction feature in April 2020, this improved to 79% and by June 2020, we had up to 99% unique submissions.



onboard the test center administrators and lab managers to the system and familiarize them with it.

## Lack of Research and Development Funding Can Hinder Innovation

A lack of ongoing research and development funds can make it quite difficult for organizations to expeditiously take on research and development projects that could lead to innovative products. The development of the outbreak management system was possible because of a pre-existing relationship between the research facility and CcHub that had been formed to build innovation through technology. This meant that both parties had to source the funds to support the project on their own.

## The Need for Scale

The goal of the outbreak management system in helping to maintain the integrity of the data collected at test centers is part of a bigger plan to consistently ensure that all distributed health care data points locally and regionally collect accurate, complete, and valid data. This gives rise to a need for scaling the product to as many facilities in as little time as possible.

## CONCLUSION

Ensuring integrity in health care data is imperative. The use of an outbreak management system to automate and streamline data collection and administrative processes in a COVID-19 test center in Nigeria proved to improve the integrity of data collected. Our experience shows that constant stakeholder engagement contributed to better adoption, a solution designed to ensure that

data collected were complete and accurate, and inspiring the development of similar solutions.

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**Competing interests:** None declared.

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## FIELD ACTION REPORT

# Using Human-Centered Design to Develop a Program to Engage South African Men Living With HIV in Care and Treatment

Cal Bruns<sup>a</sup>

### Key Findings

- HCD's structured, collaborative problem-solving process inspired the partners and allowed integration with multiple research methodologies. HCD excited seasoned HIV prevention and treatment veterans in the project's advisory group. The segmentation of at-risk male archetypes allowed men's attitudes, behaviors, and challenges to be seen through a human lens and informed HCD co-creation problem statements.
- HCD, paired with qualitative elicitation methods, allowed a deeper empathy with at-risk men and health professionals, ensuring the design of prototypes that addressed specific needs of men were desirable for them, as well as being feasible and viable for implementers.
- By integrating South African organizations, the Department of Health, and other funders into a project conceived with design thinking as an ingredient, our co-created innovations were primed for program integration and rapid scale-up with ongoing improvement through iteration.

### Key Implications

Program managers and policy makers should consider using HCD approaches when designing or preparing to scale up interventions. In addition to informing program design, the implementation of HCD will foster stakeholder empathy, trust, and program "ownership" that will optimize acceptability, effectiveness, and sustainability of the intervention.

### ABSTRACT

**Background:** Although HIV care is widely available in South Africa, men are less likely than women to know their HIV status, begin treatment upon diagnosis, and adhere to treatment. Men are also more likely to die from causes related to HIV compared to women. To overcome this inequity, tailored approaches designed with men's specific needs are required.

**Methods:** As part of the Testing and Treatment for Men project, a 3-year multicomponent, mixed-methods study that aimed to better understand young South African men's needs concerning HIV testing and treatment, we used human-centered design (HCD) methods to identify, develop, and pilot test a male-friendly peer-support intervention. We engaged key stakeholders in the development of several prototype interventions to improve men's engagement across the HIV cascade, one of which was selected for further development.

**Results:** Use of HCD methods, informed by the results of our team's prior qualitative and quantitative research, led to the development of Coach Mpilo, a peer-support intervention to engage and retain men living with HIV in South Africa in care and treatment. By designing with empathy for the lived experiences of these men, our intervention achieved the authenticity and credibility required to build trusting relationships in the affected communities. Preliminary results of Coach Mpilo have demonstrated a high level of acceptability by men living with HIV as well as key government and other implementing partners.

**Conclusion:** HCD as a critical ingredient became an integral and essential component in developing and field-testing the Coach Mpilo pilot. The key elements of our HCD approach that resulted in the successful generation of the Coach Mpilo pilot intervention and its implementation were understanding and addressing the specific issues identified by men living with HIV and leveraging newly created empathy with men as an approach to solving the issues collaboratively and innovatively.

### BACKGROUND

Despite improvements in the availability of HIV testing, care, and treatment programs across sub-Saharan Africa, men's engagement across the HIV cascade is suboptimal.<sup>1-7</sup> In South Africa, of the estimated 7.5 million adults (15 years and older) living with HIV in 2020, approximately 36% were adult men.<sup>8</sup> Compared to their female counterparts, South African men are less likely to know their HIV status, begin treatment upon

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diagnosis, or adhere to treatment.<sup>6–8</sup> Consequently, South African men living with HIV are more likely to die of AIDS-related causes.<sup>9,10</sup> To reach the global UNAIDS fast-track targets of 95-95-95 by the end of 2030—whereby 95% of people living with HIV know their status, 95% of those who know they are positive are on antiretroviral therapy (ART), and 95% of those on ART are virally suppressed—<sup>11</sup> it is imperative that men are better engaged across the HIV care cascade. Effective strategies are needed to identify, engage, and retain men living with HIV in care to improve their health and to prevent ongoing transmission to their partners.

With funding from the Bill & Melinda Gates Foundation, our consortium, including members with expertise in population health research and evaluation (Population Services International and Ipsos) and program design (Matchboxology), implemented Testing and Treatment for Men (TTM), a 3-year project aiming to increase uptake of HIV testing services by young South African men at high risk of acquiring HIV as well as initiation of ART for those newly diagnosed and those who had dropped out of care. A mixed-methods approach was used to understand men's decisions and behaviors related to HIV testing, prevention, and treatment and to identify different segments of young men to enable better-tailored interventions. A human-centered design (HCD) approach was used to explore strategies for reaching each segment with HIV prevention, testing, and treatment services more effectively.

HCD is a dynamic approach that engages end-users and key stakeholders to develop tailored, usable products, programs, or systems.<sup>12–14</sup> For the past decade, there has been increasing adoption and integration of HCD practices in development initiatives, particularly in global health programming.<sup>15,16</sup> Recently, the *Design for Health* community—launched by the Bill & Melinda Gates Foundation and the Center for Innovation and Impact in the U.S. Agency for International Development's (USAID) Bureau for Global Health—have defined the following 3 models by which design methods and mindsets can be applied in the development of global health solutions.

1. **Spark:** As a **spark**, design is used as an inspiration method to reframe the understanding of existing problems to make way for innovations. This might occur during structured brainstorming sessions focused on a clearly defined challenge to encourage teams to bring new ideas to the table.

2. As an **ingredient**, design can be used to improve an existing product or service by conducting rapid research to better understand the improvements needed and conducting a series of “trial and error” testing sessions to determine which ideas should be incorporated to improve the user experience of the existing product or service.
3. Using design in an **end-to-end** approach requires full adoption of design thinking and methods throughout solution development processes including conducting design research to reveal new user insights relevant to the challenge or need, codesigning solutions in partnership with key stakeholders, gathering feedback through prototyping and testing of ideas, and continued testing and refinement of the idea throughout implementation.

In this Supplemental issue of *Global Health: Science and Practice*, each case study will demonstrate the ways design was used either as a spark, ingredient, or an end-to-end approach to drive innovative ways of addressing complex global health challenges. In this article, we describe the process of using a design thinking approach as a critical ingredient for developing prototype interventions, followed by the selection of and pilot testing Coach Mpilo, a peer-support intervention designed to increase uptake of HIV testing, prevention, and linkage to care and treatment among young men in South Africa.

## METHODS

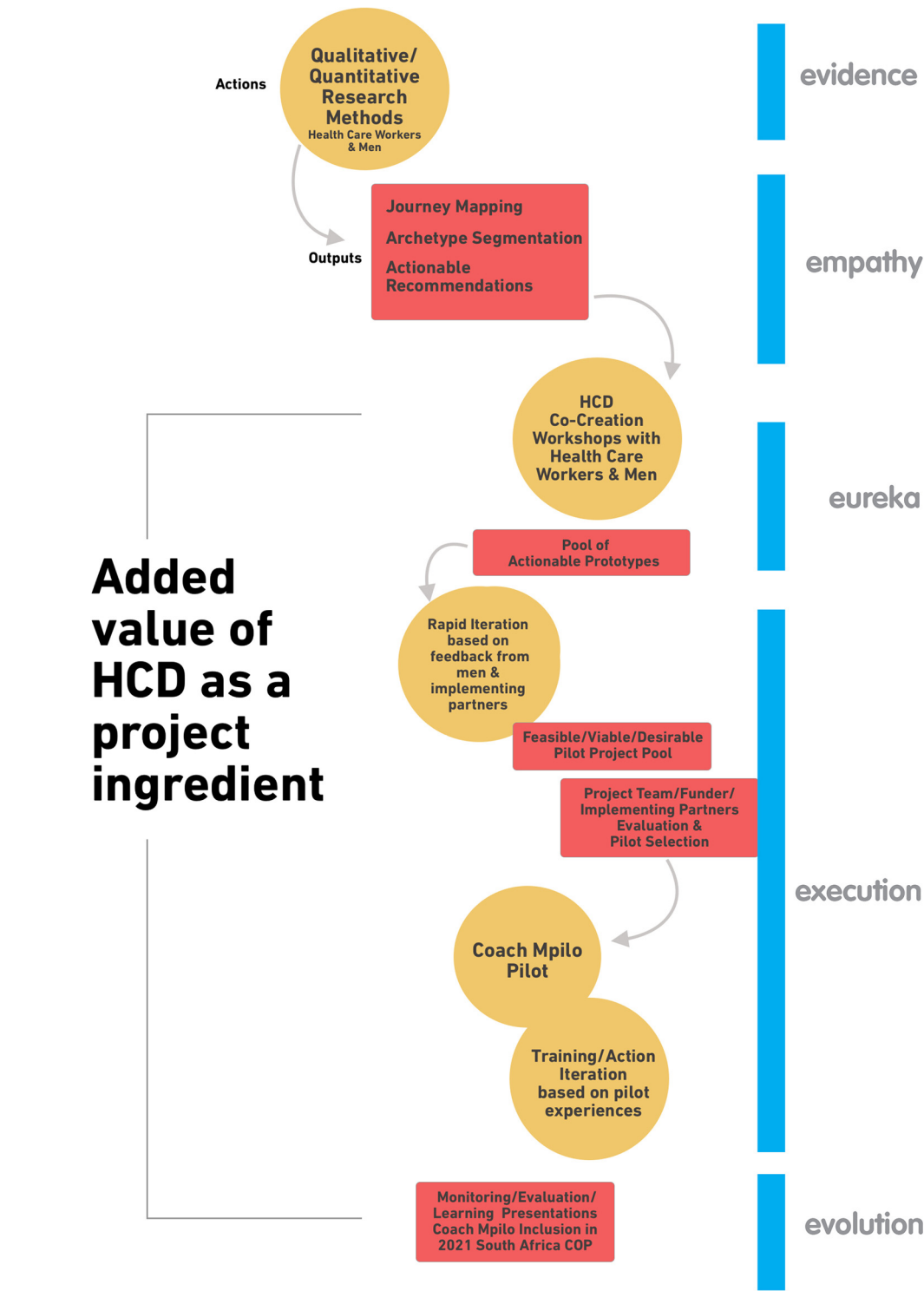
The TTM project was conducted in 3 districts in South Africa with high HIV prevalence—Ehlanzeni and Gert Sibande (Mpumalanga Province) and Ugu (KwaZulu-Natal Province). We used an HCD approach to develop prototypes of interventions to achieve the aims of the TTM (i.e., increase HIV testing and uptake of ART among men who were newly diagnosed with HIV or who had previously dropped out of care). The design process was informed by input from an advisory group, as well as results from qualitative and quantitative studies led by members of our consortium. The design process was iterative (Figure 1). We briefly describe the components of the project.

### Advisory Group Consultation

Advisory group (AG) members comprised national, provincial, and district Department of Health officials; national and local implementing partners; HIV-focused funders; representatives of normative bodies including the World Health Organization and UNAIDS; and civil society organizations. We

**A human-centered design approach was used to explore strategies for reaching each segment with HIV prevention, testing, and treatment services more effectively.**

**FIGURE 1.** Human-Centered Design Process Used to Develop Prototypes of Interventions to Increase HIV Testing and Update of Antiretroviral Therapy Among Men





began with a “learning and listening workshop” augmented with one-on-one meetings with selected members. These were highly interactive opportunities to: (1) share learnings from previous successes and failures, (2) understand what AG members defined to be relevant academic or practical evidence based on lived experiences working with men, and (3) explore each participating organization’s barriers, attitudes, motivations, and deliverables. Members were formally engaged at key design decision milestones across the project timeline.

Qualitative Data Collection

We recruited and enrolled health care providers and HIV-positive and HIV-negative men aged 25–34 years in high-HIV prevalence districts in Mpumalanga and KwaZulu-Natal Provinces to participate in qualitative data collection activities, including full-day ethnographic shadowing with men (n=18) and health care providers (n=4), as well as in-depth interviews with men (n=58) and health care providers (n=64). Ethnographic shadowing involved following and observing participants during their usual routines and asking them to interpret actions through informal interviews. All ethnographic work was conducted by male interviewers in the respondents’ home languages.

Quantitative Data Collection

Details of the methods used have been previously presented.<sup>17</sup> In brief, between October 2018 and

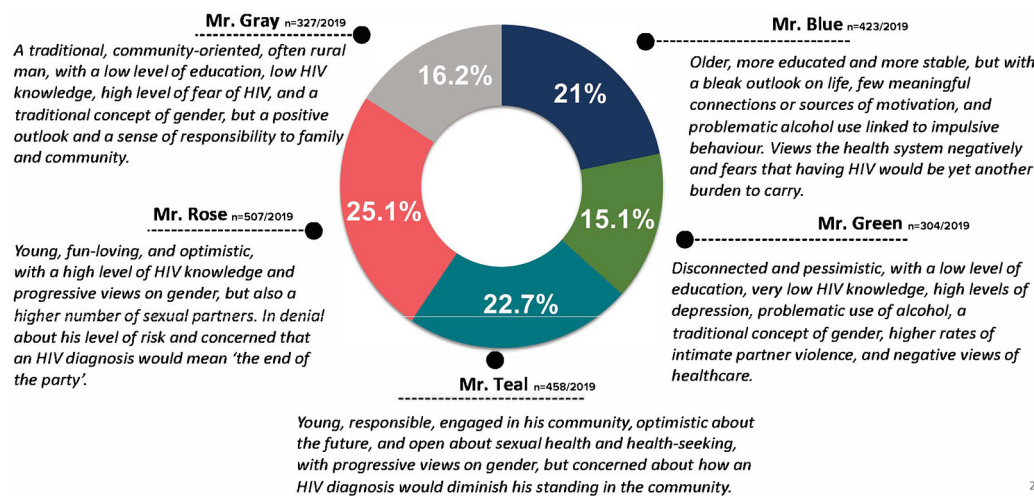
January 2019, a cross-sectional study was conducted in 8 district municipalities in Mpumalanga and KwaZulu-Natal Provinces including from 2,019 Black African men aged 20–34 years with less than a university-level education. Participants completed a survey of demographic characteristics, sexual behavior, engagement with HIV testing and treatment services, alcohol use, HIV knowledge, mental health, and attitudes to gender equity. The study was informed by the Theoretical Domain Framework<sup>18</sup> and analyzed following a protocol described by Sgaier et al.<sup>19</sup>

Prototype Design

The results of the qualitative and quantitative studies were presented to the core group of partners and funders in February 2019, when data were synthesized to produce descriptions of each segment that incorporated the salient characteristics and attitudes, beliefs, and behaviors related to HIV testing and treatment (Figure 2). Based on insights from the segmentation, actionable prototype interventions were generated by core team members through the use of various HCD methods,<sup>13</sup> including brainstorming, “how might we” questions, role-play, visualization, theme identification, and exercises (Table 1).

Three 3-day residential workshops were held (1 in Nelspruit, Mpumalanga, and 2 in Durban, KwaZulu-Natal), each including up to 32 participants representing a diverse mix of stakeholders

FIGURE 2. Characteristics of Male Archetypes Used in Segments That Incorporate Infection Attitudes, Beliefs, and Behaviors Related to HIV Testing and Treatment



**TABLE 1.** HCD Activities to Support the Co-design of Program Prototypes

Activity	Participants	Description	Contribution to Program Design
<b>Engage with AG</b>	National, provincial, and district DOH officials National and local implementing partners HIV-focused funders Local experts	Learning and listening workshop augmented with one-on-one meetings with selected members	<ul style="list-style-type: none"> <li>– Learnings shared from previous successes and failures</li> <li>– Understand what AG members defined to be relevant academic or practical evidence based on lived experiences working with men</li> <li>– Explore each participating organization's barriers, attitudes, motivations, and deliverables</li> <li>– The AG served as an expert resource with strategic checkpoints to change direction in real-time</li> </ul>
<b>Video ethnography</b>	n=18 men; n=4 HCWs	1-day video "follow-alongs" in communities	Increased empathy for men's self-reported interactions with community members and the health care system
<b>IDIs</b>	n=58 men; n=64 HCWs	2-hour IDIs in high HIV risk, hard-to-reach communities Journey mapping, a technique visualizing the health-seeking journey of at-risk men to deepen empathy and inform problem solving	<ul style="list-style-type: none"> <li>– Provided men space and time to express feelings and insecurities that informed qualitative survey design</li> <li>– Highlighted logistical and emotional challenges of at-risk men in South Africa, drawing attention to friction points and barriers for confirmation via QS</li> </ul>
<b>Quantitative surveys</b>	N=2,000 men aged 25–34 years; high school education or less	1-hour tablet-based surveys with random sample of men across 5 districts in KwaZulu-Natal and 3 districts in Mpumalanga	Generated statistically significant data points for robust segmentation analysis
<b>Segmentation of men</b>		Cluster analysis via modeling, options evaluation, and profiling based on solutions	Generated 5 distinct segments of men who gave new insights to seasoned implementers, informed problem statements and recruitment into co-creation process
<b>How might we? challenges</b>	n=32 workshop participants x 3 workshops	6 "How might we?" questions: A positive, actionable question that frames the challenge—a prompt used in co-creation workshops to focus participants on a specific topic and generate ideas	6 "How Might We?" focused brainstorming to solve very specific, granular issues facing 2 prioritized segments deemed most likely to produce the greatest impact across all 5 segments of men Generated ideas for strategies that would be responsive to the needs of 2 prioritized segments deemed most likely to produce the greatest impact across all 5 segments of men
<b>Role playing</b>	3 professional actors	5 monologues informed by segmentation and performed by professional actors from high-risk communities for overseas-based team members and advisory group	Significantly enhanced understanding of nuanced differences between 5 segments and helped inform the decision to focus prototyping on 2 specific segments of men
<b>Experience design</b>	32 workshop participants x 3 workshops	Focusing on the range of different health care access and service delivery touch points to reveal key gaps in quality service delivery that might otherwise fall through the cracks	Bringing together men, HCW from clinics, and district DOH staff as equal partners to design, rethink assumptions, perceive impossibilities, and unlock new ideas
<b>Co-creation prototyping</b>	n=32 workshop participants x 3 workshops; participants consisted of men from 2 segments (recruited using an Ipsos-generated typing tool), HCWs, and DOH staff Field testing storyboarded prototypes	Co-designing a variety and range of tangible engagement actions with users and implementers via storyboarding, which are believed to solve a specific "How might we?" challenge	Produced 20 diverse prototype concepts which were refined to 15 simple-to-understand men's engagement and service design proposals shared with men in communities and implementation partners for further evaluation

*Continued*

TABLE 1. Continued

Activity	Participants	Description	Contribution to Program Design
Rapid prototype feedback and iteration		15 visualizations of new service designs and engagement initiatives were shared with a random sample of men across the project recruitment communities	Informed iterative design alterations to several of the prototypes, including changing the name of the coaches to <i>Coach Mpilo</i>
Prototype evaluation/prioritization		Prioritization ranking analysis based on 4 criteria: feasible/viable/desirable/speed to results	4 prototypes emerged as pilot finalists; <i>Coach Mpilo</i> selected as the first fielded pilot

Abbreviations: AG, advisory group; DOH, Department of Health; HCD, human-centered design; IDI, in-depth interviews.

including male community participants, nurses, community leaders, and representatives from the provincial departments of health and implementing partners. Community participants were recruited by study staff members using a segmentation screening tool, developed by Ipsos, for “Mr. Green” and “Mr. Rose” types (Figure 2); potential participants were screened in short one-on-one interviews to ensure candidates had the capacity to express opinions and ideas within a workshop setting. Local clinic nurses and community leaders, district and provincial department of health officials, and AG members were also invited to participate in these workshops. Activities were organized around Matchboxology’s e5 HCD process (Figure 3), designing and calibrating solutions that are responsive to the needs of the end-user and focused on addressing the various challenges that emerged in qualitative interviews with men representing the archetypes represented by “Mr. Green” and “Mr. Rose” (Figure 2).

## RESULTS

### Qualitative and Quantitative Studies

Qualitative research revealed several key barriers and challenges, most significantly that: men are afraid, not stubborn or indifferent; they have no one they trust or feel safe to talk to; they associate HIV testing and treatment initiation with loss, not gain; and they anticipate a negative experience in the clinic and by others following disclosure of their HIV status. The quantitative segmentation study produced 5 subgroups or segments of men, based on their attitudes, beliefs, behaviors, and needs related to HIV testing and treatment (described in depth in Bell et al).<sup>17</sup>

### PROTOTYPE DESIGN ACTIVITIES

The AG recommended further development of prototype interventions focused on 2 of the 5 segments

that were deemed the largest and most challenging: “Mr. Green” and “Mr. Rose” (Figure 2).

Workshop participants generated more than 20 solution concepts, converging on 4 broad themes that revealed the following needs:

- “Flip the script” on ART: HIV treatment can trigger negative emotional responses. We need to change those so that men can feel good about being on treatment. Example: Move from a daily reminder that “I’ve lost control” to a daily reminder that “I’m in charge.”
- Make HIV a collective challenge: Many men feel that having HIV is treated as a personal failure rather than a public health problem and that they are blamed and shamed rather than being supported. In reality, the strongest predictor of a man’s HIV risk is not his behavior but where he lives. HIV isn’t a personal failure, it’s a community challenge.
- Help men feel they are not alone. Treatment leaves many men feeling alone, afraid, and ashamed. Many men feel there can be no good life after an HIV diagnosis. But men also said they could accept advice and support from a man who is living with HIV and doing well.
- Make the clinic a more familiar and welcoming space.

In selecting among possible solutions to pilot, we selected Coach Mpilo (Mpilo means health in Zulu and is a play on the English word pill), as it responded to all of these identified needs. The prototype was fully developed in collaboration with men and other stakeholders. Details of the program may be found elsewhere.<sup>20</sup> In brief, Coach Mpilo is a peer-support model that recruits and employs men living with HIV who are stable on ART as coaches of newly diagnosed men and men lost to follow-up (Figure 4). It was designed to resonate with men in several ways including

**Qualitative research revealed several key barriers and challenges such as men feel they have no one they trust or feel safe to talk to and they associate HIV testing and treatment initiation with loss, not gain.**

FIGURE 3. Matchboxology's 5-Step Human-Centered Design Process

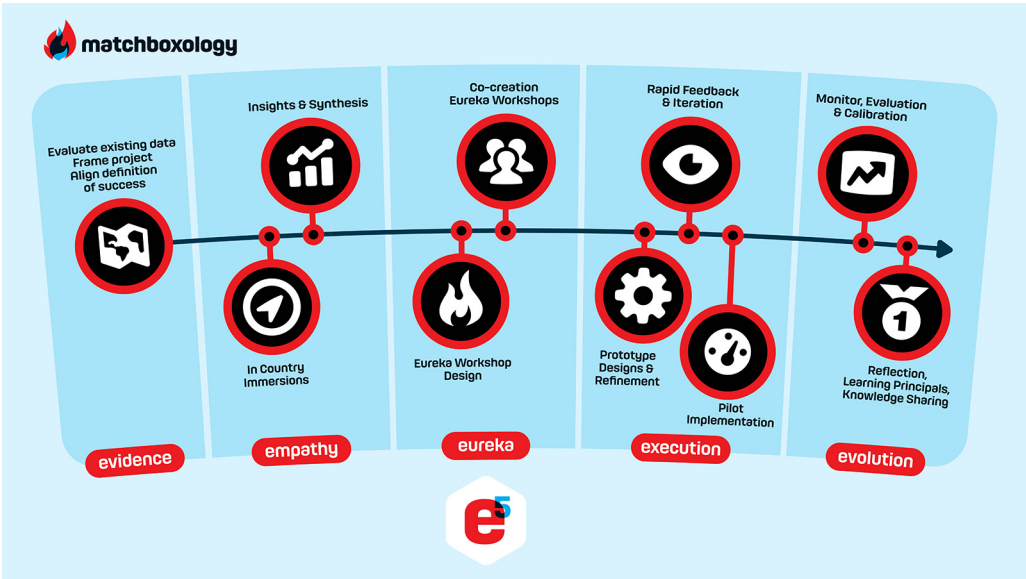
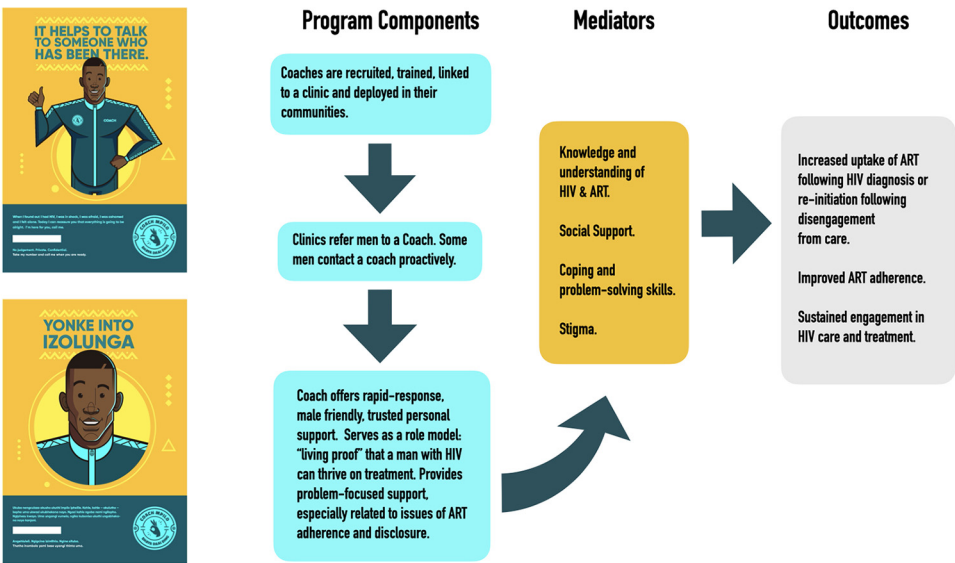


FIGURE 4. Coach Mpilo Program Conceptual Framework



Abbreviation: ART, antiretroviral therapy.

breaking the isolation and paralysis that many men feel at diagnosis, giving men someone they can relate to and feel safe talking to, giving men “living proof” that a man can have HIV and live a

normal life, supporting men to reimagine a positive future, and helping the coaches to reframe and reclaim their own identities. In addition to supporting men living with HIV to stay engaged



**TABLE 2.** Additional Key Benefits Leveraged by *Coach Mpilo*

<b>Rapid response</b>	Coaches can be recruited in any community, trained in 4 days, and immediately deployed.
<b>Low cost</b>	Coaches are paid a modest salary and a transport/data stipend, and otherwise require minimal infrastructure or support.
<b>Relieving pressure on clinic staff</b>	Clinic staff can refer challenging cases to a coach.
<b>Stigma reduction</b>	Stigma is reduced among family and community members by providing living proof that a man with HIV can thrive on treatment.
<b>Leveraging the power of peer outreach</b>	Peer-outreach programs have been used in key populations programs for many years.
<b>Putting men living with HIV at the forefront of the response</b>	“Nothing about us without us.”

in care and treatment, Coach Mpilo was also designed to leverage other key benefits (Table 2). Figure 4 provides an overview of the Coach Mpilo intervention and how it is designed to work.

Since March 2020, the Coach Mpilo program has been implemented in Ehlanzeni and Gert Sibande Districts, Mpumalanga Province, and Ugu District, KwaZulu-Natal Province and has employed 120 coaches and reached over 3,700 men living with HIV. Preliminary data indicate that more than 90% of men are linked or returned to care within the first month of support and remain on treatment thereafter. HCD-driven piloting and rapid field iteration allowed course corrections to tailor the final prototype. The program has been met with a high level of acceptability by men, as well as key government, implementing, and funding partners. Coach Mpilo has been integrated by 4 implementing partners—Anova Health Institute, Aurum Institute, Centre for Communication Impact, and Wits Reproductive Health and HIV Institute—into current programming. Coach Mpilo has now been included in USAID’s 2021 country operating plan.

## ■ DISCUSSION

By integrating HCD principles as a key ingredient during the development, implementation, and evaluation of the Coach Mpilo pilot program, we found that an HCD approach ensured empathy in understanding how men living with HIV in South Africa experience the world and keeping them at the center of problem statements and engagement design processes. This depth of empathy also empowered decision makers in making informed decisions that would achieve better outcomes and allowed for robust, rapid evaluations of prototypes that emerged from the HCD methodologies because all parties had considered issues of

desirability, feasibility, and viability from the beginning of the endeavor. The AG served as an expert resource with strategic checkpoints to change direction in real-time. The team incorporated inputs provided by the AG and other stakeholders while being mindful of potential implementation barriers and tailoring project components accordingly. Ethnographic and qualitative studies were a critical part of the HCD process as the results of those studies directly informed the co-creation sessions and prototype iterations.

By applying the HCD approach, we developed an intervention to retain men living with HIV in South Africa in care and treatment services. It was clear from this process that:

- HCD methods have the potential to create prototypes for programs that are highly desirable, feasible, and viable
- Applying HCD philosophies throughout stakeholder engagement helps to ensure both greater empathy among all parties and the “ownership” of health programs that will contribute strongly to their success and sustainability

The HCD process enabled our team to identify that the fundamental and unique value of the coach is that of trust. This trust was consistently protected within our design by the requirement that coaches come from **outside** of a clinic system that men have grown to distrust. Each coach had credibility because he is someone who has “been there with the virus”; this was articulated through the HCD process as the most valuable proposition in the prototype. Being a coach has also changed the self-esteem and community respect for the men who adopt this role. In addition, Coach Mpilo addresses a critical national issue of unemployment, giving work to men in a country with an unemployment rate of more than 30%.

**Preliminary data on the Coach Mpilo program indicate that more than 90% of men are linked or returned to care within the first month of support and remain on treatment thereafter.**

**The HCD process enabled our team to identify that the fundamental and unique value of the coach is that of trust.**

Quality control throughout each aspect of the design process, data collection, and program implementation was critical to success. Maintaining prototype design fidelity required that coach positions be filled only by men living with HIV. By designing with empathy for the lived experiences of these men, our intervention achieved the authenticity and credibility required to build trusting relationships in the affected communities. HCD workshops stressed that coaches must be mentors who have “lived the journey”—a practice that resulted in improved engagement in retention in HIV care and treatment services. The performance of the coaches in the pilot revealed the impact of reducing stigma, which potentially accelerated ART uptake and adherence.

The key to the success of the design process and program pilot of Coach Mpilo was the influence of an “HCD as ingredient” approach on the project philosophy and its application in the development of the intervention. The success of future iterations of Coach Mpilo will require applying HCD principles to the implementation and scale-up of the intervention. This will help to ensure that stakeholder empathy, trust, and program “ownership” are integrated into all aspects of program design and rollout, driving toward greater acceptability, success, and sustainability of the intervention.

“Mission creep” presents one of the most significant risks for scaling up Coach Mpilo. Funders may look for ways to leverage investments in Coach Mpilo to gather additional health burden data or perform other functions in their communities (e.g., TB or gender-based violence education). The coach’s value to the community and to the individual is as a trusted advisor independent from the traditional health care system, and adding roles beyond this core competency risks compromising program impact and data quality. Plans for scale-up of Coach Mpilo will thus need to consider several key issues and potential challenges, including program ownership and accountability, more rigorous evaluation approaches, and long-term sustainability and commitments for funding.

## CONCLUSION

Deployed as an ingredient in this and similar projects, HCD can help to avoid errors based on top-down assumptions and biases and incorporate the lived experiences and perspectives of men living with HIV, as well as health care ecosystem expertise, into producing desirable and workable solutions that reduce the risk of failure when piloted.

Ultimately, our process generated deeply empathetic and highly pragmatic solutions by and for men living with HIV that clearly addressed their issues related to linkage to and retention in HIV care and treatment services. Every man’s life changed is a story, not just a statistic. By engaging key stakeholders in the design of our interventions, HCD helped to produce outcomes that matter.

We hope that the Coach Mpilo pilot can inform the integration of HCD that addresses health programs and interventions across diverse populations and health issues.

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**Competing interests:** The author works for Matchboxology, which is a human-centered design consultancy that conducts research on behalf of other funders and commercial companies, including in the field of HIV.

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## FIELD ACTION REPORT

# Using Human-Centered Design to Develop, Launch, and Evaluate a National Digital Health Platform to Improve Reproductive Health for Rwandan Youth

Nicole Ippoliti,<sup>a</sup> Mireille Sekamana,<sup>a</sup> Laura Baringer,<sup>a</sup> Rebecca Hope<sup>a</sup>

### Key Findings

- Using a human-centered design (HCD) approach throughout the design and adaptive implementation phase with youth and key stakeholders led to major pivots in the product, implementation, and evaluation design of a digital health product for Rwandan youth.
- While using an HCD process to develop CyberRwanda, it was critical to include a diverse population of young people and community stakeholders as both collaborators and leaders in a youth-driven design process.
- Prioritizing equity of access led to the design of interventions for users with and without their own devices and with varying levels of digital literacy and experience using digital platforms.

### Key Implications

- Organizations developing digital health products for young people should consider taking an end-to-end human-centered design approach for the product development and intervention model.
- With increasing interest and investment in digital health interventions, especially those supporting direct-to-consumer products, funders should support and encourage funding and time for codesign, development, and prototyping with the intended audience in both the design and implementation phases.
- HCD practitioners designing for youth need to ensure appropriate representation of diverse groups of young people, take extra care to address power differentials between young people and designers, and ensure they have robust safeguarding policies and practices.

➔ *Résumé en français à la fin de l'article.*

### ABSTRACT

**Background:** A lack of access to evidence-based, unbiased, and youth-friendly family planning and reproductive health (FP/RH) information and care limit young people's ability to prevent unplanned pregnancies and HIV and sexually transmitted infections. This threatens their health and is a significant cause of school drop-out, limiting young peoples' well-being, future potential, and employment opportunities. To address these challenges facing youth, YLabs used an end-to-end human-centered design (HCD) approach to create CyberRwanda, a digital platform aiming to improve the health and livelihoods of adolescents (aged 12–19 years) in Rwanda.

**Designing for digital with youth:** From 2016 to 2020, CyberRwanda was designed and piloted using an HCD approach in partnership with more than 1,000 youth, parents, teachers, and public and private health care providers. During the problem recognition phase, HCD revealed participants' beliefs, behavioral preferences, and experiences as they relate to FP/RH specifically and their broader life experiences, motivations, and challenges. Several phases of analog, digital, and live prototyping with youth and key stakeholders were used to codesign, test, and refine the intervention for implementation.

**Results:** CyberRwanda is a direct-to-consumer platform where adolescents can learn integrated, age-appropriate health, and skills-building information through edutainment behavior change stories and a robust frequently asked questions library, order health products online, and be linked to CyberRwanda's network of private and public health care providers who have been trained to provide adolescent-friendly care.

**Implications for future research:** The HCD process resulted in significant pivots to the design of the digital platform and the implementation model. Using HCD provided a structured methodology to combine technical FP/RH expertise and visual and product design expertise to codesign and iteratively develop a digital health intervention with and for Rwandan youth.

### BACKGROUND

Adolescence and young adulthood are critical windows of opportunity to influence positive habit formation, behavior, and development. There is growing consensus among researchers, policy advocates, and practitioners worldwide that recognizes that interventions that are developed in partnership with youth are

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more likely to be effective at engaging young people resulting in greater impact on behavioral and biological outcomes of interest.<sup>1,2</sup>

Over the last decade, human-centered design (HCD) has emerged as a promising methodology to engage youth in the design and adaptation of solutions to better meet their needs. HCD is a creative problem-solving process used to develop interventions that center on the person or beneficiary. The HCD process provides a framework to design and iterate on interventions while taking into account desirability, feasibility, and viability.<sup>3</sup>

Preliminary data suggest that an HCD approach more successfully engaged Zambian adolescents with family planning (FP)/sexual and reproductive health (RH) services than standard care.<sup>4</sup> In Kenya, a redesign of adolescent health services using HCD resulted in a 7-fold increase in the number of adolescents visiting health centers and a 70% increase in uptake of long-acting reversible contraceptives.<sup>5</sup> There are forthcoming randomized controlled trials (RCTs) on HCD programs to improve access to RH and FP information and services for youth in Rwanda,<sup>6</sup> to increase HIV self-testing in Tanzania,<sup>7</sup> and to address provider bias toward youth in Burkina Faso, Pakistan, and Tanzania.<sup>8</sup>

Although rigorous documentation on using HCD to design global health interventions has increased, to date, there are limited documented examples of applying HCD throughout the entire health intervention-development cycle. This includes understanding the problem from the user's perspective, informing the solution design, and implementing and measuring progress, all in partnership with the end user. Even fewer interventions have

documented conducting this process in partnership with youth.

This article describes the HCD approach that Youth Development Labs (YLabs) used in Rwanda to codesign, pilot, evaluate, and design CyberRwanda, a digital behavior change intervention designed to improve the health and livelihoods of adolescents aged 12–19 years. CyberRwanda weaves together behavior change stories featured via webcomics, a robust frequently asked questions (FAQs) library, online ordering of health products, and a pharmacy/health facility locator. Combined, these features aim to deliver integrated, age-appropriate adolescent health, and economic empowerment information and linkage to quality youth-friendly services. CyberRwanda also trains pharmacists and nurses at participating health facilities on addressing provider bias, youth's right to access health products in Rwanda, and voluntary FP/RH care.

YLabs is a leading global design and research organization working to improve health and economic opportunity for young people aged 10–24 years. YLabs' mission is to design, test, and advocate for youth-driven solutions that address the biggest challenges to young people's health and economic opportunity, including sexual and reproductive health, HIV, and mental health. YLabs combines diverse disciplines to develop and measure innovative solutions with young people and their communities. Our team, including young people among the 16 countries where we work, brings expertise in adolescent health, behavioral science, mental health, impact evaluation, digital product design and development, marketing, and brand design.

**CyberRwanda aims to deliver integrated, age-appropriate adolescent health, and economic empowerment information and linkage to quality youth-friendly services.**



Conducting design research of reproductive health content with adolescent girls. © 2016 Laiah Idelson/YTH

This article documents process findings that will reveal how taking a youth-driven and youth-led design approach, as defined by YLabs (Table 1), played a critical role in understanding the needs of young people, brought forth innovation to traditional forms of information and service delivery, and highlighted the special considerations of designing with youth.<sup>9</sup>

## ■ FP/RH CONTEXT AMONG ADOLESCENTS IN RWANDA

In Rwanda, adolescents have limited access to high-quality FP/RH information and care to prevent unplanned pregnancy, HIV, and sexually transmitted infections. Despite a strong national commitment to reducing unplanned adolescent pregnancies, the adolescent fertility rate in Rwanda has not changed significantly between 2010 and 2018 from 40 live births to 39 live births (per 1,000 women aged 15–19 years).<sup>10,11</sup> Among sexually active adolescents aged 15–19 years, nearly 50% are not using any form of contraception.<sup>12</sup> Youth-friendly services remain limited, with only 13.6% of health facilities providing these services.<sup>13</sup>

With limited access to services and insufficient training of providers on adolescent-friendly care, youth who access FP/RH services often experience disproportionately lower-quality care and provider judgment. Adolescents also lack access to quality, adolescent-focused information. Although the Rwandan Ministry of Education has committed to providing comprehensive sexuality education in schools and has invested in training schools on the new curriculum, there is a lack of quality materials to support teachers in its delivery.

With rapidly increasing access to digital devices and the Internet for young people in sub-Saharan Africa, there has been a surge of interest and investment in digital approaches to support the delivery of quality FP/RH information

and care for youth. Digital channels provide an opportunity to support youth, a population who are known to be early adopters of technologies, in learning about their health and take positive steps to access health services and products privately and on their own time.<sup>3,14</sup> In a recent global survey of youth, with more than one-third of participants from sub-Saharan Africa, 62% already reported using technology for their own health needs, and 84% planned to use digital tools to track their health in the future.<sup>2</sup> Digital interventions that are designed with attention to adolescents' desire for autonomy, social connection, and agency have the potential to reach adolescents and young adults during critical neurodevelopmental windows of opportunity to influence positive habit formation, behaviors, and learning.<sup>15</sup>

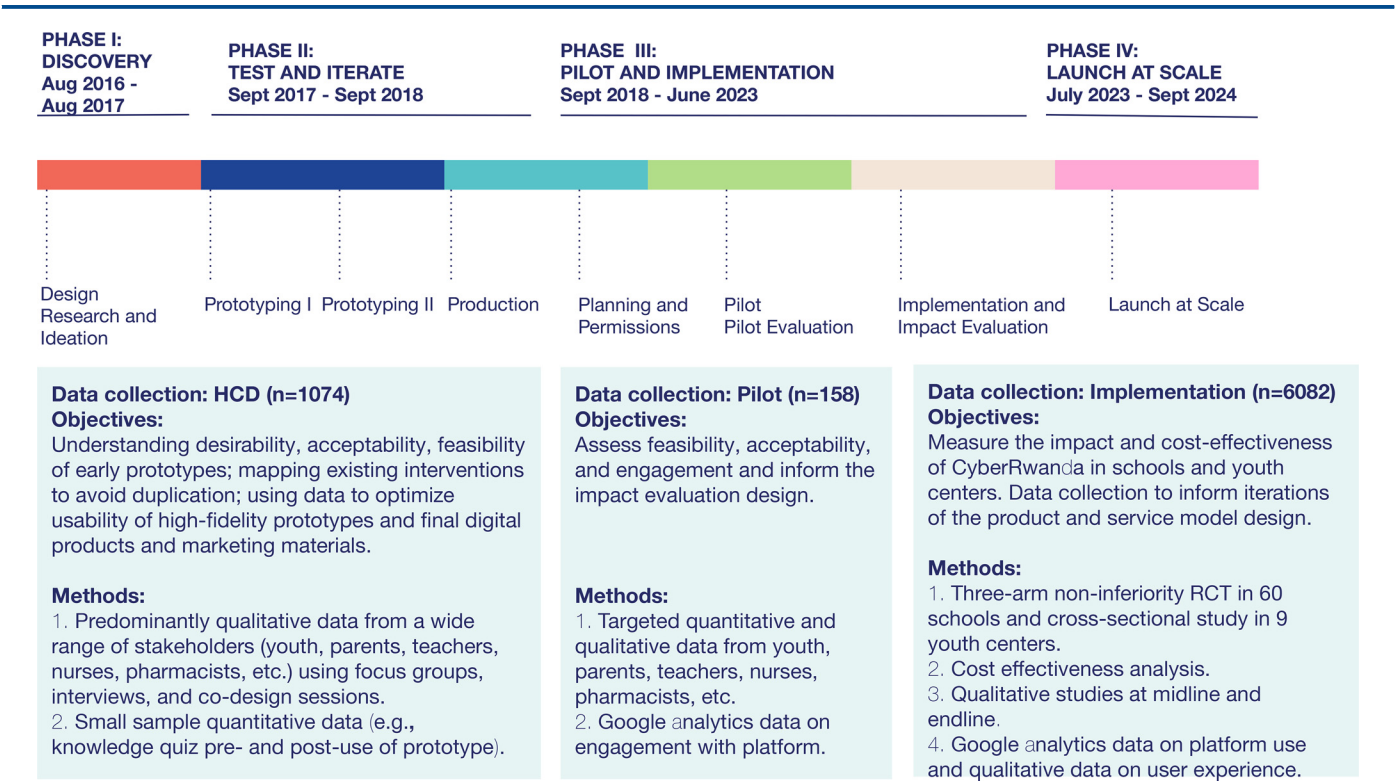
The challenge of designing impactful digital health interventions is ensuring equity, access, and usability for new technology users, especially in low-resource settings. In Rwanda, digital usage is on the rise with mobile cellular subscriptions more than doubling between 2010 and 2019 to 76.5%, in line with pan-African trends.<sup>16</sup> Current annual growth in active social media use is 20% and internet use is 8.8%.<sup>17</sup> However, there are marked differences in access to phones by socioeconomic status, between rural and urban contexts, and between boys and girls.<sup>18,19</sup> Among youth, there are persistent gender gaps in phone access and ownership and in the use of mobile money and e-commerce.<sup>4,20</sup> Youth commonly share phones, which can adversely impact the level of privacy they experience in accessing digital health information and service. These considerations must be further explored when designing a digital intervention for young people to avoid designing only for urban or elite youth, thus exacerbating existing health inequities.<sup>21</sup>

**The challenge of designing impactful digital health interventions is ensuring equity, access, and usability for new technology users, especially in low-resource settings.**

**TABLE 1.** Distinctive Approaches to Designing With Youth

Term	Definition
Youth-led design	Young people make the decisions on which problem statements to focus on. They are facilitators and designers of the solution development process, either with or without guidance from an adult team.
Youth-driven design	Young people's voices and perspectives drive the decisions about the interventions and approaches that will affect them and their communities. Young people are actively involved in the decision-making processes and lead key project activities.
Youth-centered design	Youth are the audience of focus for the intended intervention or approach. They participate in the design process by providing data, input, or feedback to an adult design team. Typically, they are not part of the team that decides on the intervention or proposed approach.

**FIGURE.** Overview of Phases of HCD Phases, Data Collection Objectives, and Methods Throughout the Design, Pilot, and Implementation of the CyberRwanda Project



Abbreviations: HCD, human-centered design; RCT, randomized controlled trial.

■ **DESIGNING FOR DIGITAL WITH YOUTH**

Between 2016 and 2019, CyberRwanda was developed using a youth-driven and youth-led design process with 1,074 Rwandan youth, caregivers, teachers, health care providers, and government stakeholders (Figure).

The platform’s intended outcomes for adolescents aged 12–19 years were to:

1. **Improve knowledge:** Help adolescents gain employment skills, set future goals, and learn about FP/RH in a private, safe space
2. **Improve access:** Support adolescents’ ability to access FP/RH products and services by strengthening linkages to services
3. **Improve quality:** Improve providers’ knowledge on FP/RH and address provider bias to improve service quality for youth

We describe the methods used to design CyberRwanda and the populations engaged

throughout the phases of design research, prototyping of initial and refined concepts, product and content development, pilot, and adaptive implementation and evaluation. Throughout the design and implementation process from 2016 to 2021, our team moved from youth-centered design to youth-driven, to a youth-led approach today (Table 1 provides definitions of terms), where youth members of the team led decision making on intervention design. This transition from youth-centered to youth-driven and youth-led approaches was supported through dedicated training of youth members in the following: how to conduct each phase of the HCD process, conducting user experience testing of digital prototypes, and ensuring the safeguarding and protection of youth participants. Additionally, all staff members (youth and adult) were trained in youth-driven or youth-led design principles. This includes how to recognize and address the power imbalances that exist between adult and youth team members and how to create

**Throughout the design and implementation process, our team moved from youth-centered design, to youth-driven, to a youth-led approach.**

**TABLE 2.** Selected Design Research Methods Used for CyberRwanda

Method	Examples of How They Were Used for CyberRwanda
Card sorting	Participants ranked cards with different images of people in order of preference (e.g., people they trust most with sensitive information or who they would ask for information on reproductive health). Additional prompts and discussion informed the initial design of the characters who deliver information in the webcomic.
Vignette cards	To explore provider knowledge and biases, pharmacists and clinic staff were asked to opine on which family planning methods and reproductive health services might be “appropriate” for different mock clients.
Role play	Role play was used extensively to understand taboos and stigma that youth held in discussing their reproductive health with others, including peers, providers, teachers, and parents, and prompt discussion on how to address these challenges. Dialogues also helped inform the style and tone of conversational content for the webcomic.
Codesign activities	Workshops gather audiences of focus to take part in the creative development process of brainstorming ideas for a specific design challenge and then bring them to life by creating rough representations of their solution idea. Youth were asked to develop paper prototypes of their own campaign addressing adolescent pregnancy in Rwanda to prompt further discussion on messaging, content, and digital and nondigital delivery channels (e.g., social media, magazines, and school lessons).
Surveys	Rapid, small sample surveys were used during design research to capture baseline knowledge, demographics, and technology usage among participants.
Journey mapping	Participants drew their journey maps, setting different life milestones and their expected timeline for their achievement.
Mystery clients	Mystery clients are trained community members who visit services or facilities in the role of the patient or client and report on their experience. Mystery clients were used to explore the service experience for young people requiring different products and services at pharmacies.
Observation	Observation was a critical method used to understand the level of privacy, dignity, and comfort for young people accessing health care services. In schools, observation of teachers, equipment, and classroom spaces helped us test assumptions around using school laptops to deliver CyberRwanda. Observations that existing laptops were not easy to use by untrained staff and did not afford privacy led to a pivot to instead use tablets in kiosks or school clubs.
Personas <sup>a</sup>	Personas were used to better define potential groups of users with shared characteristics regarding knowledge, needs, and access to technology.

<sup>a</sup> Personas are adapted from World Health Organization (WHO). *Digital Implementation Investment Guide (DIIG): Integrating Digital Interventions Into Health Programmes*. WHO; 2020. <https://apps.who.int/iris/rest/bitstreams/1303132/retrieve>.

opportunities for youth members to lead activities and/or cofacilitate with appropriate support and guidance.

### Design Research

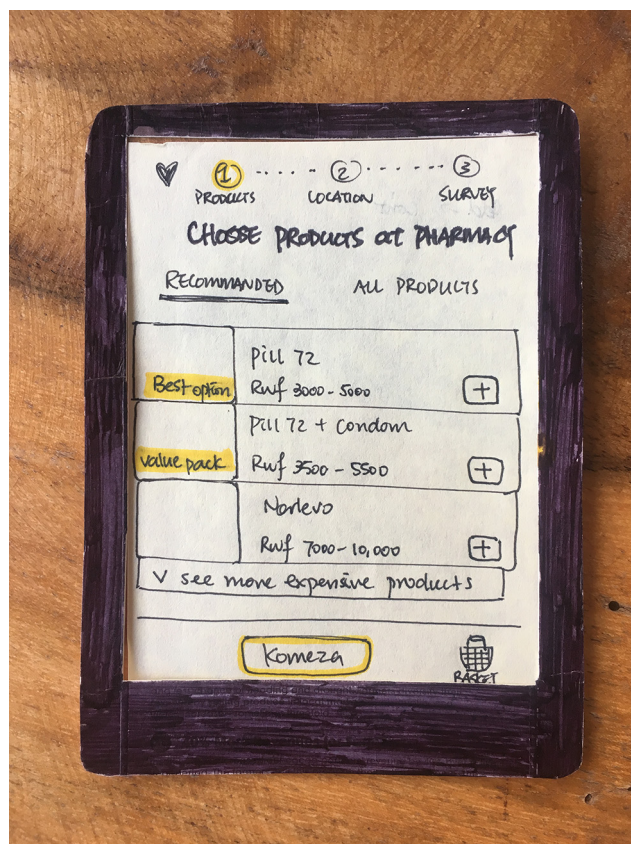
Design research is the primary stage in the HCD process that leverages qualitative and observational data to understand human behavior, latent needs, and the environmental factors or social norms that might contribute to the design of an intervention. The team began the design research phase (Table 2) with the key question of how to leverage technology to address 2 pressing and inextricably linked issues facing young people: teen pregnancy and unemployment, with young people as the primary users. This phase consisted of interactive codesign workshops, focus group discussions, and in-depth interviews with young people, health care providers in both public and private facilities and pharmacies, parents, government officials, and other critical stakeholders. Interviews were

conducted by Rwandan youth designers, in Kinyarwanda with simultaneous English translation. During the HCD process, participants were purposely sampled in 8 districts (Gasabo, Nyarugenge, Kicukiro, Nyagatare, Ruhango, Huye, Musanze, Rwamagana) in rural, urban, and peri-urban contexts, to ensure diverse representation regarding socioeconomic status, gender, age, educational status, and social vulnerabilities (participants included former sex workers, insecurely housed youth, and domestic workers). A literature and policy review and landscape analysis of existing digital and youth-centered programs was also conducted to ensure that CyberRwanda's focus was non-duplicative and aligned with national priorities.

The design research phase enabled the team to rapidly assess the desirability of a digital intervention and potential barriers to access for urban/peri-urban youth. It also revealed young peoples' and providers' beliefs and behavioral drivers and barriers as they related to FP/RH. Journey mapping was used to understand topics and themes

**In the design research phase, journey mapping was used to understand topics and themes that youth found most interesting.**





Rough prototype of Shop interface. © 2018 Caroline Wong/YLabs

that youth found most interesting (Table 2). Young people mapped their various life goals and important milestones and by when they hoped to achieve them. The youth then listed resources and information they would need to achieve those goals at the desired age. This process provided important insights into a young person's lived reality; mapping their everyday experiences, goals, motivations, and challenges enabled the design team to develop prototypes that integrated content and features that ultimately resonated with what young people found to be desirable and inspirational. Research with parents, teachers, and health care providers revealed how to develop prototypes that would be socially accepted and aligned with national priorities, revealed appropriate "entry points" when discussing sensitive topics, and unearthed pharmacists as potential secondary users.

### Prototyping

Using the learnings from the design research phase, multiple rough prototypes were tested with young people and pharmacists. Rough prototypes are

quick, tangible, low-fidelity versions of a product or intervention used to gather rapid user feedback on the design, content, delivery channel, and experience. Table 3 shows selected methods used to share prototypes with participants and the methods of eliciting feedback. These rough prototypes not only enabled the team to test and iterate on ideas quickly and cheaply but also signaled to young people and pharmacists that they could provide honest feedback, even if it meant dramatically changing the approach. When refined and polished prototypes are presented, participants are more likely to hold back critical feedback if they believe much of the design is already fixed.<sup>22</sup>

Prototyping was conducted in 2 phases to enable the team to iterate ideas and develop increasingly high-fidelity prototypes based on learnings from the previous phase. Prototypes were tested and assessed based on predefined criteria that included desirability for participants, cultural acceptability, and feasibility. We used research questions to assess these factors during the prototyping phase and the subsequent ways in which they

**TABLE 3.** Prototyping Methods Used to Develop CyberRwanda

Methods of sharing prototypes used	Description
Paper prototyping: used to develop the initial design platform and subsequent iterations, content, and marketing materials (content, UI/UX, social media marketing strategy, promotional materials)	Paper and cardboard prototypes are used or co-created to create a quick but interactive physical representation of the product or experience.
Role play: Used in prototyping the end-to-end ordering experience	Participants are assigned certain scenarios and roles to help designers understand the interactions through observing the improvised scenario-specific performances.
Storyboarding: Used in prototyping workshops with pharmacists to walk through the potential value of the platform and pain points	Drawings or images displayed in sequence for pre-visualizing a new experience or service (e.g., a clinic visit).
Low- and high-fidelity interactive prototyping/digital prototyping: Used in the final stages of prototyping of the digital platform	Participants interact with an interactive prototype that has the look and feel of the final product.
“Wizard of Oz”: used to test a motorcycle taxi delivery service prototype	Participants interact with a digital product that appears to be computer-driven, when in fact responses are human-controlled. This method may intersect with others listed here.
Methods of eliciting feedback and preferences	Purpose
Ideation and co-creation: used to design and iterate on the cast of CyberRwanda webcomic characters, as well as developing storyline and content)	Participants generate entirely or partly new ideas for prototypes to test based on a design brief.
Elicitation: commonly used at the end of a prototyping session after showing multiple concepts	Asking the participants directly what improvements can be made to the prototypes to better reflect their needs and desires, what they prefer, and why.
Ranking: used to rank preferred channels of communication for young people to inform CyberRwanda marketing (e.g., posters, radio ads/shows, referral cards, and SMS alerts)	Participants vote and/or rank their preferred prototypes and top concerns.
Pre-/post-survey: this was used to evaluate knowledge improvement after interacting with an early prototype	Use surveys to evaluate change in specific indicators pre- and post-interaction with prototypes. The level of rigor may vary depending on the needs and the phase of the project. In early stages when testing low-fidelity, “rough” prototypes, these may help in rapidly deciding on prototype selection, but the sample size may not be powered appropriately. During the pilot, and implementation, and sometimes for live prototyping, an adequately powered sample is used.

informed pivot points for the intervention design (Box 1).

### Product and Content Development Through User Testing

Building on lessons from the previous stages of work, the team proceeded to develop the final digital intervention design. Although at this stage the intervention was more fully refined, additional testing and iteration with young people and pharmacists were conducted during all stages of content development, web application user experience design, service design development, and visual design. Product refinement and testing during this phase enabled the team to improve user experience and identify any potential

barriers to use through testing the web app flow and function, brand, look and feel.

To develop the narrative and factual content in preparation for the RCT, a team comprised a narrative content writer, social norm and FP experts, and a behavioral scientist mapped the behavioral outcomes to the theory of planned behavior. The team determined how best to communicate key messages throughout the content based on an intervention mapping protocol for integrating theory and evidence-based behavior change methods into an intervention.<sup>23</sup>

### Pilot

In preparation for the RCT launch across 60 schools and 75 pharmacies in 8 districts, an 8-week pilot

**BOX 1. Research Questions Used to Develop Prototypes of CyberRwanda****Do the themes and tone of the educational content resonate with young people?**

Our initial prototypes for youth and providers included a virtual nurse/educator that answered questions through real-life stories. Through prototyping this idea with young people, they shared a preference for combining information about future planning and employment with the health-focused content. Parents, who reported concerns about their children being exposed to the often-taboo topic of family planning (FP)/reproductive health (RH), responded positively to prototypes presenting CyberRwanda as a guide to future health success, integrating employment-related content. Therefore, the final CyberRwanda curriculum was changed to reflect these preferences. The content on CyberRwanda today contains RH and FP content but also integrates other key aspects that young people care about, such as finding a job, goal setting, and economic empowerment. The content role models conversations between young people and parents, between parents, and between young people and providers and provides examples of how to navigate conversations on sensitive topics.

**How do we ensure accessibility and affordability through the delivery of the CyberRwanda program via various digital channels (i.e., SMS, native app, etc.)?**

Via focus groups and interviews, the team carefully mapped young people's access to and use of different digital delivery channels such as personal or shared mobile devices and use of different social media and printed media channels. Through this research and low-fidelity prototyping (Table 3), youth expressed that they rarely download native apps and had concerns about the costs of data and memory use associated with using a native app. Furthermore, young people shared that they were using computer labs at the youth center to look for jobs and access information through online resources. They wanted CyberRwanda to be among the resources they could easily access using those computers. Therefore, the team pivoted the design to a web app that could be more readily accessed on any phone, tablet, or computer. This finding also expanded the implementation model to focus on loading CyberRwanda on tablets in youth centers along with schools. However, some schools and youth centers are in areas where Internet connectivity is not reliable, which delays the loading of content for users. As a backup, the team also developed a native app that is installed on tablets at schools and youth centers. With the native app, the youth at the schools and youth centers can access CyberRwanda content offline without needing to rely on the Internet.

**What would encourage young people to provide accurate information when accessing over-the-counter contraceptive methods?**

During design research, pharmacists expressed concerns about young people not honestly answering medically relevant questions when aiming to purchase contraceptive products. Young people were concerned about their privacy when requesting services in front of other customers. Youth reported pretending to purchase products for someone else to avoid judgment and potentially uncomfortable questions. In turn, pharmacy staff had concerns that young people were purchasing products without the necessary information to use them safely.

Initial prototypes were developed to explore how privacy might be improved in pharmacy settings. Initially, a "screener" survey prototype was explored. Upon arrival, the pharmacy staff directed young people to a paper survey including all medically relevant questions. Young people were concerned that other customers would be able to view private details while they were completing the form. Using the learnings from this prototype, the shop portion of the CyberRwanda platform now includes an online questionnaire with medically relevant questions that the user completes before purchasing a product. Depending on their answers, the platform allows them to proceed with the order or suggests a better alternative.

was conducted to finalize service design and implementation models, baseline data collection tools, and training. The pilot, conducted across 4 schools, 1 youth center, and 8 pharmacies, enabled the team to test every component of the web app and implementation models before a large-scale launch. Through post-pilot in-depth interviews and focus groups with 158 stakeholders and students, data from Google Analytics, and pilot baseline test data, the team gained critical learning and iterated appropriately. Learning from the pilot informed the need to provide more intervention touch points for pharmacists and pharmacy staff as primary users, to increase the number of tablets provided at each school, to refine the school recruitment and sensitization strategy, and to improve the user experience of the shop and the site as a whole (outlined in the Results section).

**Adaptive Implementation and Evaluation**

CyberRwanda is entering into a 2-year implementation and evaluation phase, in which the same HCD methodology used to design CyberRwanda will be applied as the team iterates the design of the web app and adds features and content. This will include working with young people to develop all new narrative content and validating it before it is finalized, analyzing data generated by Google Analytics to understand which pages and content young people respond to the most, conducting focus group discussions with youth and teachers on additional topics and features that are needed, and working with parents and other stakeholders to support usage of CyberRwanda in schools and at home. From 2018 to now, the team continues to use HCD to iterate, test, and evolve CyberRwanda's product and implementation

**The HCD process resulted in a digital behavior change intervention designed with 2 main users in mind: urban and peri-urban young people and pharmacy staff.**

model, with the participation of an additional 400 stakeholders.

Throughout the design and adaptive implementation process, the team prioritized several special considerations when applying HCD approaches to designing with youth (Box 2).

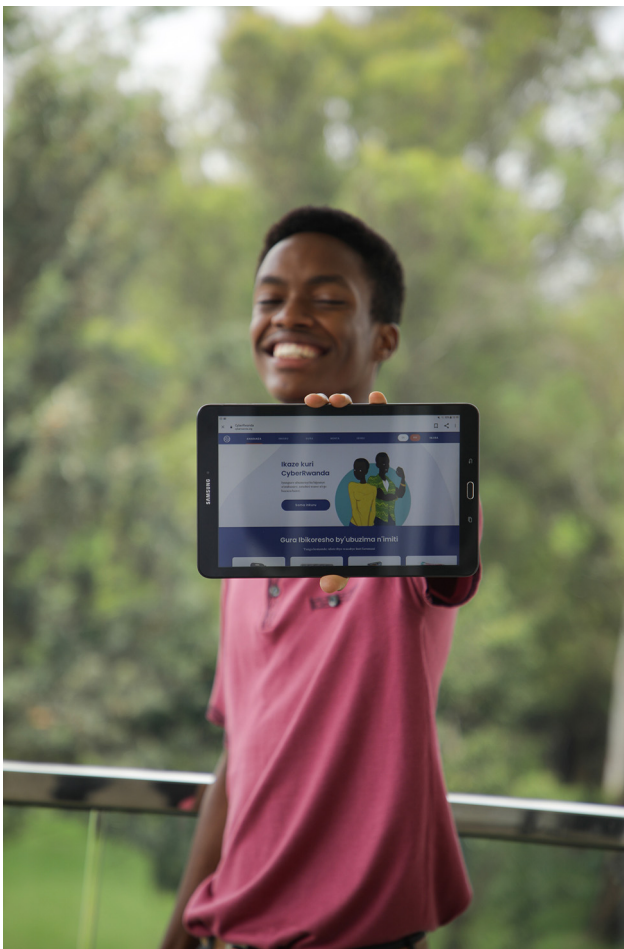
## ■ RESULTS

From 2016 to the present, more than 1,000 Rwandan youth, caregivers, teachers, health care providers, and government stakeholders have been engaged in the design and evolution of CyberRwanda to answer the question, “How might we leverage technology to address teen pregnancy and unemployment among urban youth?” The HCD process resulted in a digital behavior change intervention designed with 2 main users in mind: urban and peri-urban young people and pharmacy staff (nurses and head pharmacists).

For young people, the web and future native app includes 3 sections:

1. **Stories.** Interactive behavior change web-comic series, with stories featuring a cast of characters designed with young people.
2. **Learn.** A robust library of young people’s priority questions, with more than 200 (and growing) frequently asked questions and a directory to help youth locate both public and private health care facilities and pharmacies in their area.
3. **Shop.** Young people can discreetly and privately order, purchase, and pick up certain pharmaceuticals and other health products at the CyberRwanda pharmacy of their choice. Location and pricing are transparent on the site.

CyberRwanda will be available to participating schools and youth centers where the intervention



CyberRwanda web app loaded on a tablet. © 2020 Oscar Muhire/AfricaMile



**BOX 2.** Methods Used to Safely Design With Youth

**Training youth designers.** Using a predominantly youth-led or youth-driven approach (Table 1), young Rwandans were trained as youth researchers to conduct human-centered design (HCD) sessions and most sessions, including user testing and development of all content, were led by youth. Trained youth designers were compensated in line with national salary benchmarks and not expected to volunteer their services for free.

**Creating safe spaces.** The design team used multiple techniques to support the development of a safe space for youth to engage by incorporating principles of trauma-informed care and led icebreaker activities designed to address the inherent power differential between researcher and participants. Less taboo topics were leveraged as “gateway” activities, and the team took steps to ensure that the session was valuable to youth by providing activities of interest and use to them (such as follow-up question and answer sessions). All young people were compensated for their time and participation.

**Ensuring comprehensive safeguarding protocols.** Several precautions were taken to ensure that child and youth safeguarding measures were in place. All staff were background checked and trained on child protection and safeguarding and followed robust child protection policies. Staff never conducted sessions alone with young people.

**Conducting comprehensive risk mitigation assessments.** Sensitivities and stigma surrounding reproductive health means prototyping with youth could potentially pose a social or safeguarding risk to them. Risk analysis and mitigation planning were conducted before prototyping, and prototypes were also tested with parents, teachers, and community leaders for acceptability and to help inform risk estimation before the pilot.

**Ensuring ethical use of participant images and data.** All young people provided written consent or assent with adult consent for their participation in the HCD process. Images were only taken and/or used with written consent from the young person. No images of youths aged younger than 18 years were used in program materials.

is made available on online tablets. Youth may also access CyberRwanda on their personal devices and school computers, where available.

For pharmacy staff, CyberRwanda is building a network of private pharmacies to support the provision of high-quality, youth-friendly care. Pharmacies who join this network have access to:

- **Training:** In-person and virtual training to CyberRwanda pharmacy staff. The 1-day in-person training for either the staff nurse or pharmacists covers key topics such as youth-friendly service provision, FP methods, and how to use the CyberRwanda platform and pharmacy portal. Providers who attend the CyberRwanda training will receive continuing professional development credits through accreditation by the National Pharmacy Council. A more condensed accredited version of the training is available virtually for all other pharmacy staff.
- **Portal:** Pharmacies access the online CyberRwanda pharmacy portal that enables them to add and update health products and pricing online as part of the Shop. When youth order products from the pharmacy of their choice, pharmacy staff can build relationships with young people in their communities.
- **Additional support:** The CyberRwanda team provides weekly support to pharmacies to ensure that they can use the portal and receive orders and to identify additional training areas and needs.

Implementation will be accompanied by a 2-year impact evaluation, consisting of a 3-arm RCT in schools, serial cross-sectional study in youth centers, qualitative studies, and a cost-effectiveness evaluation across 60 schools and 9 youth centers in 8 districts in Rwanda (sample at baseline  $n=6,082$ ; 2,953 male; 3,129 female).<sup>6</sup> The 3 arms of the RCT are: (1) “self-service” model: schools will be provided with tablets, a hotspot, and trained school ambassadors who promote CyberRwanda; (2) “facilitated” model: schools receive the same as the self-service model, plus structured activities held in a CyberRwanda club, where trained peers support youth to explore CyberRwanda content in a group setting with discussion and reflection; (3) control: schools without any form of the intervention. In addition to being implemented in the schools participating in the RCT, the self-service model will also be implemented in 9 district-level youth centers and 4 pilot schools, totaling an additional 13 implementation sites.

Table 4 shows key findings during the design process and the resulting major changes that were made to the intervention design. Using HCD as an end-to-end approach resulted in several critical process learnings that were foundational to the eventual design and implementation of CyberRwanda.

### Expanding the Audience of Focus

CyberRwanda’s original demographic focused on adolescent girls. However, design research sessions

**TABLE 4.** Key Findings and Iterations to Intervention Design of CyberRwanda

Key Finding	Iteration to Intervention Design
<b>Supply-side barriers to quality care</b>	
Youth often saw health care providers as “gatekeepers” to accessing methods and were afraid about the questions they might be asked at health care facilities	We pivoted the platform away from simply linking to clinics to providing direct-to-consumer products and information directly in the hands of youth to reduce barriers associated with gatekeeping. Medically relevant screening is conducted at point of order to minimize bias-related barriers to FP/RH care and expedite the interaction between provider and youth. Youth can choose from a selection of pharmacists with transparent pricing.
Youth strongly preferred pharmacies as a point of access for contraception due to expediency and privacy	Deliver products and services via pharmacies: Young people’s priority concerns for privacy and expediency informed the pivot to supplying products via pharmacies instead of clinics, as originally planned. The platform also links to all public clinics in the intervention districts for longer-term methods.
Pharmacists lacked confidence in addressing young peoples’ SRH needs and had knowledge gaps on FP	Designed tailored training modules with and for pharmacists and pharmacy staff to address common misinformation, provide training on adolescent-friendly care, and support self-identification of provider bias to help providers improve access to care for adolescents.
<b>Demand-side barriers to quality care</b>	
Program lacked content on economic opportunity and job readiness, making it less appealing to youth and less acceptable to parents	The webcomic stories and FAQs now include content on preparing for employment and address gender stereotypes on careers. The site links to job search resources. The site tagline is “learn about relationships, your body, and your future.”
Boys had clearly expressed needs for information on health, relationships, and reproductive health	Content, characters, and the direct-to-consumer platform were codesigned and implemented with and for young men.
Youth lacked access to trusted, nonjudgmental information in accessible language they could understand	Characters were designed with youth to represent trusted personas for young men, women, and parents. A webcomic format was introduced to deliver information in a compelling, locally relevant way, focused on addressing key behavioral barriers and social and environmental norms that stigmatized access to FP/RH services. All content was reviewed by gender and behavior change and validated by youth. Finally, it was approved by the National Health Communications Committee to ensure alignment with national guidelines.
Young people were primarily concerned with lack of privacy and confidentiality in accessing information and services	To minimize barriers to engagement and allay fears about confidentiality, no identifiable data were collected from youth, even though this limited the ability to track individual user engagement. All data from the CyberRwanda platform were gathered and stored in compliance with General Data Protection Regulation guidelines. The shop was designed so that users can order without supplying personal information, without needing to request the product in person from the pharmacist. An order code is provided, which is needed to collect their order, with an optional SMS to their phone.
Given low levels of knowledge on FP/RH, youth often seek help for a specific problem rather than a specific product	In the shop, we pivoted to include both products for quick access for informed users and added common scenarios as another pathway to access products on the platform for naïve users or users experiencing a crisis (e.g., “I had unprotected sex.”). When a user clicks on those scenarios, they access essential information and recommendations of products and additional services available.

Abbreviations: FAQs, frequently asked questions; FP, family planning; RH, reproductive health; SMS, short message service.

revealed that young men had limited knowledge about FP/RH and had few trusted sources of information on the topic, though they were often the most influential driver of girls’ FP decision making. Young men lacked the confidence to access condoms and shared the same

concerns about privacy when seeking care at a clinic. Based on these insights, the project team expanded the project scope to include information, topics, webcomic characters, and delivery channels that appealed to young men as well as girls.

*I had a perception that when a girl gets pregnant, there's nothing to do other than wait to have a child. Or when a girl has forgotten to take emergency contraceptive after 72 hours after unsafe sex, I thought that that it is over; if you attempt to abort, you can die.*  
—Male secondary school student, 18 years old, interviewed during the pilot

*As young people, we fear being seen by a neighbor at the shop when you have to buy a contraceptive, you are shy that you are judged of what you are going to use the condom for.*—Male secondary school student, 18 years old, interviewed during the pilot

Findings from the pilot evaluation revealed that pharmacists and pharmacy staff needed to be seen as primary users. By doing so, the team further refined CyberRwanda's role in working with pharmacists by expanding the focus audience to not only the head pharmacist in a pharmacy but also the nurse as young people trusted both but went to each for different reasons. Additionally, the team revised the training tools in partnership with pharmacists to ensure that content and the training approach addressed pharmacists' most common information gaps, was acceptable and accessible to them, and also leveraged their motivations to better serve adolescents. The training has been accredited with continuing professional development credits by the National Pharmacy Council to increase the value of and trust in the program to participating pharmacists.

## Designing Educational Content

Extensive prototyping with a broad range of young people revealed how to design educational content for digital inclusion, different learning styles, and multiple literacy levels. The early and continued engagement of a spectrum of heterogeneous young people regarding digital access, literacy, educational, and socioeconomic status informed the development of an inclusive and accessible intervention. Based on youth preferences for shorter content, the intervention pivoted to a less text-dependent webcomic format delivered in both Kinyarwanda and English to accommodate different levels of literacy and support visual learners. In response to input from youth and parents on what makes a trusted health advisor, characters who deliver the content through stories were codesigned to represent clinic providers, aspirational older peers, and parents themselves. Given low levels of understanding about puberty, menstruation, and consent, additional topics were added.

Finally, there is little evidence on the level of in-person facilitation needed to implement digital interventions in school settings. We had found that youth were familiar with and actively participated in school health clubs. Therefore, we decided to compare a facilitated model, building on this existing school club culture to facilitate group and peer-driven learning (especially for less tech-savvy users), with a self-service model that supports potentially more private, self-directed learning. During the pilot in 3 schools, a higher percentage of students reported using CyberRwanda at the self-service school as compared to the facilitated schools (95% vs. 45% of students, respectively). Qualitative interviews with staff and students informed a redesign of the training and onboarding of teachers to reduce gatekeeping of tablets and improve access to CyberRwanda in both models during implementation.

Given variable levels of digital access especially between rural and urban youth, CyberRwanda is delivered via tablets in schools and youth centers as well as online, rather than relying solely on youth access to smartphones. Video instructions were designed to help youth with low literacy and low confidence using online ordering to easily navigate the shop function of the platform.

*I was interested by the part called 'Shop.' You can order contraceptive products using this program and get the products without the people knowing what you ordered. I like this part so much more than other parts, but I didn't order anything.*—Female secondary school student, 14 years old, interviewed in pilot study

## Accessing Health Care Services

Design research and prototyping changed the interventions' health care access points to cater to youths' preferred service delivery points of pharmacies. In the early design stages, the team's initial assumption had been that intervention would refer youth to primary health care clinics for FP/RH service delivery. However, during design research, young people shared fears of seeking health care services at the clinic for fear of being seen by fellow community members, which clinic staff confirmed.

*Youth don't want to come to the clinic because they are afraid of being seen by their parent or someone they know.*—Nurse, Kigali

Both pharmacists and youth reported that they commonly opt to use emergency contraception to prevent pregnancy after an "accident"

**Comparing a facilitated and self-service model for in school settings, a higher percentage of students reported using CyberRwanda at the self-service school.**

(unprotected sex), as youth perceive this as more socially acceptable than admitting to “planned” premarital sex, which is often stigmatized. Pharmacists reported seeing the same youth return repeatedly for emergency contraception after multiple “accidents,” suggesting young people are using emergency contraception as a regular method to avoid provider stigma. Given that youth can readily access emergency contraception at a pharmacy with minimal risk of exposure, they often do not seek longer-term contraception at clinics. In fact, youth are so reluctant to visit clinics, they prefer to pay for products or services (e.g., pregnancy tests and emergency contraception) at the pharmacy that could be accessed for a much lower cost at the clinic.

Youth had a strong preference for receiving FP/RH services at the pharmacy, valuing the expedient, confidential, and private method of service delivery. However, pharmacists were often reluctant to provide contraceptive products to unmarried adolescents, lacked private spaces for counseling, and often had inaccurate knowledge about FP. These findings informed a pivot toward a direct-to-consumer platform providing streamlined access to and online screening for health products supplied by a network of trained pharmacists, with signposting to clinics for longer-acting FP and other RH care.

*I struggle to counsel my customers on FP because our pharmacy has no private space. —Pharmacist*

*I feel more comfortable prescribing the oral contraceptive pill to a married woman because waking up to her husband on a daily basis will remind her to take the pill. Unmarried women don't have this kind of reminder. —Pharmacist*

**A shift to a direct-to-consumer platform provided streamlined access to and online screening for health products supplied by a network of trained pharmacists.**

### Designing for Accessibility

User testing revealed that despite rapid increases in technology ownership and use, for many Rwandan youth, especially those with lower incomes, using a smartphone or tablet is a new skill. CyberRwanda had to be designed to be accessible and usable for 2 distinct groups: young people who had never used a smartphone before with minimal digital literacy and those with prior use and greater fluency in using tablets/smartphones. User testing allowed the team to observe where young people became confused or lost interest and allowed them to make design changes that made the user experience as streamlined and

intuitive as possible. It was critical to engage those with low or no digital literacy in user testing, as features and navigations that are often assumed to be straightforward by young people with greater technological capabilities often become standard design specifications in digital solutions. Engaging those with lower digital literacy in user testing allowed the product team to more carefully integrate user flows that were more intuitive for an audience with minimal digital capabilities or experience. In Rwanda, online ordering is relatively new, even for experienced technology users. For the shop feature, where youth can order health products, prototyping informed the addition of written simple instructions to onboard new users, design elements to make action and navigation items easily noticeable, progress indicators, and simplification and shortening of the order process overall. In response to youth requests, we developed 2 instructional videos: one to help youth understand the CyberRwanda features and a second to help them navigate an unfamiliar process of online ordering and product collection at the pharmacy.

### ■ IMPLICATIONS FOR FUTURE PRACTICE AND RESEARCH

The HCD process, driven and led by youth, was used to understand the complex user needs regarding FP/RH and promoted the routine testing, learning, and refinement of initial ideas. It paved a supported pathway toward implementation and evaluation by ensuring that the ultimate intervention was desirable among many key stakeholders, feasible for nationwide implementation and scale. Some implications for future practice and research follow.

### ■ HCD OFFERS FOUNDATIONAL METHODS AND MINDSETS TO SUPPORT CONTINUED ITERATION THROUGHOUT IMPLEMENTATION

Using an adaptive implementation approach, the findings from routine user testing and the impact evaluation will inform iterations to the program and digital product design throughout the project timeline. Applying HCD during the implementation and evaluation stages of the intervention lends itself well to adaptive learning and iteration; allowing for new information to be continuously introduced that promotes rapid and informed decision making about which intervention elements



need to be strengthened or abandoned.<sup>24</sup> To achieve these aims, CyberRwanda will operate on a product release cycle where every 3 months the team reviews historical data to assess what new features to implement and how to make improvements. Monitoring data are collected from intervention sites and pharmacies routinely to identify areas of improvement and correct any issues that are disrupting site use. Qualitative interviews with participants are conducted on a routine basis to understand and supplement data gathered from quantitative data collection efforts. By taking this approach, HCD may help to support the long-term sustainability and cost-efficiency of the intervention by assuming a gradual approach to product launch and scale and addressing implementation challenges early and often, rather than relying solely on endline results.<sup>25</sup>

### Iterative and Equity-Centered Approaches to Design Can Allow for the Inclusion of New Technology Users in Digital Initiatives

Digital self-care or direct-to-consumer approaches like CyberRwanda have the potential to offer the privacy that young people prioritize in FP/RH service delivery, yet require careful design to ensure usability by a broad range of users.<sup>26,27</sup> User testing of early product versions revealed usability challenges that were addressed and retested in iterative cycles. This iterative approach to design and testing allowed the team to test assumptions and observe which features needed improvement to enhance the user experience and flow. To ensure digital equity and inclusion, particularly among those with limited or no access to technology, the team was intentional about sampling a diverse spectrum of participants regarding socioeconomic status, educational status, social vulnerabilities, and those from rural, urban, and peri-urban contexts. Recruitment of diverse participants was a recurring challenge during this project, and appropriate time and funding are needed to support inclusive recruitment. This article, along with other international digital health guidance from the World Health Organization,<sup>28,29</sup> offers methods to inform a final product design and implementation model that is inclusive of diverse user groups. The forthcoming RCT will provide much-needed data on uptake and sustained use of the platform, disaggregated by age and gender among diverse youth populations.

### Engaging Youth Throughout the Design Process Requires Special Considerations, Particularly When Designing for Taboo Topics

Given the unique set of vulnerabilities and inherent power dynamics present when designing with youth on sensitive sexual and RH topics, there is a critical need for design teams to identify and plan for any risks that would compromise youths' safety or compromise the quality of their engagement. The importance of upholding the continued safety and dignity of young people in the HCD process has gained special attention within the adolescent sexual and RH and HCD community of practice. Recently, several actors in the HCD community released a set of guiding principles for the safe and ethical engagement of youth during adolescent and sexual RH program design.<sup>12</sup> In line with these guiding principles, the team took extra care to address power differentials between young people and program teams. Throughout CyberRwanda's design phase, the project team sought to ensure the safety, dignity, and ethical participation of youth. During the initial design phases, the project team leveraged gateway activities focused on popular culture, future aspirations, and leisure activities as gateway topics to explore more taboo topics. Doing so enabled the team to provide a safe space for open and generative conversation with youth participants and created a foundation to explore sensitive sexual health topics. The emphasis on safeguarding and protection of youth was considered essential throughout all phases of the HCD process to protect young people's safety and wellbeing. To maintain the safe and ethical participation of youth beyond the design phase throughout implementation, there was a clear need to understand what framing would be acceptable to parents, as key influencers and decision makers in their children's lives. The visioning of CyberRwanda as a guide to future success was co-created through the sessions with parents and has been a foundational framing for the project to date.

## CONCLUSION

Using HCD as an end-to-end approach was instrumental in guiding the team to learn, test, and refine the intervention before implementation and evaluation. It provided a natural approach to center young peoples' needs, aspirations, and perspectives into the intervention design by having youth lead design research, prototyping, and data

**HCD may help to support the long-term sustainability and cost-efficiency of the intervention by addressing implementation challenges early and often, rather than relying solely on endline results.**

collection efforts with their peers. The process toward designing and implementing CyberRwanda has demonstrated the value of supporting youth-driven or youth-led HCD approaches that shift decision-making power to young people through funding, mentorship, and training. Furthermore, the HCD process provided a structure to integrate and blend technical and design expertise to ensure the intervention content was grounded in the adolescent health evidence and best practice, and the visual and product design was developed with user needs, access capabilities, and preferences in mind. Through trial and learning through continuous data collection and iteration, HCD informed a product and service design model that prioritizes digital equity. Through continuous learning and refinement, CyberRwanda's hybrid implementation model was designed to meet the full spectrum of digital access and literacy and to reach vulnerable youth without access to technology. CyberRwanda's forthcoming RCT will generate critical new data in fields of digital health for adolescents and social and behavior change communication. By assessing the difference between young people in the self-service and facilitated arms, findings will reveal the impact of a digital intervention as a stand-alone (self-service model) versus that with a person-to-person component (facilitated model). These findings will demonstrate which programmatic components lead to behavior change and how best to implement digital interventions for youth.

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involved in study design; data collection, analysis, and interpretation; and in writing the manuscript.

**Author contributions:** NI and RH conceived the structure of the paper, summarized relevant evidence, and authored the framework for design with youth. MS, RH, and NI conducted much of the early design research and prototyping. LB and MS led the implementation of later-stage user testing and the pilot study, and refinements to the final intervention based on data gathered. LB managed on-the-ground operations for the implementation of the project. All authors were major contributors in writing, reviewing, and approving the final manuscript.

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## En Français

### Utiliser le Design Centré sur L'humain Pour Développer, Lancer et Évaluer Une Plateforme Nationale de Santé Numérique Pour Améliorer la Santé Reproductive Pour la Jeunesse du Rwanda

#### Principales constatations

Utiliser l'approche du design centré sur l'humain durant la conception et la phase de la mise en œuvre avec les jeunes et les parties intéressées a conduit à des pivots majeurs du produit, de la mise en œuvre et l'évaluation de la conception d'un produit de santé numérique pour la jeunesse du Rwanda.

En utilisant la processus du design centré sur l'humain pour développer CyberRwanda, il était crucial d'inclure une population diversifiée de jeunes gens et des parties intéressées, tous en tant que collaborateurs et leaders dans le processus d'une conception axée sur les jeunes.

Donner la priorité à un accès équitable a conduit à la conception des interventions pour les utilisateurs avec ou sans leurs dispositifs mobiles et en variant les niveaux d'alphabétisation numérique et de l'expérience avec la plateforme numérique.

#### Les principales implications:

Les organisations qui développent les produits de la santé numérique pour les jeunes devraient considérer une approche de bout en bout du design centré sur l'humain pour le modèle du développement du produit et de l'intervention.

Avec l'intérêt croissant et l'investissement dans les interventions en santé numérique, surtout ceux qui soutiennent les produits destinés directement aux consommateurs, les bailleurs devraient soutenir et encourager les fonds et le temps pour la co-conception, le développement et le prototypage avec le public désigné durant les phases de la conception et la mise en œuvre.

Les professionnels du design centré sur l'humain centrés sur les jeunes ont besoin de s'assurer qu'il y a une bonne représentation de différents groupes de jeunes, prendre soin d'adresser le déséquilibre des pouvoirs parmi les jeunes et les concepteurs, et s'assurer qu'ils ont des politiques et pratiques solides en matière de sauvegarde.

## RÉSUMÉ

**Contexte:** Un manque d'accès aux soins et à une information fondée sur les faits, impartiale et une planification familiale et de santé reproductive adaptée aux jeunes limitent la capacité aux jeunes d'éviter les grossesses non planifiées, le VIH et les maladies sexuellement transmissibles. Ceci

menace leur santé et devient la cause majeure d'abandon scolaire, limite le bien-être des jeunes, leur potentiel pour l'avenir, et les opportunités d'emploi. Pour remédier à ces problèmes, Ylabs a utilisé une approche de bout en bout du design centré sur l'humain en créant CyberRwanda, une plateforme numérique qui a pour objectif d'améliorer la santé et les moyens de subsistance des adolescents (âgés de 12 à 19 ans) au Rwanda.

**Concevoir pour le numérique avec les jeunes:** Depuis 2016 jusqu'en 2020, CyberRwanda a été conçu et testé en utilisant l'approche du design centré sur l'humain en partenariat avec plus de 1000 jeunes gens, parents, enseignants ainsi que les prestataires de soins publics et privés. Pendant la phase de la reconnaissance du problème, le design centré sur l'humain a révélé les croyances des participants, leurs préférences comportementales et leurs expériences en particulier avec la planification familiale et la santé reproductive ainsi que leur expérience en générale de la vie de tous les jours, les motivations, les aspirations, et les défis. Plusieurs phases notamment de prototypage analogues et numériques avec les jeunes et les décideurs clés ont été utilisées pour concevoir conjointement, tester et améliorer l'intervention pour la mise en œuvre.

**Les résultats:** CyberRwanda est une plateforme axée sur le consommateur où les adolescents peuvent apprendre des informations sur la santé appropriées à leur âge et qui renforcent leurs compétences à travers des histoires éducatives tournées vers le changement du comportement, une rubrique des questions fréquemment posées, commander en ligne des produits de santé et être connecté au réseau CyberRwanda des prestataires de soins privés et publics qui ont été formés pour des soins adaptés aux adolescents.

**Les implications pour les futures recherches:** Le processus du design centré sur l'humain a abouti à des pivots significatifs dans la conception de la plateforme numérique et du modèle de la mise en œuvre. Utiliser le design centré sur l'humain a fourni une méthodologie structurée pour combiner l'expertise technique de la planification familiale et de la santé reproductive et l'expertise de la conception du produit pour concevoir conjointement et répéter une intervention de santé numérique avec et pour la jeunesse rwandaise.

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## PROGRAMMATIC REVIEW AND ANALYSIS

# Integrating Human-Centered Design to Advance Global Health: Lessons From 3 Programs

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### Key Findings

Reflections from 3 global health programs using human-centered design (HCD) offer 3 categories of lessons for those considering similar approaches:

- Planning while considering the needs of both traditional global health and HCD approaches
- Engaging key stakeholders to build understanding, alignment, and buy-in from the outset
- Applying approaches differently from the way both designers and global health actors are accustomed to working to promote long-term program sustainability and learning

### Key Implications

- If implemented appropriately, integrating HCD into global health programming can produce a virtuous cycle between co-creation, stakeholder buy-in, and quality of outputs. The more that programs engage stakeholders in an inclusive, participatory process, the greater their continued willingness and motivation. This in turn allows for more iteration and higher quality, better-tailored outputs that are more likely to be sustainably used and scaled.
- To engender this virtuous cycle, programs that incorporate an HCD approach will need to be scoped differently than traditional global health programs (e.g., more flexible timelines; dedicated budget for implementation and capacity building, etc.).
- Because stakeholders may perceive a higher risk of failure with a new approach, proponents of HCD are faced with a substantial burden of evidence to persuade actors to consider its benefits. However, traditional global health actors should consider alternative approaches to measuring HCD's contributions, including perceived end user value.

### ABSTRACT

**Background:** Human-centered design (HCD) is increasingly being used as a complementary approach to traditional global health methods due to its ability to bring new ideas to entrenched problems, integrate multiple stakeholder perspectives, and bring in a strong human lens among other advantages. To reap these benefits, public health and design practitioners in global health programs can learn from the early experiences of integrating HCD to advance these efforts.

**Objective:** This article distills lessons gathered from 3 programs leveraging HCD to advance global health programming: (1) the “V” program which used an HCD approach to reframe the once-a-day HIV prevention pill from a potentially stigmatizing medicine into empowering self-care; (2) the Adolescents 360 program which integrated HCD to create a service for adolescent girls to access contraception in Ethiopia and to scale this offering nationwide; and (3) Reimagining TA which used HCD to help shift perceptions around traditional technical assistance models to one of co-creation, defining a new approach for non-financial support for health systems strengthening.

**Findings:** To inform global health programs that are considering employing an HCD approach, lessons learned are distilled into 3 categories: (1) planning: considerations for problem definition and project scoping to allow for flexibility and selection of appropriate methods; (2) engaging: reflections on the means to productively engage different stakeholder groups to build alignment, understanding, and buy-in; (3) applying: adoption of new ways of working during implementation to best take advantage of the benefits of HCD while promoting long-term program sustainability and learning.

**Conclusion:** These lessons represent an important step on the pathway to demonstrate the contributions of HCD to improving the effectiveness of health programs at a time when the global health community needs the most robust set of tools possible to meet the demands of our current pandemic context and beyond.

### BACKGROUND

Despite the billions of dollars expended for global health in the last decade, the global community remains far from achieving many of the ambitious Global Goals for Sustainable Development (SDGs) for health.<sup>1</sup> Global malaria cases and deaths have plateaued, progress toward ending preventable maternal deaths has slowed, and despite remarkable global progress on under-5 mortality, stark disparities persist between regions.<sup>2,3</sup> Over the

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past year, advancement toward these goals has been further eroded due to the primary and secondary effects of COVID-19. For example, due to interruptions in service delivery, immunization coverage has fallen to rates last experienced in the 1990s.<sup>4</sup> Global health programming seeks to address these challenges.<sup>5–7</sup> In particular, the learnings in this article are targeted toward large, multistakeholder partnerships—often constituting a combination of a funder, an implementing partner(s), and local government—implementing public health interventions in low- and middle-income countries at a national or international scale and reaching a substantial proportion of the target population.<sup>8–10</sup> Human-centered design (HCD) is increasingly being used in global health programs as a complement to traditional public health methods due to its ability to bring new ideas to entrenched problems, inclusively integrate multiple stakeholder perspectives, and bring in a strong human lens, among other advantages.<sup>11–21</sup>

Recognizing that while HCD has its limitations, this article seeks to illuminate reflections and lessons learned from 3 global health programs that sought to integrate this approach. Reflecting on these experiences, this article can benefit both traditional global health funders and implementers seeking to introduce HCD into their work and/or improve the effectiveness of existing projects, as well as designers seeking to use their HCD skills to advance global health. These reflections aim to help both groups successfully integrate their different approaches to reap the benefits of HCD in the context of global health programs.

## ■ INTERVENTIONS

The 3 programs discussed in this article all integrated HCD into traditional global health programming, but they vary in important ways that can illuminate learnings for a broad range of global health programs (Table).

### V

In 2015, the U.S. Agency for International Development (USAID) engaged a consortium of partners led by CONRAD, and including IDEO and Matchboxology, to identify a new approach to offering oral pre-exposure prophylaxis (PrEP) to adolescent girls and young women (AGYW). While access to oral PrEP is scaling up across sub-Saharan Africa, low rates of initiation and retention continue to limit the progress toward ambitious, global goals for AGYW.<sup>23</sup> USAID hypothesized that an HCD approach could help program implementers

better understand what AGYW want when it comes to HIV prevention, shifting from the more traditional “demand creation” to “desire creation.”

Formative research in South Africa included user journey mapping and highlighted a negative, overmedicalized experience of PrEP. Based on this research, “V” was co-created with AGYW through prototyping and testing, resulting in a radically reframed PrEP experience from a potentially stigmatizing medicine into empowering self-care. V is introduced through brand ambassadors and initiated using a starter kit that mimics a makeup bag, including a small pill case that silences pill rattling and can be shown off or disguised as a lip balm case.

In 2019, USAID engaged the Engage Design consortium—led by McKinsey Design, Matchboxology, and research partner PATH—to partner with USAID/Zimbabwe’s leading HIV prevention service delivery partners to adapt V for program implementation. Due to COVID-19, implementation was paused but has recently resumed, with results expected in late 2021.

## Adolescents 360 Ethiopia

Adolescents 360 (A360) is a 4-year initiative (2016–2020) to increase adolescent girls’ access to and demand for modern contraception in Nigeria, Ethiopia, and Tanzania. A360 is implemented by Population Services International (PSI) and in partnership with IDEO.org, the Center on the Developing Adolescent at the University of California, Berkeley, and the Society for Family Health Nigeria, and cofunded by the Bill & Melinda Gates Foundation and the Children’s Investment Fund Foundation. A360 used HCD alongside other disciplines of social marketing, developmental neuroscience, and anthropology to develop innovative country-specific interventions through an iterative process of researching, testing, prototyping, and piloting ideas with girls and other stakeholders. The first 2 years were dedicated to program design and optimization, while the second 2 years were focused on implementation and scale-up.

The HCD approach applied led to the development of Smart Start, an intervention that uses financial planning as an entry point to engage young married couples in planning their futures and reaching financial stability, positioning contraception as a tool to achieve their self-defined goals. Smart Start supports girls aged 15–19 years and their partners to understand the resources they will need for the families they desire.

As of September 2020, Smart Start has reached 76,480 girls in Ethiopia, with 35,887 (79% of eligible

**The reflections in this article aim to help both global health practitioners and designers successfully integrate their different approaches to reap the benefits of HCD in the context of global health programs.**

**TABLE.** Featured Program Characteristics and Approaches to HCD Integration

	Project V	A360	Reimagining TA
Scope	Product	Program	System
Goal	Reframe oral PrEP to increase demand and adherence	Increase demand and access to modern contraception	Inspire and plant a seed for system change for improved TA
Target audience	Adolescent girls and influencers (parents, partners, health care workers)	Married adolescent girls	Global and in-country users, buyers, and implementers of TA
HCD dose (i.e., Design as an ingredient; Design as a spark; Design end-to-end) <sup>22</sup>	Design end-to-end	Design as an ingredient	Design as a spark
Duration	South Africa: 2015–2018 Zimbabwe: 2019–present	2016–2020	2018–2020
Application of HCD to advance global health programming	How HCD can reframe a product (shifting the perception of oral PrEP from medicine to self-care) to advance an HIV prevention service delivery program	How HCD can be used to define a new service delivery solution (“Smart Start”) that can be adopted by the ministry of health and rolled out countrywide	How HCD can be used to redefine program planning and delivery itself (technical assistance) in the context of global health programs
HCD methods employed	Market (literature review, stakeholder interviews) and design research (immersions, workshops), synthesis (user journey mapping), prototyping	Design research, synthesis, prototyping	Design research (stakeholder interviews), co-creation workshops, and design sprints
Outputs	Four-pillar implementation approach drawing inspiration from fashion and beauty brands, including a starter kit styled after a makeup bag that includes a lip balm shaped pill case that silences rattling	Smart Start, a program that uses goal setting and financial planning as an entry point to discussing the role of contraception with young married couples.	1. Nine critical shifts that need to occur to transform the current TA system. These shifts are a bridge between the identified challenges of current approaches and the future vision 2. Twenty design principles of good TA for global and local stakeholders
Funders and partners	South Africa: PEPFAR-supported, USAID-managed via Project EMOTION Zimbabwe: PEPFAR-supported, USAID-managed via Engage Design, in partnership with PSI, PZAT <sup>a</sup>	PSI, IDEO.org, Center on the Developing Adolescent at UC Berkeley, Bill & Melinda Gates Foundation, Children’s Investment Fund Foundation	Bill & Melinda Gates Foundation, Child Health Task Force Secretariat (through JSI), Sonder Collective

Abbreviations: HCD, human-centered design; JSI, John Snow Inc.; PZAT, Pangaea Zimbabwe AIDS Trust; PEPFAR, U.S. President’s Emergency Plan for AIDS Relief; PrEP, pre-exposure prophylaxis; PSI, Population Services International; TA, technical assistance, UC, University of California; USAID, U.S. Agency for International Development.

<sup>a</sup>V Zimbabwe was created in collaboration with adolescent girls and young women, health care workers, and a global network of partners led by Engage Design—a human-centered design partnership including McKinsey & Company, Matchboxology, and PATH—alongside PSI Zimbabwe, Pangaea Zimbabwe AIDS Trust, and the Zimbabwe Ministry of Health and Child Care. V Zimbabwe is infused with the spirit of EMOTION, a CONRAD-led partnership with IDEO, Matchboxology, Abt Associates, CAPRISA, and Instant Grass, that launched V (<https://www.conrad.org/launchingv/>). V Zimbabwe was made possible by the support of the American people through the United States Agency for International Development (USAID) under the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) through EngageDesign contract 7200AA18M00011 and EMOTION Cooperative Agreement AID-OAA-A-15-00033.

girls who are not pregnant and not using contraception) of those voluntarily adopting a form of modern contraception. It is currently being implemented in 1,070 sites across the country and the Ministry of Health (MOH) is embedding it in the national health extension worker program. PSI has also introduced and adapted Smart Start for adolescent girls in Mozambique.

## Reimagining Technical Assistance

Reimagining Technical Assistance (Reimagining TA) was a 2-year project (2018–2020) funded by

the Bill & Melinda Gates Foundation and implemented by the Child Health Task Force Secretariat through John Snow Research & Training Institute (JSI R&T) and Sonder Collective. TA has been criticized for failing to align with country priorities or coordinate with governments and other stakeholders, often focusing on short-term wins, and lacking systematic approaches to solve public health challenges.<sup>24–26</sup> The project goals were to invite in-country TA stakeholders to engage in a co-creation process to map current barriers and opportunities in how TA is designed and delivered; co-create a

Traditional global health practitioners needed to adapt their approaches to consider the flexibility, iterative nature, and sometimes elongated time frames that HCD requires to produce robust results.

shared vision and concepts for the future of TA; and test, iterate, and develop new models for TA in [Nigeria](#) and the [Democratic Republic of Congo](#) (DRC). To achieve these goals, the project team adopted an integrated approach that combined HCD, co-creation, and systems thinking. The HCD aspects of the process involved activities to understand the human experience of TA, including attitudes, motivations, and behaviors, as well as social determinants, including social norms and group identity. In each country, the project used HCD and co-creation processes that included workshops, design sprints, and stakeholder interviews. The system's thinking included mapping the journey of TA planning and delivery that recognized interactions among international, several national government departments, and subnational actors as opposed to a single project addressing a technical intervention.

The project co-creation teams identified 9 critical shifts and 20 design principles of good TA for global and local stakeholders, which serve as a platform for alignment, inspiration, and action toward a re-imagined TA.

LESSONS LEARNED ACROSS PROGRAMS

Reflections on these projects hold lessons for global health practitioners and designers seeking to advance global health programming through HCD. Learnings can be broadly distilled into 3 categories: (1) planning: considerations for problem definition and project scoping to satisfy integration of HCD methods; (2) engaging: reflections on the means to productively engage different stakeholder

groups to build alignment, trust, and buy-in; and (3) applying: adoption of new ways of working during implementation to best exploit the benefits of HCD while promoting long-term program sustainability and learning ([Figure](#)).

1. Planning

Across the 3 programs, early project planning phases were critical to realize the benefits of HCD methods. Traditional global health practitioners needed to adapt their approaches to consider the flexibility, iterative nature, and sometimes elongated time frames that HCD requires to produce robust results. Similarly, designers needed to invest time during the planning phase to understand how design could best add value.

Allow the Problem Definition to Evolve

Because HCD is a creative problem-solving approach, projects must have a clear, baseline problem definition that is developed and refined through research with end users and other stakeholders. However, experiences of these programs also suggest that continuing to iterate on the problem definition throughout the project can advance better outputs.

For example, in A360 Ethiopia, the program initially sought to achieve 121,000 new users of contraception, aged 15–19 years over 4 years. However, after the insights gathering phase, the team uncovered 3 different segments in this age bracket that would require different solutions: unmarried girls in school, young married adolescents, and young adolescent mothers. This fueled a conversation about redefining the scope of the

FIGURE. Summary of Lessons Learned Across 3 Projects on Integrating Human-Centered Design Into Global Health Programming

PLANNING	ENGAGING	APPLYING
<p><b>Allow</b> the problem definition to evolve</p> <p><b>Build</b> in iteration and allow for pivoting</p> <p><b>Understand</b> the possibilities and limitations of each approach</p>	<p><b>Emphasize</b> alignment and understanding among partners</p> <p><b>Establish</b> ownership with key stakeholders early in the process</p> <p><b>Identify</b> partners with strong adaptive management capacity</p>	<p><b>Engage</b> users as technical experts in a true co-creation approach</p> <p><b>Don't stop</b> at insights</p> <p><b>Embed</b> design skills among partners</p> <p><b>Develop</b> design-sensitive monitoring and evaluation frameworks</p>



project, the user segment, and the appropriate targets, which ultimately laid the foundation for designing a highly tailored program for one of these segments.

V's formative research in South Africa suggested that V would be most impactful if it was positioned as a consumer brand. Consequently, the materials were designed with a look and feel that was intentionally distinct from traditional public health communication materials. However, when translating the product for use in Zimbabwe, users wanted V to be linked to current oral PrEP offerings through public health programs to avoid confusion. For future replication, the team recommended that a rapid, low-resource validation within an existing program be conducted first. This would allow the designers leading the HCD process to facilitate the initial phase of problem definition based on an understanding of the specific country and program context.

In Reimagining TA, the timeline, project approach, and funding had been allocated to the implementing partners with the assumption of a single, broad problem definition. However, though all actors agreed that the TA delivery was broken and needed to be reconceived, during the initial in-country workshops the design team discovered that the problem with TA was more complex and nuanced than previously understood. For example, while there was consensus that the current timeframes for TA projects were not appropriate, funders preferred shorter-term TA projects and near-term results, while governments wanted several years of TA to strengthen the underlying capacity of the health system to deliver long-term and sustainable results. These multiple and partly diverging problem definitions between global, national, and local stakeholders were at odds with the ability to undertake a fast HCD process. A more collaborative problem definition phase could have helped establish a clear, shared intent for the work and identify solutions more suited to the needs of stakeholders at all levels.

### **Build in Iteration and Allow for Pivoting**

The HCD process is rooted in deep inquiry and open exploration to surface new insights and develop innovative products or processes together with the users of those solutions. As a result, the prototype or proposed solution will rarely be the one to scale. This process of iteration and adaptation can often take more time and can be in tension with the more linear structure of traditional global health programs. Recognizing this tension and building in more time and resources for a

rigorous, iterative HCD process can enable global health programs to reap the benefits of HCD.

From the beginning, A360 Ethiopia had a generous timeline and expectation for program adaptation, which allowed the initiative to be successful at scale. In the solution design phase, there were 3 rounds of rapid prototyping before a 6-month pilot. Through these iterations, the team quickly validated the value proposition of financial planning for young couples, experimented with how to best communicate the relationship between financial and family planning, and ultimately, refined the delivery model for this intervention for married adolescents in rural Ethiopia. In the second year, even after the Smart Start financial planning curriculum was launched, a second short design sprint helped condense the curriculum from 60 pages and 1 hour to 12 pages and 15 minutes, making it much easier for health extension workers to integrate these messages into their work.

Similarly, in Reimagining TA, the team found that conducting a design process within a complex system requires time. While the donor originally allocated funding for an 8-month timeline, the project ultimately took 24 months for several reasons. First, the project encountered logistical constraints. Co-creation workshops required direct engagement with country-level stakeholders, particularly government officials, who had limited availability, and that was exacerbated by personnel turnover in key roles post-elections. Second, in the case of the DRC, the first round of prototyping surfaced problems at the community level that resulted from poorly designed TA, including lack of consideration of the burden of out-of-pocket health costs on the families, lack of dialogue with community leaders, and duplication of activities in the field. The team decided that a second round of prototyping was needed to identify the root, systems-level problems. Third, once the timeline began to get delayed, amendments to the pre-defined project plan and budget took additional time.

To address these challenges, the project concept should be codesigned by the funder, the content and process experts, and the collaborating government entities. With all key stakeholders at the table, expectations would be clarified, roles and responsibilities agreed upon, accountability mechanisms established, and funding allocated based on a realistic timeline and level of effort. Ultimately, a timeline that allows for co-creation of the vision, iteration, and exploration throughout the process is crucial to consider for successfully integrating HCD into health programs.

**Building in more time and resources for a rigorous, iterative HCD process can enable global health programs to reap the benefits of HCD.**

**A timeline that allows for co-creation of the vision, iteration, and exploration throughout the process is crucial to consider for successfully integrating HCD into health programs.**

For A360 Ethiopia, navigating the institutional review board (IRB) process surfaced tensions between HCD's discovery-driven and public health's pre-articulated research approach. For public health practitioners, IRB approval is required when deemed necessary to protect the human subjects of research. HCD practitioners are accustomed to open and fluid lines of inquiry with users to discover new and unexpected insights and often utilize market research approaches that are exempt from IRB requirements. A360 Ethiopia pursued IRB approval in line with the principles of its [Commitment to Ethics in Youth-Powered Program Design](#). Initial IRB feedback stated that A360 did not have an adequate sample size and had to change the wording of questions and limit their methods to a specific set of 9 approaches. The requirement to submit the design research plan 6 to 9 months in advance of project launch also limited the design team's ability to adapt their methods as needed throughout the process. The IRB process did help pre-articulate the lines of inquiry that would truly advance programming while eliminating those that are potentially extractive and not relevant to programming. A360's experience demonstrates how adhering to ethical standards in design can be achieved while maintaining the uniquely iterative nature of design research. For example, future HCD practitioners can learn from A360's approach of including in the final IRB application a range of approaches, such as "inquiry questions may include" "we will speak to a maximum of X people." By pursuing discovery-driven approaches that also promote documenting methods and results, HCD practitioners can advance the diffusion of potentially catalytic approaches such as design, while ensuring common ethical standards across the global health and design communities.<sup>27</sup>

### **Understand the Possibilities and Limitations of Each Approach**

Part of the value of embedding HCD in global health programming is the opportunity to use it in combination with traditional public health methods and other complementary methodologies. Each of the program experiences highlighted the importance of identifying the specific areas where HCD can add value and where other approaches can be useful (and where these have limitations). Further detail on the value of design as a complementary methodology is detailed in a separate article in this supplement.<sup>28</sup>

The experience of V demonstrates how HCD can be used to build on existing knowledge and derive new solutions. V's formative findings reinforced well-documented opportunities (e.g., how female-controlled HIV prevention products can capitalize on the concept of control for young women struggling with a lack of agency) and challenges (e.g., how discretion is needed to combat the stigma associated with a product whose users are perceived as engaging in risky sexual behavior).<sup>29</sup> V's solutions build on well-established social marketing principles, such as linking health products with desirable private sector positioning and messaging, and well-researched interventions, such as pill cases' ability to improve adherence.<sup>30</sup> HCD's unique contribution was the ability to build on these known truths and design a new solution tailored to the needs of the target segment. If successful, V will demonstrate how aligning oral PrEP with a beauty product promotes both desirability and behavior change (e.g., by taking advantage of existing wellness routines to promote adherence), discretion and control (e.g., through its ability to be concealed as a nonmedical consumer product), practicality and delight (e.g., by offering a pill case with design elements that meet young women's unique needs in a novel form not available at their local pharmacy).

In Reimagining TA, the team found that with a project as complex as reimagining a system of service delivery at global scale, other approaches such as systems thinking and behavioral science would have been useful in addition to HCD. The project's HCD approach centered around mapping the human experience of TA, the user needs of different actors involved, and journeys through different TA programs. This helped to understand people, their interactions, and the complexity of those interactions. However, a systems-thinking approach could have helped better identify linkages and power dynamics in these systems that could be targeted for change. In addition, reimagining a system involves changing the behavior of the people in that system. The HCD approach in this project did not apply a behavioral science approach to analyze behavior to propose a behavior change strategy.

## **2. Engaging**

While implementing these projects, both traditional global health actors and designers found that they needed to adapt their traditional ways of working to successfully collaborate on integrating HCD into global health programming. Teams

found an initial start-up phase useful to build alignment, understanding, and trust among the different groups involved. They also found that establishing ownership with MOHs, implementing partners, and other key stakeholders early in the process was particularly important for sustainability, as was identifying partners with strong existing capacity in adaptive management.

### **Emphasize Alignment and Understanding Among All Partners**

Embedding HCD in a global health program requires a shift in the way both global health practitioners and designers are accustomed to working. The 3 projects thus noted that a start-up alignment phase would be helpful to clearly delineate roles and responsibilities of each partner in the HCD process and familiarize traditional global health actors with the baseline components of the HCD approach.

In Reimagining TA, no such start-up phase was built in for Sonder and JSI to align on process and approach. The design team had to orient the JSI team to the HCD methodology and approach while simultaneously kicking off activities in-country, as the JSI team had not worked with HCD before. Equally, the design team needed time to understand the country's context and effective ways of working with the national governments. The lack of time to align on how to integrate a consultant-led design process into the global health program exposed a lack of mutual understanding in terms of ways of working. This created confusion, mutual questioning of the project approach, and a lack of clarity around roles and responsibilities. Had there been an initial codesign and planning phase for the 2 organizations to deeply engage with the planned approach and methodology, reflect on the country context and its impact on the process, build mutual understanding and trust, map out roles and responsibilities carefully, and align the timeline accordingly, the project would have been delivered in a more targeted, streamlined, and effective manner.

Conversely, V invested time and resources to transition formative research conducted in South Africa to testing, adapting, and integrating the approach into HIV programming in Zimbabwe. The prototypes of the V starter kits and distribution plans developed in South Africa were not automatically transferable to a new context given the procurement realities of supplying large, U.S. government-funded programs. Ultimately, implementing V in Zimbabwe required procurement

through an existing U.S. government supply chain mechanism focused on pharmaceutical product procurements, which required a competitive contracting process. The start-up planning phase in Zimbabwe was essential to transition from prototyping to program implementation. In addition, because of the investment of time and effort in procuring through an existing U.S. government supply chain mechanism, V is now much more accessible for other country teams who might want to procure it.

### **Establish Ownership With Key Stakeholders Early in the Process**

In traditional global health programming, partnerships are already regarded as important, particularly partnerships with MOHs, to build buy-in and promote sustainability. However, when adding in a less familiar HCD approach, generating early buy-in was even more important.

The key to A360 Ethiopia's sustainability was its early and flexible partnership with the MOH. Because A360's objectives closely aligned with the National Adolescent and Youth Health Strategy targets for reducing teen pregnancy, the MOH participated early in A360's proposal development. While the MOH was skeptical of the longer timeline and programmatic delays that an intensive co-creation approach would entail, inviting young designers to present the insights and opportunities that emerged from design research ultimately helped convince the MOH of the approach. It was a powerful signal, coming directly from their constituents, about what change was needed and whose voices needed to be heard to address teen pregnancy. Design afforded the rare and insightful opportunity for the MOH to hear directly from constituents that they may not have had otherwise.

For Reimagining TA, a lack of strong government buy-in affected the quality and speed of the co-creation process. Given the limited timeline for securing government buy-in, the government accepted the initiative without full awareness of and commitment to the level of engagement needed for a true co-creation process. As the project was one among many donor-funded projects competing for stakeholder time and attention, it lost out against other priorities that were included earlier in the country's operational plans. As previously noted, including the country governments in co-creating the project concept could have helped to achieve greater buy-in.

**A start-up alignment phase would be helpful to clearly delineate roles and responsibilities of each partner in the HCD process and familiarize traditional global health actors with the baseline components of the HCD approach.**

**The experiences of these projects suggest that partners with strong adaptive management skills are best suited to continue to test, learn, and improve the solution to bring it to scale.**

**Experiences from these projects suggest that it is necessary to engage in a true co-creation process, involving the end users and stakeholders at each stage of the work, rather than a more prescriptive, donor-recipient relationship.**

### ***Identifying Partners With Strong Adaptive Management Capacity***

The HCD process is based on the rapid development of prototypes and iteration, which means that the output of a project is never truly “finished.” The experiences of these projects suggest that partners with strong adaptive management skills (i.e., the ability to make adjustments based on new information) are those best suited to continue to test, learn, and improve the solution to bring it to scale.

For the Reimagining TA project, the Technical Assistance Hub (TA Hub), an initiative of the Bill & Melinda Gates Foundation Nigeria country office and implemented by DAI Nigeria, was able to adopt, adapt, and use the project outputs. The TA Hub is an independent nonprofit organization that coordinates the delivery of comprehensive technical assistance and institutional strengthening support to state governments in Nigeria. DAI staff participated in the Reimagining TA process as co-creation team members and were later able to apply the reimagined TA approach. Now, all partners applying to provide TA to state governments in Nigeria with funding from the TA Hub are required to demonstrate how they will apply the critical shifts and principles of good TA. Identifying a partner with the capacity to adapt and iterate on the project outputs was critical to the project’s implementation.

For A360 Ethiopia, a key factor for success was PSI Ethiopia building an institutional culture of adaptive management, which allowed the Smart Start solution to scale beyond the initial design phase. After the initial work was completed, the PSI Ethiopia team created an internal “Learning and Insights Team,” which continued to practice design and adaptive management, including routine data monitoring, conducting focus groups, and taking action to adjust key program components as needed when scaling to a new region or training a new tier of health workers. This has allowed them to quickly identify and adjust program components when scaling to a new region or training a new tier of health workers.

## **3. Applying**

When putting HCD into practice in the context of global health programming, both designers and traditional global health stakeholders found they needed to adapt their typical approaches to implement an integrated program. First, to develop outputs tailored to the needs of the end user, teams found it critical to engage in a true co-creation

process with end users and other stakeholders throughout the project, with each participant adding equal value; this represented a shift for more traditional global health actors. Second, though some HCD projects end with insight generation, in this work, teams found it necessary to push toward implementation of the product or service to promote uptake of the final outputs. To ensure the program can continue once the core work has concluded, teams found that building HCD capacity among the consortium of partners allowed them to continue to iterate and adapt the solutions based on the needs of the target population. Finally, when designing monitoring and evaluation (M&E) frameworks for these programs, either traditional global health actors or designers needed to adapt their approach to identify a set of indicators well-suited to the integrated approach.

### ***Engage Users as Technical Experts in a True Co-creation Approach***

Traditional global health programs and HCD projects vary in the degree to which they include and embed input from end users and other key stakeholders. In traditional global health programming, consulting end users and including other key stakeholders at key decision points is not a new concept. However, experiences from these projects suggest that it is necessary to engage in a true co-creation process, involving the end users and stakeholders at each stage of the work, rather than a more prescriptive, donor-recipient relationship.

A key component of A360 Ethiopia was co-creation of solutions with young Ethiopian designers. During prototyping young people played a significant role in identifying the most resonant ideas, resolving conflicting feedback in testing, and improving ideas to be more contextually appropriate. For example, when discussing the cost of having a baby, a young designer proposed expressing it in the number of goats, rather than the local currency, which was a more relatable concept for the pastoralist community. A second benefit to co-creation was that having young designers as a core part of solution development gave Smart Start credibility among the MOH stakeholders who saw these young people as their constituents. Engaging youth as team members in this way requires dedicated financial resources, human resources, and time, which may often be at odds with short-term efficiency; yet it was central to the success of the project’s outputs and long-term sustainability.

In the case of the Reimagining TA project, the degree of co-creation varied by project stage and



country context. The project launch represented a more prescriptive approach; countries were preselected by the funder, and country stakeholders were only involved after funding was approved. Country governments were not involved in developing the problem definition in the proposal to determine if the related process and approach would be meaningful and needed in their country. As a result, throughout the project, it was difficult to achieve stakeholders' buy-in and commitment, despite intentionally adopting a more collaborative co-creation approach in later project phases. In Nigeria, inconsistent stakeholder engagement in the workshops resulted in fragmented insights and low commitment to the process and the solutions. Conversely, in the DRC, the co-creation team was consistent and engaged throughout the whole process, which resulted in better adoption and implementation of the solutions. By the end of the project, the DRC team was ready and willing to take independent ownership of the next steps. Involving stakeholders not as participants but as co-creators requires global health funders and other traditional stakeholders to engage in a more inclusive process from project conceptualization to implementation.

### **Don't Stop at Insights**

Some HCD projects can run the risk of seeing the insights as an end, rather than a means to an end. When design projects are scoped with insights as an output, traditional global health actors, country governments, or other stakeholders must take the extra step to translate these insights into action to achieve outcomes. Programs that continued beyond insight generation to prototyping and actual implementation achieved greater success in the adoption of project recommendations.

In A360 Ethiopia, the insights-gathering phase yielded findings similar to those found in the adolescent and youth sexual and reproductive health sector previously, such as “contraception is at odds with a girl's identity and what is expected of her” or “proving fertility and having children is culturally revered.” The HCD process was more valuable in translating these insights and learnings into tangible programming opportunities. For example, from these insights, the team built rough prototypes of a baby cost calculator, a newlywed counseling session, a young wives club, junior health extension workers, and many more. Following insights generation with rapid solution prototyping helped to deepen learnings gleaned

from the HCD process and make more actionable progress toward behavior change.

Conversely in Reimagining TA, the project ended with insights and concept generation, including 20 principles of good TA. The team originally planned for 4 workshops to move stakeholders through a design process. However, this proved unrealistic due to the complexity of the “problem” to be solved, the inconsistency of stakeholder attendance at the workshops, and the time frame allocated. Given the constraints, the team determined that the workshops could be better leveraged to develop a set of design principles to guide and govern TA planning and delivery. Implementation of the design principles in each country would have required additional funding and time but would have been more effective in achieving the intended impact of the program.

To address these challenges, first, the project itself should have been co-created with an emphasis on the iterative nature of the HCD process. The full project design, timeline, and funding allocation should have only been developed after defining the design challenge or questions. After understanding the complex nature of the design challenge, all actors in the process, including the funder, should have agreed to a flexible timeline and funding needed to co-create the vision, test solutions, implement, and evaluate.

### **Embed Design Skills Among Partners**

The HCD process and related outputs are highly tailored to the needs of a target population that will shift over time. These projects illustrate how engaging partners throughout the project, and particularly during the insight-generation phase, builds capacity and buy-in to HCD methodology. Including additional budget and time to support the active development of these skills will better enable countries to respond to changing needs of the target population once the “project” has ended.

In V, Engage Design, the HCD consortium, partnered with PSI and Pangaea Zimbabwe AIDS Trust to scale V in Zimbabwe. This partnership focused specifically on building HCD capacity and the expertise needed to implement and adapt V independently after the Engage Design support ends. Engage Design sought to empower and inspire local ownership through capacity-building workshops and opportunities for program implementers to work alongside the design team at every stage of the project. PSI and Pangaea Zimbabwe AIDS Trust staff began as observers,

**Programs that continued beyond insight generation to prototyping and actual implementation achieved greater success in the adoption of project recommendations.**

then with coaching, gradually became cofacilitators and lead facilitators, working alongside Engage Design project staff. This collaborative approach and tapered support plan were also designed to improve the V product during implementation, demonstrating how HCD capacity building also benefits the quality of global health program outputs.

For Reimagining TA, given timeline and budget constraints, there was no time to build the HCD skills of in-country co-creation team members. Therefore, the solutions identified have not been implemented systematically.

### **Develop Design-Sensitive M&E Frameworks**

Both design and traditional global health approaches are valuable when defining suitable M&E frameworks. These projects experienced success with both a more traditional global health approach for measuring longer-term outcomes and with a more design-led approach for iterative process measures. However, both cases required one group to adapt their traditional methods.

In A360 Ethiopia, taking a design-led approach to monitoring and evaluating the Smart Start program promoted greater adaptive management that was conducive to continually optimizing the program for scale-up across Ethiopia. Those familiar with traditional global health approaches might be tempted to try to rigorously monitor early prototyping phases and make decisions based on predefined indicators. However, in A360 Ethiopia, the team found it important to regard prototyping phases as formative research, while keeping the suite of indicators broad. For example, instead of only tracking how many girls were reached and how many girls adopted a contraception method in prototyping rounds, it was equally important to gather feedback on how girls were hearing about the program, how their partners felt about the program, and how long it was taking for providers to deliver a counseling session. Tracking this more expansive set of indicators led the team to make important refinements to optimize impact during scale-up (like cutting program components that were not adding value, shortening the lengthy curriculum, and creating new roles for community members recruiting girls). The ability to flexibly apply a mix of qualitative and quantitative methods to gather data early on was instrumental in helping the team to constantly learn and iterate on the program model.

For V, an independent impact evaluation failed to launch due to challenges in identifying a sufficiently rigorous methodology at a feasible

cost. The evaluation of V in Zimbabwe was therefore designed to leverage existing, routine program monitoring systems. The learning objectives for V included first assessing acceptability and relevance with target end users and second, evaluating the feasibility of integrating V into existing oral PrEP service delivery. Impact will be assessed using PEPFAR's standard performance indicators for oral PrEP. In addition, a learning agenda was developed, with questions designed to benefit both Zimbabwe and global communities (e.g., What are the similarities and differences between the experiences in South Africa and Zimbabwe? And what can we learn about applying this approach in other countries interested in V?). This blended approach of leveraging existing M&E systems alongside questions that can advance learnings related to HCD can support key decision makers in determining whether—and how—to scale programs like V.

## **DISCUSSION**

The 3 program experiences analyzed in this article offer lessons for planning, engaging, and applying individually. Additionally, several of these lessons are interrelated and illuminate insights for the project approach overall. Reflections from these projects suggest a virtuous cycle between the insights in each category. For example, the more that stakeholders, particularly country governments and end consumers, are engaged in an inclusive, participatory process, the greater their continued willingness and motivation to engage. Deeper engagement allows for more iteration and leads to higher quality, better-tailored outputs that are more likely to be sustainably used and scaled. Intentionally building HCD capacity among stakeholders over the course of the project strengthens this virtuous cycle by allowing the iterative process to continue once the “project” has ended. A360, V, and Reimagining TA in DRC were able to foster this cycle from the beginning and the solutions have continued to scale. Conversely, Reimagining TA in Nigeria was less able to undertake a participatory process from the start, which made securing country buy-in difficult and ultimately hindered implementation of project recommendations.

The ability to engender this virtuous cycle depends on another insight previously discussed: the importance of scoping projects appropriately to allow for co-creation, iteration, and HCD capacity building. Programs that seek to incorporate an HCD approach need to be scoped differently than

**Intentionally building HCD capacity among stakeholders over the course of the project strengthens this virtuous cycle by allowing the iterative process to continue once the “project” has ended.**

traditional global health programs. The project conceptualization and scoping process itself needs to be more collaborative, and the budget and timeline need to be more flexible and sometimes be longer than traditional programs to allow for greater iteration. However, longer timelines are not always necessary; a nimbler HCD approach can be achieved by building in more built-in stage gates or pivot points for rapid prototyping and iteration at different stages of the process. A more inclusive scoping process may lead to a problem definition and output that is different from donor expectations and perceived as less directly focused on a funder's mandate.

Yet, these projects exemplify that ultimately it helps to reduce rework and wasted resources and promote more sustained impact through investing in stakeholder buy-in and iteration upfront. In this way, HCD practices represent more inclusive and participatory approaches that should inspire us to take further steps toward decolonizing program development in global health; however, more can be done to further define where HCD is additive to those aspirations and where it is further exacerbating historical power imbalances (i.e., many HCD design agencies or teams are based in North America and Europe).

Of course, expanding the integration of HCD into more global health programs will require convincing funders and other decision makers that these programs are valuable. When considering a new approach, traditional global health stakeholders may perceive a higher risk of failure, especially when weighed against methods that are better understood and supported by well-documented evidence. Thus, there is a substantial burden of evidence required to persuade actors that this approach is not only beneficial but also that the risk of not having local ownership limits long-term benefits if it means projects will require ongoing grant funding.

The gold standard in global health programs is demonstrating cost-effectiveness; however, there is little publicly available information on the cost of these programs. Further, it is difficult to clearly break down costs for specific activities and phases, as budgets are allocated at a high level and multiple workstreams often take place in parallel. However, this type of estimation was attempted in a mid-term evaluation of A360, which found it cost between US\$2 million—US\$3.5 million to design the project approach.<sup>31</sup> This included the cost to convene the consortium partners in the inception phase, as well as some costs from later phases for continued refinement. Further transparency

and analysis of the true cost—and cost-effectiveness—of incorporating HCD into global health programs are needed to persuade others to adopt this approach.

Alternative approaches to measuring HCD's contributions should also be considered. The results of the projects examined in this article demonstrate the value that both program implementers and program beneficiaries received. However, rigorous process evaluations to assess HCD's contribution throughout programming implementation is an area that merits further investigation and investment, given their acceptance in global health implementation science programming. At the same time, the concept of value to the end user is increasingly being heralded to improve health services, and HCD brings a unique perspective on how best to define those value-based indicators. For example, end users may not only value clinical outcomes but also value improvements in quality and experience of care as well as the quality of life and well-being.<sup>32</sup> Given the expense of rigorous, impact-level evaluations of clinical outcomes, defining HCD's success in terms of how it can improve a patient's perceptions of value presents a lower-cost alternative that aligns with HCD's ethos of user-centric solutions. Further elaboration on best practices for M&E of HCD projects in global health is detailed in another article in this supplement.<sup>33</sup>

## ■ CONCLUSION

The global community continues to seek solutions to achieve the ambitious SDGs for health. The experiences of V, A360 in Ethiopia, and Reimagining TA strongly suggest that integrating HCD into planning, engaging, and applying in global health programming could help traditional global health actors achieve better outcomes. HCD's iterative and inclusive approach can produce more targeted and effective interventions while building local ownership and promoting more sustained impact. However, not every challenge is well suited for HCD, and programs need to be scoped and implemented thoughtfully to reap the benefits of an HCD approach and promote sustainability. A participatory, collaborative, and iterative co-creation approach from the project outset is important, as well as scoping the project in a way that supports an iterative approach throughout implementation. Further work is needed to better quantify the costs and benefits of integrating HCD methods to provide more evidence-based justification for the appropriate use of HCD. In the

meantime, alternative approaches to characterizing the benefits of integrating an HCD approach should also be considered. As the global health field grapples with how to close the growing SDG gap, especially with the disruptions from COVID-19, HCD can be a powerful tool to generate progress toward these goals and more sustained impact.

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## ORIGINAL ARTICLE

# Methods and Benefits of Measuring Human-Centered Design in Global Health

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## Key Messages

- Integrating human-centered design (HCD) and global health requires new approaches to managing measurement across multidisciplinary project teams that:
  - Optimize the rigor of public health monitoring and evaluation
  - Introduce appropriate measurement into creative HCD approaches without compromising the types of learning that HCD can uniquely provide
- Tensions can emerge in the ways that HCD and global health approach measurement, but these can be addressed by appreciating the value of iterative learning, combining measurement approaches, and increasing transparency and documentation.
- To be relevant and effective in HCD-influenced health programming, global health practitioners and evaluators should adapt the timing and approach of traditional measurement approaches, integrate metrics that reflect user experience and desires, and use methods that facilitate adaptation and learning as well as assess performance and impact.

## ABSTRACT

Monitoring and evaluation (M&E), a new frontier for human-centered design (HCD), is still largely unexplored. In global health, M&E is considered essential to good practice, and evidence and data are critical tools in program design, performance monitoring, impact evaluation, and adaptation and learning. As HCD is increasingly integrated into global health practice, designers and global health practitioners are learning as they go how to integrate measurement into design and adapt traditional M&E approaches to design-influenced global health projects. This article illustrates some of the tensions inherent in the way global health and HCD practitioners approach measurement, using several cases to illustrate the ways in which tensions can be managed. Using framing introduced by the MeasureD project, which aimed to audit measurement practices in HCD (called social design in the MeasureD project), we explore 3 recent examples of design-influenced global health interventions: 1 focusing on products, 1 on behavior change, and 1 on service improvement, to extract learning about how teams used measurement, for what purpose, and to what effect. In comparing these examples and recent experience, we report on the steps being taken toward greater alignment in the use of measurement to advance human-centered global health programming.

## INTRODUCTION

Strategies to measure and evaluate efforts to improve human health in low-income settings are well established and documented.<sup>1</sup> However, measurement of human-centered design (HCD) processes and the use of measurement in design-influenced global health programming are still a new frontier.<sup>2</sup> As HCD is increasingly integrated into global health practice, designers and global health practitioners are learning how to use measurement effectively during design, adapt traditional public health monitoring and evaluation (M&E) approaches to design-influenced projects, and assess the influence of design on global health program processes and outcomes. HCD has been introduced to global health interventions in various ways, but current understanding about when and how to use measurement and even what value is derived from measuring is incomplete.

Health programmers and evaluators experience frustration when integrating public health measurement approaches into HCD-led programs. Accustomed to

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standards that reflect rigor and evidence, they anticipate scores or metrics to describe insights or behavioral choices emerging from design research and solution prototyping, raising questions about sample size and respondent segmentation. Impact evaluation approaches in design-led projects are frequently derailed or delayed by the iterative nature of the design process. Rigorous mixed methods studies are not always responsive to the rapid learning pace of design. To date, there is no handbook of the M&E of HCD in global health that articulates an evaluation approach or framework that is fit for purpose and embraced by both design and health practitioners.

In this article, we build on an investigation begun in 2017, with support from the Robert Wood Johnson Foundation, that set out to audit measurement practices in HCD in a variety of initiatives. For the MeasureD project,<sup>3</sup> we identified 31 initiatives from 27 different organizations to understand common methods and patterns of measurement, then developed cases for 8 projects. As part of our learning, we identified a framework consisting of 4 distinct ways in which measurement can be integrated into interventions that apply HCD, along with the types of learning that accrue from each. We began this review with those same questions, building on them to explore the experience of measurement in the context of HCD-influenced health programming.

We chose 3 global health cases, for diversity of project maturity and the amount of HCD and measurement involved, for this article (Table). A360, a large-scale, 3-country initiative, is an example of a comprehensive and strategic approach, both in terms of integration of HCD in adolescent sexual and reproductive health and in the investment made in documentation and measurement. The Brilliance series of products from Equalize Health provide an opportunity to observe measurement as it is integrated into a more traditional HCD process—to develop and deliver medical devices over a period of time and through multiple iterations based on continual learning. Group ANC, a small project from Scope Impact, is a useful example of early investment in measurement and experimentation in the role as well as the methods of measurement. We provide an overview of each project, the role played by HCD, and approaches to measurement, followed by a discussion of the accumulated lessons from these and other experiences.

## ■ OBSERVATIONS ON MEASUREMENT WHEN INTEGRATING HCD IN GLOBAL HEALTH

### Adolescents 360

Adolescents 360,<sup>4</sup> an adolescent sexual and reproductive health program, integrated HCD to increase the demand for and voluntary uptake of modern contraceptives among adolescent girls aged 15–19 years in Ethiopia, Nigeria, and Tanzania. It was implemented from 2016 to 2020 by Population Services International in collaboration with IDEO.org as the HCD partner. In addition to design research and iterative solution framing during HCD, the project made a comprehensive investment in measurement and evaluation led by ITAD and in collaboration with the London School of Hygiene and Tropical Medicine and Avenir Health, including a theory-based independent evaluation with 3 core components: cost-effectiveness, outcome, and process evaluations. A360 generated several lessons about how to integrate design-led measurement and learning with traditional public health M&E.

First, the A360 team used HCD-generated insights to gain greater understanding of adolescents' experience and desires related to relationships, health, and future livelihoods to help the project address its value proposition: to help girls understand the relevance and value of contraception to their lives. From this baseline understanding of the user, they crafted process documentation and monitoring tools such as user journey monitoring to track the project effectiveness over time using the girls' framing of their desired experience when seeking contraceptive services. The A360 team learned that in an HCD-led intervention, the primary purpose of assessment and learning is not only measuring program outcomes (e.g., contraceptive adoption and continuation) but also ensuring fidelity to the idea of enabling girls to take their preferred journey toward decision and action related to contraceptive use. Process evaluation was found to be well-suited to this phase of a project that integrates HCD. As an A360 manager noted:

*In HCD, the user journey is deeply tied to the unique value proposition that you are trying to offer. The whole idea of HCD interventions is you are trying to offer a different user experience than they had before, one that is centered on their experience. . . . and you must monitor your ability to [maintain] fidelity to that user experience.*

The deliberate orientation of routine monitoring toward human-centered elements of the inter-

**We identified a framework consisting of 4 distinct ways in which measurement can be integrated into interventions that apply HCD, along with the types of learning that accrue from each.**

**TABLE.** Three Examples of Using Measurement in Human-Centered Design-Influenced Health Interventions

Project	Measurement Approach
<b>Adolescents 360, 2016–2020</b> Focus: Behavior change and service improvement Mechanism: Multi-partner collaboration An adolescent sexual and reproductive health program intended to increase demand for and voluntary uptake of modern contraceptives among adolescent girls aged 15–19 years in Ethiopia, Nigeria, and Tanzania	Clear problem statement and theory of change User-centered design research Iterative solution framing Process evaluation including interviews, document review, and observation Continued measurement and iteration during implementation Theory-based independent outcome evaluation Cost effectiveness study
<b>Brilliance, 2010–present</b> Focus: Product design Mechanism: Single, multi-disciplinary organization A line of phototherapy devices intended to close the quality health care gap for underserved newborns requiring jaundice management	Clear problem statement and theory of change Landscape analysis User-centered design research Interviews with medical professionals Clinical observation Human factors testing, theory of change Customer value chain analysis Supply chain analysis Adaptive management: routine monitoring and cycles of product adaptation
<b>Group Antenatal Care, 2016–2019</b> Focus: Service improvement and behavior change Mechanism: Multi-partner collaboration Develop and test group ANC models as alternatives for addressing shortcomings of one-to-one models to deliver higher-quality care	User-centered design research Co-creation of potential models with key stakeholders including mock pregnancy club sessions, card sorting, and testing of visuals, focused discussions Routine data analysis Interviews, focus group discussions, and observation of ANC pre/post Time and motion studies Materials testing

Abbreviation: ANC, antenatal care.

**Collaboration on measurement and reflection ensured that the HCD-designed interventions delivered the value intended.**

vention helped the team “learn things that we did not know we needed to learn” to assess program performance. As an A360 program manager noted:

*These were not typical public health metrics or outcomes, but the whole success of the intervention hinged on this.*

Second, the team learned the hard way that the evaluation strategy designed to deliver a rigorous assessment of the impact of the intervention was introduced too early in the lifespan of the intervention. The impact evaluation was designed based on the broad program strategy, and baseline measures taken before intervention strategies and sites were defined and refined through design research and prototyping of solutions. The program design emerged much later than normal leading to a misalignment of evaluation and implementation strategies.

Third, on a positive note, the use of early-stage iteration and adaption of prototypes that is inherent in HCD encouraged continued iteration and optimization of the full-scale interventions beyond the design stage. The evaluation and implementation teams together reviewed data routinely to decide on the necessity of course corrections and to support real-time problem-solving. This collaboration

on measurement and reflection ensured that the HCD-designed interventions delivered the value intended for girls and helped implementers know where and why to adapt once the design phase ended.

## Brilliance

Brilliance, introduced in 2010, is a phototherapy device intended to close the quality health care gap for underserved newborns requiring jaundice management. Unlike A360, which brought together several diverse partner organizations, Equalize Health is a single, multidisciplinary organization that integrates design and engineering and partners with medical and business professionals at various points along the process of design, development, and product distribution. Brilliance is one of Equalize Health’s earliest projects and has become a benchmark in the design for impact space.<sup>5</sup> While the outcomes attributable to Brilliance are impressive, we focus on the seamless integration of HCD measurement with traditional monitoring and evaluation. Over the last 10 years, Equalize Health has continually tested and improved the adoption and impact of Brilliance, using an iterative process of HCD and



adaptive management. The result of this is a series of new product variations, based on specific user needs and feedback, that have contributed to the growth, delivery, and impact of the Brilliance line.

Brilliance (classic) was developed in response to doctors in India and Nigeria lamenting the very low (5%–10%) prevalence of effective phototherapy devices in those countries. Through initial user-centered research, Equalize Health discovered that (1) existing phototherapy devices were too challenging to deliver and maintain, and (2) the incandescent or fluorescent bulbs that most of them used burned out every 6 months and were costly to replace. Once Brilliance was in the market, interviews with doctors uncovered the need for an “underside” version for when light was desired to reach the back and front of the baby. The result was Brilliance Underside, launched in 2012. Additional feedback from customers, partners, and in-hospital staff led to the introduction of Brilliance Pro in 2014, with significantly improved usability: thinner, lighter, easier to tilt with 1 hand, 2 treatment settings, and new technology that adjusted irradiance levels to be consistent across the baby’s skin. In 2015, an inexpensive light meter was introduced (the Brilliance Pro Light Meter) to allow nurses and doctors to measure irradiance themselves and be assured that they were providing correct dosage.

Each of these improvements was driven by evidence emerging from Equalize Health’s HCD approach and illustrates the benefits that measurement during HCD can contribute through discovery of nuanced user needs that might be missed by traditional methods. For example, the technology for phototherapy—even LED phototherapy—existed before Brilliance was introduced. Through an HCD process of discovery, Equalize Health listened to clinicians whom other device manufacturers ignored and solved problems for these individuals’ specific needs.

Equalize Health used several tools for measurement, including a clear problem statement, stakeholder surveys, clinical observation, landscape analysis, human factors testing, theory of change, customer value chain analysis, and pairwise comparison ranking (for device features as well as partner characteristics). After Brilliance Classic was launched, measurement, in the form of customer surveys, clinical observation, and monitoring was also used as part of the intervention to assess whether the device was reaching target customers, whether it was being used as intended, and whether improvements could be made for increased impact. Methods included monitoring sales,

installations, and feedback from customers and the commercial partner, collecting demographic data about the hospitals, interviewing users about their experience, conducting surveys around clinician experience and preferences, and collecting data directly from the Brilliance devices to measure frequency of use. In cases where usage was lower than expected, Equalize Health interviewed clinicians and administrators to understand why—illustrating an important attribute of HCD measurement that is often neglected in global health M&E: to garner nuanced understanding that can contribute to improvements. Use of measurement and learning during the process of product development and supply chain mapping ensured effectiveness for users and made it possible for 1,111,300 babies to be treated with Brilliance as of January 2021.

### Group Antenatal Care

The group antenatal care (ANC) model was contextually developed in a partnership between the design agency Scope Impact and Management Sciences for Health. Group ANC models that promote self-care and social support have emerged as a promising alternative for addressing shortcomings of one-to-one models and delivering quality care.<sup>6,7</sup> Group ANC was designed for communities in Uganda and Kenya and adapted to improve ANC services in Guatemala. The premise of this initiative is that ANC services are often not designed to meet women’s needs, resulting in negative experiences that can discourage engagement. Since the degree to which women engage with ANC is dependent on their level of trust and the quality of their experience, an HCD approach was used to understand client and care provider needs and preferences and to adapt services and materials to local contexts. The program consisted of a concept design and feasibility study in Uganda in 2016, a pilot study in Kenya in 2017, and adaptation and pilot in Guatemala in 2019. In each context, HCD was used to understand and incorporate both women’s and providers’ perspectives.

An initial discovery phase was followed by a co-creation phase with key stakeholders, including mock pregnancy club sessions, card sorting, and testing of visuals, focused discussions about challenges, support materials, schedule management and logistics of travel and transportation. In Uganda, 1 cohort of women completed the program, and the team conducted qualitative research to understand women’s experience of group care. Learning from Uganda was applied to models in Kenya: for example, appointments were

**Each improvement to Brilliance illustrates the benefits that measurement during HCD can contribute through discovery of nuanced user needs that might be missed by traditional methods.**

**HCD holds that iterative, small steps that incorporate user feedback lead to more reliable solutions.**

**The Group ANC team not only monitored the effect of the new model, but also were able to understand why it was or was not working, which provided them the opportunity to adapt their approach.**

scheduled in the afternoon to mitigate logistical issues that were observed among users in Uganda. In Kenya, 22 groups with approximately 12 women per group were established in 6 sites. Implementation in Kenya lasted approximately 1 year. Routine data from 1,090 women were analyzed to follow retention. The team conducted interviews, focus group discussions, and observation of ANC before and after the introduction of pregnancy clubs to understand feelings of agency, degree of satisfaction, and overall ratings of quality in care. They also conducted time and motion studies and tested materials with mothers and health care workers.

Despite limitations of time and money, the team acquired valuable learning, specifically questions about trust, connection, empowerment, and participants' ability to implement the advice they received in the group ANC model. Importantly, they not only monitored the effect of the new model, but also were able to understand why it was or was not working, which provided them the opportunity to adapt their approach.

As of 2019, learning to date is being piloted in 10 facilities in Mayan communities in Guatemala and will be scaled up to 30 health facilities over the next 2 years.

## ■ TENSIONS THAT EMERGE DURING MEASUREMENT

From these cases and other efforts to explore measurement in the context of integration of HCD and global health practice,<sup>2,8,9</sup> we observed several common tensions that emerge when both disciplines collaborate in the collection and use of data and evidence. These tensions relate to: (1) use of data for problem framing and intervention design, (2) the role of measurement, (3) the cadence and timing of measurement, (4) perceptions of rigor in measurement, and (5) documentation and transparency. We discuss the ways in which these tensions appear and the solutions evidenced in the cases reviewed for this article.

### Use of Data in Problem Framing and Intervention Design

Global public health interventions focus on an overarching goal: to improve human health. When HCD is applied to project planning, designers introduce an open and creative mindset and place understanding of human desires, behavior, and experiences at the forefront of design decisions. HCD principles hold that until context, including nuanced user needs and attitudes, is fully understood,

the problem to be solved cannot be accurately defined. Also, HCD holds that iterative, small steps that incorporate user feedback lead to more reliable solutions. Reframing problems and iterating solutions begin early and may happen several times before defining the intervention, and the user (i.e., client, provider, or community) has agency in shaping solutions. These HCD principles require a comfort level with ambiguity, flexible research methods, and iterative learning that can be difficult for nondesigners to embrace.<sup>10</sup>

In contrast, traditional health project development often occurs in the context of procurement processes required to generate resources to execute solutions, such as national planning, budgeting, and competitive contracting or grant making. In these cases, problems to be addressed are mostly predefined by government or funding partners and solution choices are limited to a range of options based on a generalized or localized body of experience and science. The project design phase is embedded in proposal development, taking place over a short time, away from the sites and people who will engage with and benefit from the intervention. Co-creation or collaboration with those people and adaptation and tailoring of solutions to different communities or contexts following a funding decision (e.g., grant, contract, or budget) are often not encouraged. This kind of approach to health intervention design places future bets for success on existing evidence and past experience and favors technical expertise in solution development over new contextual learning.

### The Role of Measurement

The different ways in which designers and health program planners approach problem solving is reflected in their use of measurement to inform and guide their work. HCD takes a "make to learn" approach that integrates the processes of gathering data, making small experiments (prototypes), and generating learning to discover users' needs, aspirations, and attitudes. HCD then tests solutions through several common methods that elicit user feedback in real time. The focus of measurement is learning that helps define and refine solutions to enhance their relevance to people, communities, workplaces, and systems.<sup>11</sup> Measurement in HCD processes is rarely used to assess the overall effectiveness of an intervention or to track change over time.

Compared to HCD, global health devotes considerable professional and financial resources to

measurement (e.g., research, monitoring, evaluation, assessment and increasingly predictive analytics and modeling) at all stages of programming. Use of evidence to inform intervention design and M&E to assess intervention effects are considered essential to good practice. Program implementers apply measurement to assess the status of conditions and define problems (e.g., needs assessments and baseline surveys) and to assess changes in these conditions (e.g., evaluation) to understand or prove the cause-and-effect link between interventions and intended outcomes. In this process, they assess variables such as uptake, use, access, quality, and health status, as well as cost effectiveness and sustainability. The focus is largely learning for tracking performance, testing solutions, and accountability once the intervention is launched, with limited investment in the use of evidence to develop program theory or inform intervention design.

### Cadence and Timing

When HCD is introduced into global health programming, its “make to learn” mindset often derails the steps and timing of traditional project implementation and measurement processes. In the HCD process, investigation takes place before problems are fully framed or root causes are identified. This conflicts with the traditional approach to health intervention design (e.g., proposal development and project planning), which often frames the problem and determines the solution before engaging clients and communities. An HCD approach requires a fluid use of measurement tools and strategies to surface user experience or perceptions to inform solution generation and program theory. In A360, designers worked with program implementers and service clients to evolve the program strategy and focus through user insights and testing solutions with clients after the project was planned and funded. At the same time, the program implementers and evaluators executed baseline measurement, but on reflection, as respondents reported, it would have been better to delay defining and gathering fully predictive baseline metrics until early-stage intervention shaping was complete because strategies, population groups, and intervention sites changed from the original proposal plan.

### Perceptions of Rigor in Measurement

A related tension emerges from program implementers who consider HCD measurement to be less rigorous than methods typically applied in

health program M&E. Global health uses widely accepted approaches to applied research and program evaluation, which draws on public health, behavioral science, organizational strategies, and other disciplines. Credibility in measurement is derived from standardization, systematic approaches, and scientific logic using theories of change with well-formulated hypotheses of program strategy and applying methods that reflect the level of rigor required to produce reliable evidence for decision making. A program manager in A360 reported that she questioned the insight decks and prototype report cards produced during the design process because they lacked the nuance and precision related to segmentation of respondents by age, geography, and other characteristics that were expected in a public health program. In other examples, design research did not integrate process or outcome metrics which health program implementers find familiar and reliable nor did they articulate the link between design-generated solutions and health program outcomes and impacts.

Designers explain that rigor in the design process derives from the clear articulation of the objectives for learning and assiduous monitoring of progress toward stated objectives. As a rule, design researchers, like health researchers, map out data collection strategies (e.g., for formative purposes). They apply mainly qualitative approaches influenced by ethnography, psychology, and user-experience or service design mainly in the program design stage. In contrast to public health research, designers rely on small samples and short data-generation and analysis timeframes to provide faster feedback at interim stages of solution development. They also modify methods and lines of inquiry based on what they are learning, allowing opportunity to follow and confirm unanticipated discoveries that emerge.

HCD's approach to measurement can appear to nondesigners as unstructured or unintentional, but it is inherently creative as well as strategic in its adherence to learning goals. Designers make the case that the “proof of concept” that results from incorporating user feedback along the way justifies the investment of time in the design process. Rather than sticking with an approach that is not producing desired results, designers use learning to refine ideas or pivot before large intervention investments are made. What may look like a lack of discipline is simply a different discipline, which public health implementers are only starting to integrate in a systematic way by using adaptive learning approaches.<sup>12</sup> By the same token, designers can view attempts to monitor the process too closely or

**To nondesigners, HCD's approach to measurement can appear to be unstructured or unintentional, but it is inherently creative as well as strategic in its adherence to learning goals.**

rigidly to gain insights from users as restrictive and detrimental. Theories of change and predefined metrics of success articulated at the proposal stage typically come in too early when applying HCD and may undermine the design process.

### Documentation and Transparency

Finally, health program implementers can be frustrated by the limited transparency in the criteria that designers use to develop insights or determine when a prototype should move from low to high resolution. In the words of a team leader of an organization included in our case review, there is “no consistent methodology that captures both the tangible and intangible benefits of creative methods and solutions” nor is there agreement about how to capture the intangible decision-making criteria that drive design processes. The open, learning-focused process for finding working solutions in complex settings contrasts with the predefined, often rigid approaches to program development and implementation in global health.<sup>13</sup>

There have been recent calls for better documentation of HCD-led interventions to advance the evidence base which will help address this tension.<sup>14</sup>

## ■ HOW TO ADDRESS TENSIONS

Within the emerging body of experimentation and collaboration, HCD and global health teams are beginning to merge their practices and find ways to address the discord and tension of early experiences. For example, they are integrating human-centered methods for studying user experience with segmentation studies to provide a comprehensive picture of communities and clients. They are also mapping user perspectives and experience gained through design research into pathways in theories of change, connecting design-led solutions to public health outcomes (e.g., uptake and continuation), and conducting impact evaluations to test and document the influence of HCD. Behavioral design, a process that integrates design and evidence-driven measurement,<sup>15</sup> may also provide lessons on how to optimize different measurement approaches. Thus, while tensions around different approaches to programming and measurement can lead to disruptions and disconnect, as HCD and global health work together, each is adapting and aligning its approach and as a result, working to better overall effect. We discuss 3 specific ways of easing the tensions: appreciate iterative learning, combine measurement approaches, and increase transparency and

documentation of HCD-related measurement and decision making.

### Appreciate Iterative Learning

An acknowledged benefit from design is the primacy of iteration fueled by reflection and learning. Just as the technology industry understands that any product or service needs to continually adjust based on user feedback and new learning, the same is true for health interventions. But whereas the technology industry accepts this notion of iteration as part of the process through which their offerings stay relevant, it is only beginning to find fertile ground in global health, especially within the constructs of funding agreements and expectation for performance monitoring and impact evaluation. A designer observed that public health does not easily accept failure and learning as a path to solution development. The evolution of the Brilliance phototherapy products is an example of the benefits of iteration. Through a continual program of human-centered research, the Equalize Health team discovered 2 deterrents to adoption of the product: first, that the cost of lightbulbs was beyond what many users could afford, and second, that some doctors were not using the product because they did not know how to treat jaundice. In both cases, with human-centered approaches to learning, the team was able to discover and address these unanticipated issues and increase product adoption. When projects move from the prototyping phase to full-scale implementation and HCD-led intervention choices are translated into action, practitioners are often inspired to continue iterating with measurement. HCD models of iterative intervention testing are helpful to actors seeking to integrate collaboration, learning, and adaptation (CLA)<sup>16</sup> approaches advocated by the U.S. Agency for International Development and supported by numerous development movements (e.g., Doing Development Differently Manifesto<sup>17</sup> and Thinking and Working Politically<sup>18</sup>).

### Combine Measurement Approaches

Our review found that many health and design projects are able to blend research and measurement strategies, drawing from both disciplines to optimize learning. In moving from the design phase and adopting an HCD-iterative approach to implementation, both Equalize Health and Population Services International in A360 used both traditional quantitative approaches (e.g., client exit interview surveys) and qualitative HCD measurement (e.g., journey mapping) to understand client

**A designer observed that public health does not easily accept failure and learning as a path to solution development.**



experience. With respect to unpacking the response of younger girls in Nigeria to service messaging and offerings, a A360 program manager noted:

*Lean quantitative and heavy qualitative [approaches] helped us see things we had a hard time explaining.*

Based on learning from various data sources, they adjusted the fit between their service delivery and client needs to tailor the program to specific user groups (e.g., A360) or ensure the sustained availability and affordability of a medical device.

In a second example of blended approaches, health program implementers are incorporating “human-centered metrics” into traditional M&E plans. These HCD-metrics describe user needs and desires uncovered in the early design phase which represent intermediate steps toward outcomes and impact. In A360, program managers discovered that the “true North in design interventions is not necessarily fidelity to the public health intervention as a whole but to the user experience of that intervention as a critical driver of success.”

HCD focuses public health practitioners on the user experience as an intermediate step toward public health outcomes such as uptake or coverage that are inherently linked to human perceptions, desires, behavioral drivers, and satisfaction (or delight). Success is defined by whether users embrace and engage with an intervention as well as whether an intervention results in greater service uptake or continuity.

### Increase Transparency and Documentation

To improve understanding of HCD approaches across health and design teams and address concerns about the rigor of HCD measurement, an implementer of one of our cases introduced detailed documentation of the methods and findings that informed design research and decision criteria that were used to select prototypes for further testing and refinement. They created detailed summaries of insights gathered during the design research<sup>19</sup> and prototype report cards<sup>20</sup> to help team members, stakeholders, and funders understand the learning from HCD and the refinement of solutions. This and other steps toward greater transparency and accountability across the team helped health program managers understand and accept design methods, increase the potential for replicability of findings and reduce the potential for uncertainty and doubt. Striking a balance between the need for rigor and the value of creativity

remains a challenge in these kinds of projects. Most respondents noted that if rigorous measurement is imposed on HCD at the wrong time, it risks “taking the creative spark out of HCD.” As a program manager noted:

*Managing HCD requires you to take the foot off the evidence and rigor because it does something to the creativity.*

**Striking a balance between the need for rigor and the value of creativity remains a challenge in these kinds of projects.**

## CONCLUSIONS

Measurement in the context of HCD-led global health programming is an evolving practice. While tensions around measurement can be confusing or even vexing to those involved, learning suggests that there are practical ways to alleviate these tensions and optimize the application of measurement when HCD is applied in global health. Based on our observations from these case examples and consultation with design and global health practitioners, we posit that increased understanding of how measurement strategies differ and complement one another will benefit global health interventions overall and optimize the influence of HCD in this context. While measurement conducted during HCD is not a substitute for surveys, evaluations, and research typical of public health programming, it is vital to providing insights that help define and deliver appropriate and sustainable products, services, and interventions. Measuring in the context of HCD can provide different and important learning that is additive and can be critical to risk reduction. To work effectively with design, traditional public health M&E framing and methods require adaptation to the rhythm and process of HCD interventions. Global health evaluators can also consider HCD-generated metrics related to user desires and experience for tracking program effectiveness.

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## COMMENTARY

# What's Next in Design for Global Health? How Design and Global Health Must Adapt for a Preferable Future

Ayush Chauhan,<sup>a</sup> Krista Donaldson,<sup>b</sup> Ana Santos,<sup>c</sup> Michael Ngigi<sup>d</sup>

## Key Messages

- Design for global health is an emerging field of diverse histories and areas of misalignment in creating equity. Using a health futures framework, it is possible to better align incentives and strategies to improve the effectiveness of global health efforts. To do so, will require shifts in mindset and practice in both global health and design.
- The COVID-19 pandemic and challenges to scaling sustainable solutions have highlighted the need to evolve both practices, for example, recognizing the interdependence between planetary and human health and refocusing our efforts on the health seeker instead of merely on the systems and technologies for health provision.
- For a preferable future in which there is greater coordination and improved health outcomes even in emergencies, the global health sector must evolve to an inherent focus on the health of individuals over health care. Design practice must evolve itself toward new paradigms of life-centered design and speculative design.

## INTRODUCTION

Our global society faces unprecedented challenges and demands for appropriate, rethought solutions to how our lives are organized. The pandemic future predicted by experts<sup>1–3</sup> arrived in late 2019 with the coronavirus disease (COVID-19)—a period where society witnessed collaborative global health in action. While there were many successes in the global response, there were also significant areas for improvement that could have saved lives and significantly increased well-being.

In this commentary, we collectively envision the future of design in global health and the interactions between the

disciplines. We do this to inspire and strengthen the practice of design for global health and to provoke the continuous development of this thriving and emerging field. To address the needs and opportunities of our future, our sector must also recognize the influences of our past and the nascent stage of design for global health today. Our commentary is meant as acknowledgment and encouragement to all those working to create health equity.

## A BRIEF HISTORY OF DESIGN FOR GLOBAL HEALTH

Design for global health represents a convergence of relatively new fields, many still defining themselves while continuously evolving in response to new challenges.

While public health efforts date back to quarantine practices to prevent the spread of the bubonic plague in European states in the 14th century,<sup>4</sup> definitions of global health relative to public health and international health started in earnest in the late 2000s.<sup>5–7</sup> Despite global health's recent emergence as a unique discipline<sup>8</sup> “the central motivations, organizing principles, and modes of operation that characterize it” hark back to its colonial roots in military medicine and international health.<sup>8</sup> The focus then was on infectious diseases of white settlers and laborers rather than health services that served the broader population.<sup>8</sup> Furthermore, strategies were “imposed from above with little concern for the ideas or the cooperation of local residents.”<sup>8</sup>

The best-known example is U.S. Army physician William Gorgas's efforts to eradicate the *Aedes aegypti* mosquito that transmits yellow fever, first in Cuba (1898) and then Panama (1904) to protect workers excavating the canal. Gorgas and others coordinated disease-control strategies while establishing new university programs in tropical medicine and hygiene in the United States and Europe that set the path for future and current global health priorities.<sup>8</sup>

A more equitable view of health was first established at the Pan-African conferences in Cape Town (1932) and Johannesburg (1935) and later with the creation of the World Health Organization (WHO) (1946). A broad definition of health was reaffirmed with the 1974 Alma-Ata Declaration by delegates from 134 countries.<sup>9</sup> Yet, global

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**Although the health of many people has improved in the last decade, data indicate that none of the United Nations Sustainable Development Goals in health will be met by 2030.**

health programs continued to operate in top-down verticals with limited engagement with local populations; their health was largely the domain of medical missionaries from Europe and North America.<sup>8</sup> Despite significant progress within the field, the lack of equitable engagement cannot be dismissed as an artifact of previous centuries: high HIV prevalence and low condom usage in sub-Saharan Africa in the early 2000s were blamed on people rather than the pushed global health “solution” (condoms).<sup>10–12</sup>

Design for global health—realized largely in the implementation of design methods in the development of global health products and services—started in earnest in the mid-2000s arriving via 2 streams of work. The first stream was “design for development,” later called “design for social impact,” which can be traced back to the appropriate technology movement (late 1960s through 1990s), and the writings of globally-minded industrial designers.<sup>13–15</sup> The Ahmedabad Declaration on Industrial Design for Development in 1979 was notable in that it represented the<sup>16</sup> “first plan of action agreed upon by designers from less-developed countries” (emphasis added).

The Development by Design conference in 2002 in Bangalore, India, marked the emergence of “design for good” programs at universities and small nongovernmental organizations. The second stream came as design thinking gained traction in academia and business: in the 1990s, hospital systems and medical device companies started employing designers, who are generalists by nature, to not just improve products but strengthen patient awareness and engagement.<sup>17</sup> Uptake and integration of design into global health practices, however, has been relatively slow compared to other fields and industries. We hypothesize that this may be in part due to the range of decision makers, the complexity of stakeholder relationships and business models, and the dominant therapies orientation that prioritizes medical and academic specialists’ perceptions rather than consumer voices. The transition from design as a set of tools (to add value to a project) to an ethos fully integrated throughout strategy and process (that drives change in large complex systems) is just beginning and far from complete.

## ■ DESIGN FOR GLOBAL HEALTH NOW

Design’s core principles around setting strategy based on empathy and the user’s voice, investing deeply in understanding context, “failing fast”

and iterating, and end-to-end problem solving are highly applicable to addressing challenges of global health.<sup>18,19</sup> Over the last decade, we, as practitioners of design for global health, have been encouraged by the increasing changes in the field’s practice to promote empathy, equity, and inclusion. A simple example is the transformation in language norms from “beneficiaries” to “patients” or “users” to even “customers.” This evolution reflects broader shifts in perspective that increasingly recognize choice and one’s role in their own health care—as well as the necessity of implementation strategies that prioritize sustained impact.

Although the health of many people has improved in the last decade, pre-pandemic data indicated that none of the United Nations Sustainable Development Goals in health will be met by 2030.<sup>20</sup> Yet, many of the preventable diseases that continue to wreak havoc among low-income populations are well understood with existing solutions. For example, continuous positive airway pressure therapy was first used on neonates in the early 1970s,<sup>21</sup> but respiratory distress syndrome remains a leading cause of infant mortality in low- and middle-income regions today.<sup>22</sup>

As a field, the range of necessary changes to drive broad health equity has not been implemented. As practitioners, we observe present-day misalignments in design for global health: underinvestment in understanding context and constraints before strategy and concept development, deterrents to discuss “failures,” insufficient consideration of sustainable implementation and scaling, a “good enough” mentality resulting in low innovation quality, and short-term funding horizons that discourage iteration critical to creating impact. These incongruities are not new.<sup>23</sup> In considering the future of global health and how design can best be integrated, our sector must acknowledge and address the misalignments as well as the challenges of the present: managing the increase of noncommunicable diseases, preparing systems to respond to emerging diseases, planning for growing urbanization and planetary change, and supporting efforts to make quality health care more affordable, accessible, and humanized for all. However, we, true to nature, are optimistic: design provides us with the means to solve such complex challenges.

The practice of design for global health offers a means to ensure all voices—patients, families, health care providers, maintenance technicians, cleaners, distributors, policy makers, responsible



government officials, and others—are all heard in conceiving and developing solutions that range from devices and physical work environments to innovative strategies and improved services. Design offers invaluable tools to deeply understand problems and related stakeholders, adapt and develop solutions, as well as anticipate and prepare for the future.

## THE FUTURE ROLE OF DESIGN IN GLOBAL HEALTH

The COVID-19 pandemic, as disruptive as it has been, has offered an opportunity for the global health community to reinvent itself, asking once again certain fundamental questions around equity, inclusiveness, and diversity. Design, which has been largely on the edges of global health, offers utility in this transformation. As a community, we must ask: How can design best contribute to the next wave of health revolution while also transforming itself in ways that it is equipped to address the new and unprecedented challenges in the health sector?

To answer this question, we refer to a framework proposed by Hancock and Bezold<sup>24</sup> to explore health futures (Figure 1). They note<sup>24</sup>:

*at its best, health futures work does more than what might happen; it enables individuals and organizations to find or enhance the leadership necessary to move in desired directions.*

Consequently, they infer that futurism is much less an attempt to accurately forecast the future as it is a call to organizations and communities

to recognize that the “future is plastic” and therefore can be shaped if institutions and individuals have an imagination for it.

Using Henchey's typology of futures,<sup>25</sup> there are 4 ways of thinking about the future:

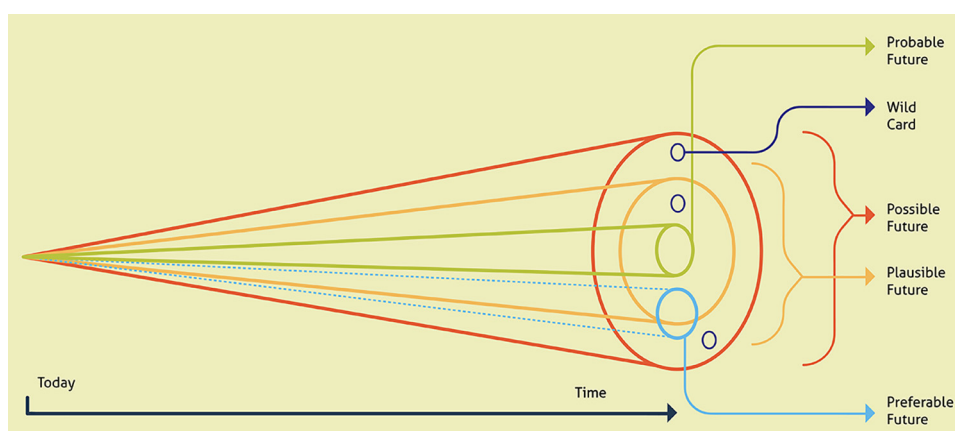
1. **Possible future** (what may be) encompasses everything we can possibly imagine, no matter how unlikely.
2. **Preferable future** (what should be) is what we want to have happen and falls in the realm of organizational or societal visions that “move reality beyond the present toward the best that can be.”<sup>24</sup>
3. **Plausible future** (what could be) is a range of alternative futures based on what we know today, combining differing trends and scenarios.
4. **Probable future** (what will likely be) is what will likely happen and is based on examination of our current situation and an appraisal of likely trends and future developments.

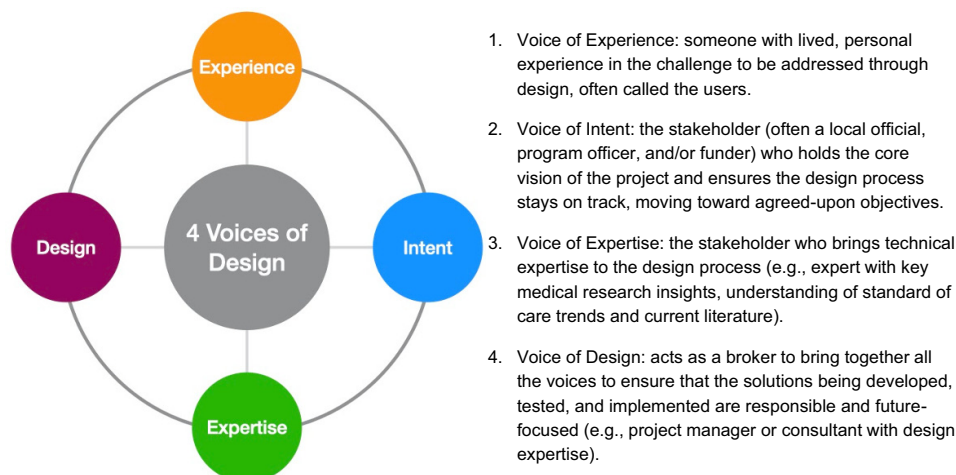
As practitioners and researchers, we base our assertions about the future of health by examining these possibilities through a design lens. Notably, our attempt is not to be predictive but to claim our agency as a community in determining a future that is informed by the natural proclivities, developments, and imaginations of design practice.

Our proposition for the future role of design in global health is 3-fold. These futures play out over different time horizons and indeed align well with the different typologies in Figure 1.

**Design offers invaluable tools to deeply understand problems and related stakeholders, adapt and develop solutions, as well as anticipate and prepare for the future.**

**FIGURE 1.** The Futures Cone: Envisioning Various Futures for Design in Global Health<sup>24</sup>



**FIGURE 2.** The Four Voices of Design<sup>a</sup><sup>a</sup> Adapted from ThinkPlace.<sup>30</sup>

**Prioritizing the short- and long-term needs of health care seekers can shift the future arc of health systems by participating in the achievement of the desired outcomes or preferred future.**

### 1. A Preferable Future That Shifts the Focus From Health Care Back to the Health of Individuals Through User-Led Design

Design advocates for the patient's well-being to be at the center of health care provision, with health care providers—also users—in support. We have seen health sectors challenged by misaligned incentives and complex systems that have resulted in the individual pushed outside of the core mission of “health for health’s sake.” For example, privatization of health care in many markets has created an incentive structure that financially benefits from a continuously unwell population rather than a healthier trendline. Within months of the start of the COVID pandemic, mid-to-high tier private hospitals in India were reporting as much as a 90% decrease in revenue because of the “sharp drops” in outpatient visits, elective surgeries, and international patients.<sup>26</sup> India is not the only country.<sup>27,28</sup> Although global health funding patterns are starting to shift, the development of solutions has traditionally been driven by academic institutes that are removed from the contextual and market realities of target users. The results, as might be predicted, are underwhelming at best: an analysis of funding for maternal and newborn health innovation found that the largest slice, more than 40% (~US\$90.7 million), went to universities largely in high-income

countries and none of those innovations scaled to a level of sustainable impact.<sup>29</sup>

Prioritizing the short-term as well as long-term needs of health care seekers can shift the future arc of health systems by participating in the achievement of the desired outcomes or preferred future. Giving greater ownership to users too will shift incentives from financial good to social good where solutions are developed by or in collaboration with the individuals and communities the solutions seek to serve.

User-led health care can be found in initiatives such as the creation of youth advisory committees that select community health workers to serve them, the purposeful integration of persons with disabilities in the design of targeted health programming, and the financial support of multidisciplinary community labs that identify, prioritize, and address their own problems. Through guided co-creation,<sup>†</sup> design can support global health strategists and decision makers to define and understand the key problems, develop the right goals, and implement preferable systems that promote equity and health improvement. This co-creation process consists of several steps that require different levels of involvement from each of the different voices of design (Figure 2) that represent the critical stakeholders required to develop

<sup>†</sup>Co-creation is the creation of solutions, through a design process, with users or stakeholders. Guided co-creation is led by a design facilitator who has significant experience in the geography and/or area of global health.

solutions that are human-centered and sustainable.<sup>30</sup> A strong predictor of failure in design processes is where 1 or more of these voices is weak or missing.

For a preferred future, the design process engages the 4 voices of design in the following ways:

- **Defining the challenge** to be addressed, the range of stakeholders and users, and who they believe are the ultimate customers, as part of the **intent phase**. This exercise (e.g., guided conversation and customer value chain analysis<sup>31</sup>) emphasizes articulating the desired future state to the challenge.
- **Gaining a deep understanding** of the challenge, context, and people involved. This **exploration phase** must include learning of the experiences of the people who are closest to this challenge to appreciate the complexities of the challenge (“voice of experience”). The “voice of design” leads the group in developing user archetypes to move into the next phase with targeted briefs that address specific personas.
- **Rapidly generating prototypes and testing new ideas** that speak to the defined challenges. This is an iterative process based on stakeholder input that works on the idea that one should “fail fast and learn fast” to get to a desirable, viable, and feasible solution to the challenge being addressed. Here the voice of design works with the users (“voice of experience”) and subject matter experts (“voice of expertise”) to identify and test potential solutions. Throughout this process, all potential solutions are evaluated, and ultimately the most promising solution is selected for implementation, as part of the **innovation phase**.
- **Iterating purposefully** to ensure the selected solution performs as intended in real environments while meeting other requirements for economic viability, scaling, sustainability, and impact. This **implementation phase** does not end once a first solution launches but should extend over time as the solution’s effectiveness is evaluated.

We offer 2 examples of approaches that sought a preferred future with preventative health initiatives: 1 that did not work, and 1 that did.

Preventative health care efforts to date have been largely prescriptive and fear-based.<sup>32,33</sup> These approaches have been controversial, often with poor outcomes,<sup>34–37</sup> owing to lack of “voice of experience” and dearth of prototyping, learning, and timely iteration. In Kenya, when HIV/

AIDS was declared a national threat in 1984, fear-based messaging was the initial response of non-governmental organizations and the government. Most of the preventive health communication at the time featured imagery of wasted and dying people to influence behavior change. It was largely unsuccessful as the virus spread at an unprecedented rate. Other aspects that influence people’s behaviors, such as environment and sociodemographic factors, were inadequately factored into campaigns resulting in avoidance responses among those for whom the health threat was self-relevant.<sup>38</sup>

Our experience from “voice of experience” and user research across a range of geographies suggests that preventative health care initiatives are more successful when they offer opportunities that fit well with people’s lifestyles, constraints, and schedules; they promote social interactions; and they provide positive reinforcement. Studies have shown successful outcomes with community programs that increase participation in one’s own wellness management. For example, a U.S. study showed that no-cost gym visits are associated with lower weight and blood pressure among African American and Latinx participants who have hypertension.<sup>39</sup> In Dakar, Senegal, the installation of workout equipment on beaches led to the rise of a social fitness movement that has sustained momentum for more than 20 years. Localized programs grew from that movement, such as group exercise classes where participants also socialize, encourage, and connect.<sup>40</sup> In both locations, the delivery vehicle for preventative health (accessible gyms) met users’ needs and fit within their lifestyles without significant undesirable behavior change.

## 2. A Plausible Future That Leverages Design’s Collaborative and Continuous Learning Principles to Encompass Ecosystems

The WHO’s constitution<sup>41</sup> recognizes with its first line:

*Health is a state of complete physical, mental, social, and ecological well-being and not merely the absence of disease or infirmity*

that we share more than our genome: we share the air we breathe, and ultimately vulnerability to our environmental context. Planetary health and holistic health, fields introduced decades ago, extend the concept of medicine to safeguard the health of persons, places, and our planet by acknowledging interdependencies

**Some preventive health care approaches have often had poor outcomes because of the lack of “voice of experience,” prototyping, learning, and timely iteration.**





Dutch artist Maria Koijsck collected the medical waste from her breast cancer operations. Sixty percent of the materials were disposable. “Is there another way?” she asked.<sup>48</sup> © 2020 Marja Koijsck

**Designing for planetary health calls for global health practitioners to look beyond social determinants to include environmental determinants.**

between the planetary life-support systems and the health of individuals.<sup>42</sup> While modern global health seeks to strengthen health broadly and create equity at the population level, these life-centered concepts call for a wider look at how humans affect and are affected by our shared environment, infrastructure, and ecology. This broader conceptualization suggests that indirect solutions exist and are potentially more effective to address today's as well as tomorrow's burden of diseases.

Designing for planetary health calls for global health practitioners to look beyond social determinants to include environmental determinants. As we consider the future, 10 billion people will be breathing, “eating, moving, plugging in, building, buying, using, wasting, and all the rest in 2050.”<sup>43</sup>

We as a global society will be challenged by new diseases affecting people, animals, and plants, as well as recurring diseases in different forms and locations. Global health needs to provide leadership in a greater range of domains, including food systems, community preparedness, politics, and urban planning.

We suggest that a plausible future focuses on improving the health of human beings and the

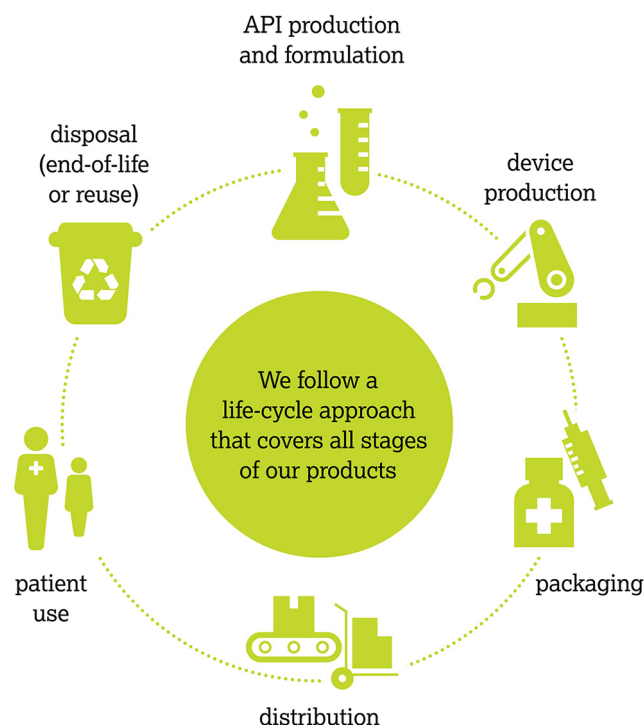
planet in union with a focus on resilient and large-scale solutions. A renewed discourse calls for thinking beyond human-centered design practices to the inclusion of ecological and environmental requirements in design methodologies.<sup>44</sup>

**Life-centered design (LCD)** borrows principles and tools from design for sustainability, circular design, and biomimicry to offer an approach to product, service, and systems design that encompasses people, profit, and the planet at its core.<sup>45–48</sup>

Given the early stage of LCD as a practice, as well as the complex nature of systems thinking, different disciplines have developed and adopted a range of principles and tools. We offer the following resources, best layered, to integrate LCD when developing strategies and solutions.

- **Product lifecycle analysis**<sup>49</sup> applied throughout the solution development process has become a key requirement for production systems that reuse, reduce, and optimize natural resources, materials, energy, and emissions. Many industry actors, including those in health care, such as AstraZeneca, also leverage design tools (e.g., design for modularity, design for disassembly, and design for reparability)<sup>50</sup> and/or





AstraZeneca's staged life cycle approach in pharmaceutical development (API is active pharmaceutical ingredient). © 2020 AstraZeneca

metrics to support life cycle considerations and improvements (e.g., process mass intensity, energy productivity, and percentage of sustainable sourcing for packaging materials).<sup>51,52</sup>

- **Product-service systems** are business models that “deliver value in use,”<sup>53</sup> enabling organizations delivering products to extend their value by offering related services.<sup>54</sup> Product-service systems approaches aim to enhance the value of their commercial products while reducing their environmental impact and harmful footprint. For example, a point-of-care testing device such as a glucometer might offer reminders for testing or automatically transmit unexpected results to a clinician, reducing waste and saving energy.<sup>53</sup>
- **Regenerative design** practices focus on restoring or revitalizing sources of energy and materials at the scale of institutions and the built environment by better embedding designs in the natural world. Butaro District Hospital in Rwanda was designed to mitigate and reduce the transmission of airborne disease by leveraging indoor and outdoor space, the surrounding geography, and natural cross-ventilation.<sup>55</sup> Other examples include

green roofs, thermal efficiency, and actively sustaining surrounding natural habitats.

Our list and examples are not comprehensive. When layering LCD processes, we realize that the degree of change, timeframe, and the number of stakeholders that are required to enact the needed transformative innovation is great, but they are not insurmountable. Change must be driven at the institutional level by global health's leading “voices of intent” to best affect the fundamentals of society, including industry and sectoral norms and values, sociocultural practices, and economies. The cost to implement LCD practices must be viewed as a necessity to remain relevant beyond the short term;<sup>56</sup> organizations must address current challenges while continuing to adapt to the plausible future of global health.

### 3. A Possible Future That Rallies the Co-creative and Imaginative Powers of Individuals and Institutions Through Speculative Design

In the parlance of futurists—those that systematically explore predictions and possibilities about the future by studying current trends and realities—the COVID-19 pandemic represents a wildcard

**Change must be driven at the institutional level by global health's leading "voices of intent" to best affect the fundamentals of society, including industry and sectoral norms and values, sociocultural practices, and economies.**

**We are in a period of tectonic shifts that will have a deep and lasting impact on global health.**

moment, a "possible" future that was imagined but ignored and as a result upended global systems. The need to truly operate with resilience and responsiveness at a global scale, and in a manner that is equitable, inclusive, and radically collaborative has never been greater. It is also evident that the trajectory of global health is impacted by factors that were either missing from conversations on health systems design or did not force a reckoning as directly and urgently.

For example, the tension between sovereignty and collective global action against a shared threat, such as epidemic outbreaks, has been an oft-debated point around governance in global health.<sup>57</sup> Especially in low-income countries, the state's ability to protect and promote the right to health is eroded by trade and investment treaties that privilege investors over governments and provide avenues for international corporations to challenge democratically enacted public health policies.<sup>58</sup> It may be argued that the disparities that COVID-19 has revealed and created, in terms of access to care and supplies such as oxygen and vaccines, could further exacerbate the perceptions of global health as neocolonialist and tip the debate in favor of stronger sovereignty over health care.

At the same time, technology is aiding more regional and local self-sufficiency. India's National Health Stack envisions a digital infrastructure designed as a common public good accessible by central and state governments and public and private sectors.<sup>59</sup> It is expected that the National

Health Stack will become the cornerstone for India's public health system, as well as offer a model for other emerging economies.

We are in a period of tectonic shifts that will have a deep and lasting impact on global health. Therefore, it is not enough to engage in conversations around "what is likely" but be wildly more imaginative in asking questions around "what if" to prepare for the social, cultural, technological, environmental, and political shifts that will eventually determine the future of human and planetary health. Incidentally, design is well-positioned to facilitate these conversations. A particular method of speculative design achieves this by creating scenarios and experiences from a set of imagined futures that stakeholders can engage with and debate its merits and flaws. The creativity inherent in design lets us transcend the known into the unknown, allowing us to be critical of what is currently happening and to reflect on the direction in which we are heading. Returning to Hancock and Bezold's health futures work, they argue that doing speculative work forces a reckoning with the values of individual actors and the community—an aspect that, both the history and current state of global health reveals, has long been overlooked.

In the humanitarian sector, for example, speculative design has been used to help organizations consider the future of their work in a rapidly changing world. HUM.2035 is a project that developed forecasts for how humanitarian work would fundamentally change based on the shifting



HUM.2035 personas of future humanitarian workers addressing a water crisis in South Asia. © 2019 Quicksand



Prototypes of objects and artifacts from the future that became a part of the HUM.2035 exhibition. © 2019 Quicksand

nature and location of crises caused by climate change, livelihoods disruption, geopolitics, digitalization, et al. The process used tools and techniques from the field of speculative design.

- **Investigating** the current humanitarian ecosystem, including forces influencing humanitarian work
- **Imagining** spaces, events, and scenarios in the future that are manifestations and extrapolations of these shifts
- **Bringing to life** future scenarios through immersive media, videos, interactive exhibits, illustrations, and physical artifacts that serve as a provocation for how the humanitarian ecosystem was changing
- **Engaging** specific institutional actors and leaders to consider these future shifts in their ongoing organizational transformation and change management agendas

HUM.2035 (HUM represents the word “we” in Hindi) tells the stories of humanitarian workers dealing with the aftermath of a devastating tropical storm Lata that has hit Goa in the year 2035. HUM.2035 started as a traveling exhibit on the future of humanitarian work, first displayed in London.<sup>60</sup> Médecins Sans Frontières leveraged the exhibit to facilitate internal strategic conversations with more than 80 heads of missions and medical coordinators on the future of the organization. The

power of this tool became evident as conversations shifted from talking about power (who is going to make decisions and where) to value creation (how the organization must rethink its services given the changing nature of crises).

In the context of global health, a speculative design process would involve looking at adjacencies to health that do not figure prominently in the discourse at the moment but may have a strong influence on how health care is sought and delivered in the coming decades. Trends such as the shifting center of geopolitics; emergence of big tech and concerns around data privacy; genomics and related ethics; and linkages between health, financial, and climatic vulnerabilities of communities will point to a range of possibilities around how health care is transacted in the future. Speculative design brings various actors together, helps conceptualize the future, and facilitates conversations on the values, intent, and directions that current systems and organizations are designed for and how they must be recalibrated (Figure 3).

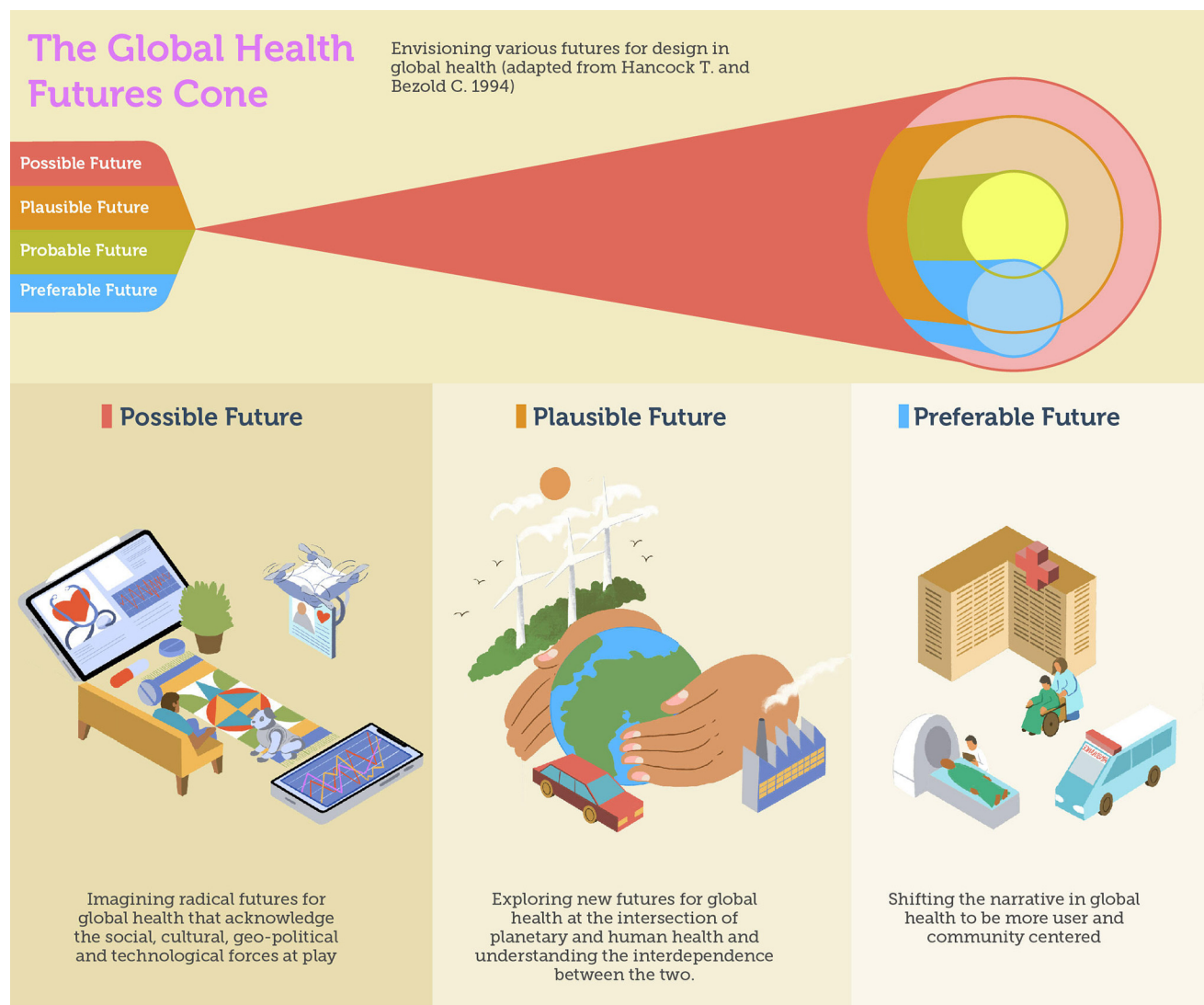
## CONCLUSION

It is evident from our current vantage that the future of global health will require the simultaneous exploration of possible, plausible, and preferable futures—from the highly unlikely developments that can upend our notions of health care to those instances where the link between planetary and

**A speculative design process entails looking at adjacencies to health that do not figure prominently in the current discourse but may strongly influence how health care is sought and delivered in the future.**



**FIGURE 3.** The Global Health Futures Cone to Consider Possible, Plausible, and Preferable Futures Based on the Work of Hancock and Bezold.<sup>24</sup>



human health is clear for moments when giving privilege to the voice of the end consumer and communities is the prudent, ethical, and equitable thing to do.

Global health, as a sector, has the knowledge and experience of history and diverse societies to address health challenges throughout the world. Design enables us to better act on this knowledge, engaging both users and communities to develop lasting sustainable solutions that create equity and impact. Design can best contribute to reform the next wave of health revolution by addressing

misalignments in existing global health practice and shifting focus from health care to health of broader ecologies. The practice of design too therefore must evolve to push beyond traditionally defined sectoral systems to the larger global ecosystems, complimenting user-centered design with LCD. Finally, the collaborative, ambitious, and speculative nature of design offers the means and tools to pre-empt changes at the level of the individual, communities, and society that will fundamentally alter how global health relates to these entities.



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