

ASSESSING THE ORGANIZATIONAL READINESS OF THE ZAMBIA MINISTRY OF HEALTH TO ADOPT  
A NEW IMMUNIZATION SUPPLY CHAIN DISTRIBUTION SYSTEM

Evan Simpson

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Approved by:

John E. Paul

Susan Helm-Murtagh

Jim Herrington

Christopher M. Shea

Bryan J. Weiner

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## ABSTRACT

Evan Simpson: Assessing the Organizational Readiness of the Zambia Ministry of Health to Adopt a New Immunization Supply Chain Distribution System  
(Under the direction of John E. Paul)

In 1974 the World Health Organization launched the Expanded Program on Immunization (EPI) with the goal of vaccinating all children. To implement the EPI, a standardized in-country immunization supply chain (ISC) design was developed and implemented by most low-income countries in Asia and Africa. Today, the ISC design faces an influx of new and more expensive vaccines putting additional strain on an already antiquated system, and little attention is being paid to the ability of the traditional ISC to absorb this increase. To do so, global health and vaccine experts are calling for a change to the current ISC.

Implementation science proposes that organizational readiness for change (ORC)—such as that being proposed to the ISC—is a critical antecedent to the successful adoption of evidence-based programs and the uptake of new systems and innovations (Weiner 2009).

Scaccia and colleagues (2015) provide a useful approach to measuring ORC. Their formula consists of determining the relative strengths and weaknesses of three ORC components: (1) *motivation* for carrying out a program or innovation, (2) *general organizational capacity* for implementation, and (3) *innovation-specific capacity*, which is specific to the program or innovation being considered (Scaccia et al. 2015).

Using a modified version of Scaccia's theoretical framework for ORC, an assessment was made of the readiness of key EPI staff at district and provincial levels in Zambia to adopt a new ISC distribution

system. Using focus groups (n=17) and key informant interviews (n=6), the assessment revealed a high level of motivation, but relatively low levels of general capacity and innovation-specific capacity. Specifically, the lack of infrastructure, particularly transport, energy, and communications, as well as low-skill levels of facility staff, are a barrier to ORC in Zambia.

A plan for change is proposed to build greater ORC among EPI staff in Zambia by implementing a demonstration project that builds general capacity and innovation-specific capacity through three objectives: (1) consistent and regular training of facility-level staff, (2) placing professionally trained logisticians at the provincial level, and (3) demonstrating the effectiveness of unmanned aerial vehicles (UAVs; aka “drones”) to delivery vaccines to remote and isolated areas.

To Louise, Theron, and Lydia, for their support, encouragement, and sense of humor.

In memory of my mom, Marcia Stoke Simpson.

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## LIST OF ABBREVIATIONS

<b>CIDRZ</b>	Center for Infectious Disease Research in Zambia
<b>DHO</b>	district health office
<b>DPT</b>	diphtheria, pertussis, tetanus vaccine
<b>EPI</b>	Expanded Program on Immunization
<b>EVM</b>	Effective Vaccine Management
<b>iSC</b>	immunization supply chain
<b>Gavi</b>	Gavi, the Vaccine Alliance
<b>KII</b>	key informant interview
<b>MCH</b>	maternal and child health
<b>MOH</b>	ministry of health
<b>NGO</b>	nongovernmental organization
<b>NSO</b>	National Statistical Office
<b>ORC</b>	organizational readiness for change
<b>PHO</b>	provincial health office
<b>PtD</b>	People that Deliver
<b>TWG</b>	Technical Working Group
<b>UAV</b>	unmanned aerial vehicle
<b>WHO</b>	World Health Organization

## **CHAPTER I: INTRODUCTION AND BACKGROUND**

Within health-care organizations, readiness for change is considered a critical precursor to the successful adoption of new systems, practices, and innovations (Weiner et al. 2008). The lack of organizational readiness for change (ORC) is thought to contribute to nearly half of the failures of all change initiatives (Kotter 1996). As a result, organizational readiness for change has become a significant research domain within implementation science (Armenakis et al. 1993).

In the low-income countries of Africa and Asia, ministries of health, nongovernmental organizations (NGOs), and other organizations are often adopting, adapting, and/or scaling-up new systems, practices, and evidence-based interventions to achieve better population health outcomes, improve efficiency, and build greater capacity of health-care workers. Despite the attention devoted to organizational readiness for change in countries with advanced health-care systems, and the evidence supporting its importance, there is almost no literature to suggest that assessing readiness for change is practiced in low-income countries, which may be a contributing factor to the limited success to change and scale-up initiatives in those regions.

One system that has been identified as an area in need of change in many low-income countries is the Expanded Program on Immunization (EPI), which is the administrative program responsible for the financing, procurement, and routine distribution of vaccines. A critical component of the EPI system is the immunization supply chain (ISC), which manages the logistics and distribution of vaccines from central warehouses to outlying district-level health facilities, health posts, and beyond (Zafran 2013). The ISC in low-income countries typically follows a top-down, four-tier system: Starting at a central level, vaccines are distributed to the provincial level, then to the district level, and finally to the health facility

or community-outreach program. This system mirrors the administrative governance structure of most ministries of health in low-income countries (Kaufmann 2011).

This current iSC distribution system is based on an outdated and inefficient supply chain model that was established over 40 years ago by the World Health Organization (WHO) and other global entities. Recent evaluations indicate that in many countries of Africa and Asia, the current iSC distribution system is highly inefficient, is barely able to adequately deliver existing vaccines, and is unlikely to provide sufficient access to new vaccines in the development pipeline (Zafran 2013). There is strong global consensus that in many developing countries, the current iSC system needs to change, including distribution systems (Elias and Chan 2016). Without a change, the universal goal of ensuring that every child receives full coverage of routine immunization will remain elusive.

Several countries have designed and piloted a new distribution system as part of a redesigned iSC. These countries have concluded from pilot studies that eliminating or bypassing at least one of the layers in the existing delivery system structure resulted in greater efficiency and cost savings. The results of these pilot projects are now influencing iSC distribution system design changes in other countries. As countries look toward broad scale-up of a new iSC distribution system, the readiness for change among the EPI staff supporting the iSC should be assessed in order to identify areas where readiness levels are high and low, and to inform efforts to strengthen readiness and increase the likelihood of success in changing the iSC distribution system.

The research project presented here describes the outcomes of a qualitative assessment of the district- and provincial-level EPI staff in Zambia, using an established conceptual ORC framework to determine the organizational readiness for adopting changes to the iSC distribution system. These changes are informed by the evidence and experience of pilot demonstrations in several other countries, as well as a systems design process undertaken by the Zambian Ministry of Health (MOH) and other key stakeholders in 2016. The results and findings from the ORC assessment focus groups

were subsequently discussed through key informant interviews (KIIs) with members of the National Immunization Program's Technical Working Group (TWG) to validate the findings of the assessment and to determine the appropriate steps to strengthen readiness for change to the iSC distribution system. It concludes with a plan for change and a set of recommended approaches for improving overall readiness among key participants to achieve the desired changes to Zambia's iSC distribution system.

### **Significance of the issue**

In 1974 the World Health Organization launched the Expanded Program on Immunization with the goal of vaccinating all children. To support the EPI and ensure availability of vaccines everywhere, a standardized in-country iSC design was developed and implemented by most low-income countries in Asia and Africa. Gavi<sup>1</sup> defines the iSC as follows:

*The immunisation supply chain encompasses all the activities, tools, resources and planning necessary to ensure that vaccines stay safe and effective and reach all those who need them. This can include, for example, the cooling equipment the vaccines are stored in, the routes through which they are distributed, the data collected to track and evaluate the distribution, and the people who manage the systems (Gavi 2015).*

Designed over 40 years ago for the technology, infrastructure, and communication contexts existing at that time, and supporting the distribution of relatively few and inexpensive vaccines, the iSC contributed to extraordinary gains in vaccination coverage and, as a result, prevented countless cases of disease and saved millions of lives across the developing world.

Despite this progress, global immunization coverage rates have stagnated, and the EPI has struggled to increase or, in some cases, even maintain coverage rates in many developing countries (Elias and Chan 2016). Full coverage rates of the three doses of DPT vaccine (diphtheria, pertussis, tetanus) are viewed as a valid proxy for overall strength of the EPI system and its ability to provide

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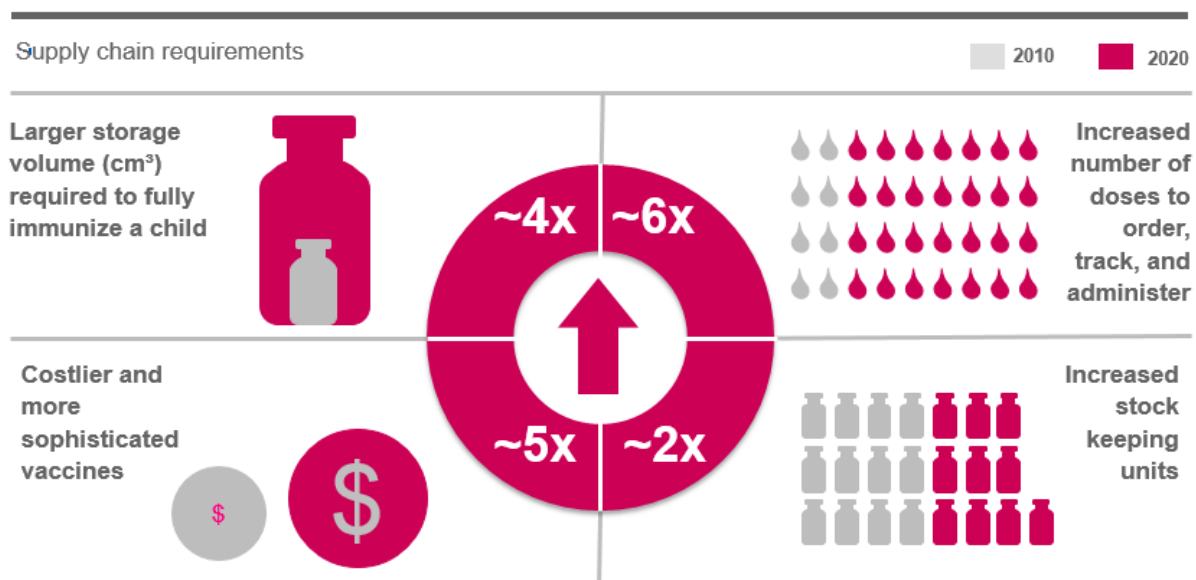
<sup>1</sup> Gavi is shorthand for Gavi, the Vaccine Alliance, an international nonprofit that finances and supports vaccine introduction and system strengthening in developing countries ([www.gavi.org](http://www.gavi.org)).

coverage of all routine immunizations (Tsega 2014). WHO estimates that 20 million children globally have not received the full, three-dose course of DPT vaccine coverage, which suggests a significant access gap to routine vaccination (WHO Call to Action 2014). Since 2010, global coverage of DPT has increased by only 1 percent (WHO 2016).

Since 1990 the demands on the iSC have grown dramatically with several new vaccines added to the system and more coming. New vaccines are in development for critical diseases unique to developing countries, such as malaria, typhoid, and cholera, as well as vaccines for HIV. New vaccines tend to be bulkier, taking up more space by volume within the system, and far more expensive, which makes wastage and loss as a result of an inadequate iSC all the more costly. Global assessments of vaccines and immunizations indicate that by 2020, low-income countries will be managing twice as many vaccine products as in 2010. By 2025 the health workers responsible for ensuring successful vaccine program outcomes will need to administer six times as many vaccine doses per person as they do now, in much more complex environments, but little attention is being paid to the ability of the traditional iSC to absorb this increase (Zafran 2013).

Figure 1.1 illustrates the changes to EPI in the past 10 years and the magnitude of the increases to the supply chain as measured by the number of vaccine doses to be managed, stock, costs, and storage volume. All of these increases put greater strain on an already outdated iSC.

**Figure 1.1: Estimated supply chain requirements and trends (Gavi 2014)**



In addition, existing EPI programs primarily target children under age two and pregnant women, while many new vaccines require reaching older children, adolescents, and adults, and in more places, including schools, pharmacies, and hospitals (Zafran 2013). While these new vaccines represent major scientific and public-health achievements, the current supply chain system relied upon to ensure widespread access is woefully inadequate.

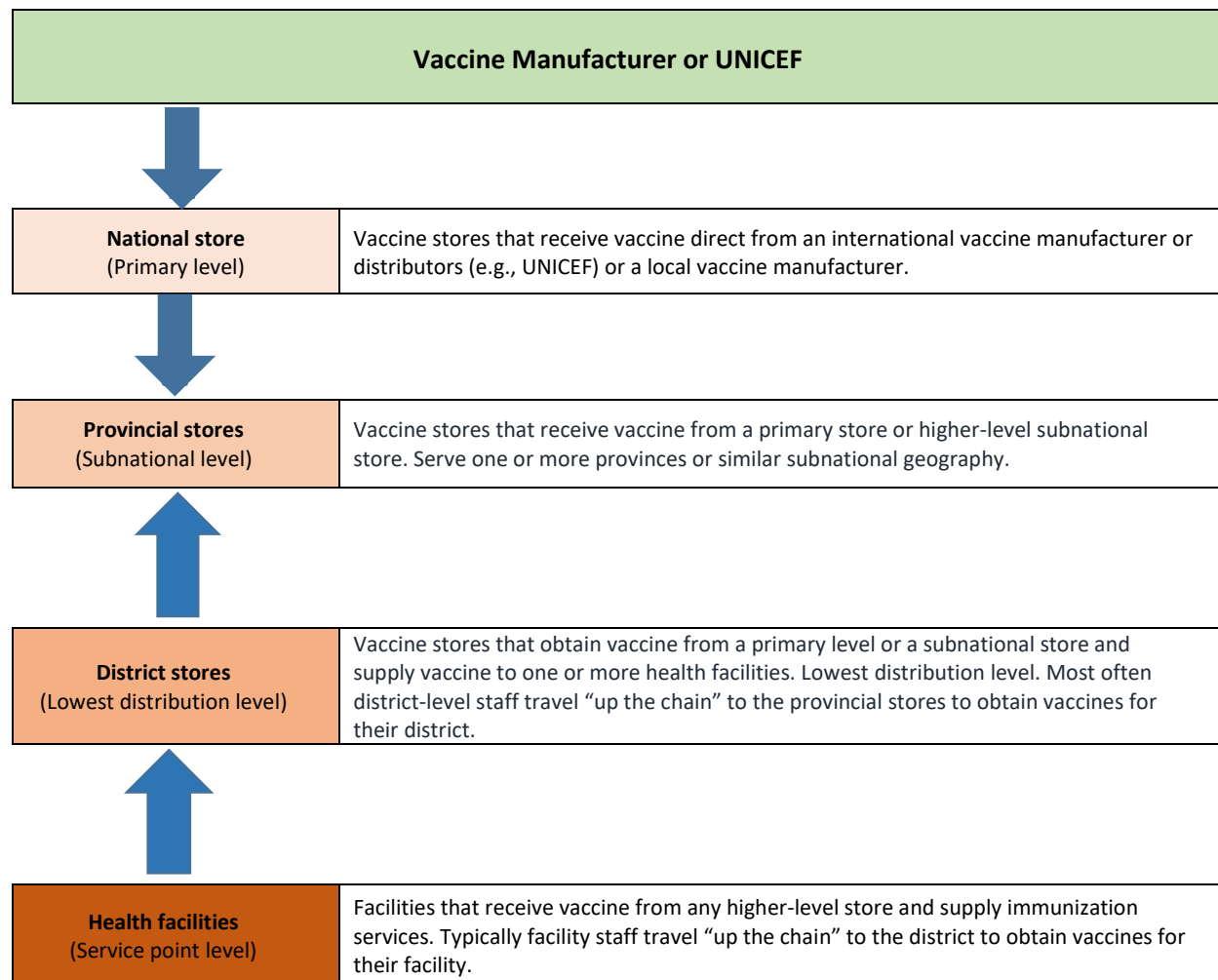
Poor performance of the iSC and its distribution system has been linked with delays in new vaccine introductions, excessive waste of expensive vaccines, and reduced availability of all vaccines at the point of immunization (WHO 2014). Based on modeling and the bottlenecks countries are now experiencing as they attempt to introduce new vaccines, the evidence is clear that the long-standing iSC design simply cannot accommodate the requirements placed on it. In many countries, changes to the existing iSC are needed.

## **The immunization supply chain distribution system**

The actual distribution of vaccines in a country is a critical and challenging component of the overall iSC. Many developing countries have poor transportation infrastructure and inadequate inventory tracking mechanisms which contributes significantly to vaccine wastage and stock-outs. A survey by WHO found that only 15 percent of the low- and middle-income countries they surveyed complied with the recommended practice for vaccine distribution as specified in WHO's Effective Vaccine Management (EVM) protocol which sets global standards for vaccine management and distribution practices (WHO, EVM 2016).

In most developing countries, the distribution of vaccines through the iSC utilizes some variation of a four-tier system that starts at the central administrative level and cascades downward to provincial and district levels and finally to a clinic or health outpost for administration. This system reflects the administrative, top-down governance hierarchy of the ministries of health, in general. Figure 2 depicts the current system, as it is generally applied in most countries. At the national level, the MOH either procures vaccines directly from the manufacturer, or they are provided by a third party (e.g., UNICEF). The vaccines are delivered to the primary level, the national central medical warehouse, where they are prepared for distribution to the rest of the country through the iSC. From the national store, vaccines are typically distributed to provincial-level stores or warehouses. In many instances, staff from district-level facilities are then responsible for traveling "up the chain" to the provincial warehouse to obtain vaccines and then returning to supply the district stores, the lowest-level storage facility, usually on the grounds of a district health facility. Similarly, staff from the lowest level, the health facilities, or from the community-level vaccine outreach program within a district, routinely travel to pick up vaccines from the district-level store, often traveling long distances.

**Figure 1.2: Standard four-tier immunization supply chain distribution system**



Source: WHO 2015. Effective Vaccine Management  
[http://www.who.int/immunization/programmes\\_systems/supply\\_chain/evm/en/](http://www.who.int/immunization/programmes_systems/supply_chain/evm/en/)

As indicated, however, this iSC distribution system in many countries is no longer able to meet the needs of an expanding and more complex immunization program.

### **Current and proposed changes to the iSC distribution system**

In response to the need for change to the iSC distribution system, many organizations and ministries of health have embarked on an iSC system design and transport modeling process to identify the barriers and gaps of existing systems and to design a more efficient and effective system (Rao 2017). Evidence has emerged from the system design process in several countries indicating that a more

streamlined distribution system, one focusing more on *distribution*—moving vaccines—and less on managing large inventories of stored vaccines at the various storage levels, results in significant system improvements as measured by efficiency, transport costs per dose, and coverage (Kaufmann et al. 2011).

Evidence from pilot projects in Benin, Mozambique, and Niger found that by reducing or consolidating the number of intermediate storage levels in the system, making more frequent deliveries to the lowest levels in the system (district levels and health facilities), and eliminating the highly inefficient and expensive practice of already overburdened health-care workers traveling “up the chain” to fetch vaccines contribute significantly to greater system efficiency, lower transport costs per dose, and increased availability of vaccines (Prosser et al. 2017; Assi et al. 2017; Brown et al. 2017).

The success of the pilot projects in these countries and elsewhere has resulted in interest from other countries in replicating the changes to the iSC distribution system, including Zambia.

### **Need for change to the iSC distribution system in Zambia**

In recent years, a number of countries have begun to respond to the pressures on the existing iSC and to seek changes to its structure and functioning. Several countries have voiced to global stakeholders, such as UNICEF, WHO, and Gavi, a desire for making improvements to strengthen the iSC, starting with assessments of current challenges and bottlenecks, followed by a systems-design process aimed at developing an alternative iSC distribution system.

One country that has expressed a strong interest in improving the effectiveness of their iSC is Zambia, where the results of assessments and evaluations of the iSC indicated significant inadequacy and spurred the MOH to reach out[?] to local and global stakeholders and donors indicating a desire to make changes to the iSC.

In Zambia the iSC distribution system is based on the standard four-tier model. The national level delivers to 10 provinces, from which 103 districts collect vaccines, and more than 2,000 health facilities collect vaccines from districts typically every month, with variances of weekly to once per quarter.

In 2014, Gavi conducted an evaluation of the EPI system in Zambia and found a number of deficiencies resulting in inefficiencies, stock-outs, increased costs, and substandard coverage, particularly in rural and remote districts. These deficiencies included a weak iSC distribution system particularly at district and health-facility levels. In addition, Zambia's Demographic and Health Survey, 2013–2014, found that DPT3 coverage was 85 percent and had remained unchanged since 2007.

The following is a summary of the key challenges to the Zambian iSC as reported by an independent analysis conducted by the Center for Infectious Disease Research in Zambia (2016):

*The capacity to accurately forecast and deliver vaccines and other essential medicines to health facilities remains a major constraint to achieving better health outcomes in Zambia.<sup>2</sup> Stock-outs at health facilities are common, unknown or unreported, resulting from distribution inefficiencies, improper stock management and reporting, insufficient cold chain, and other challenges. Although the country has achieved gains in immunization coverage in recent years, supply chain bottlenecks pose a risk to ensuring equitable coverage of immunizations for all children. Data quality challenges also persist, with reported coverage rates above 100 percent in nearly 25 percent of districts,<sup>3</sup> hindering the country's ability to accurately forecast and allocate resources. Many health facilities are reporting administered vaccines that are well above the total amount of stock they received and the forecasted target populations for their catchment area.*

*Health facilities are the last stop in the supply chain and the most important to reaching children. They are also the most burdened with regard to resource constraints, both human and financial. Zambia has a growing population, new health facilities and districts, and an expanding EPI portfolio with increased budgetary requirements. An efficient and high-performing supply chain will help protect the country's investment in vaccines for all children.*

*Most health facilities in Zambia (91 percent) travel to district stores to pick up vaccines. The frequency with which health staff pick up vaccines ranged by province with some health facility staff going weekly in Copperbelt, and others waiting two and a half months between pick ups in parts of Western Province. In addition to the money required for per diems and transport, this resulted in a considerable time investment by health workers away from the health facility. In*

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<sup>2</sup> Zambia's Health Sector Supply Chain Strategy & Implementation Plan

<sup>3</sup> 2016 HMIS data, provided March 2017

*total, it was found that health facility staff spend an average of >100,000 hours per year – an equivalent of 48 FTE of clinical staff – away from other healthcare activities to pick-up vaccines.*

*While the average distance travelled to the district was 54km, there was great variability in these distances. Poor road conditions were common in remote areas and demonstrated challenges many health facilities face in getting vaccines. A range of transportation options were used. In addition to vehicles, boats and public transport, there were several health facilities picking-up vaccines by oxcart.*

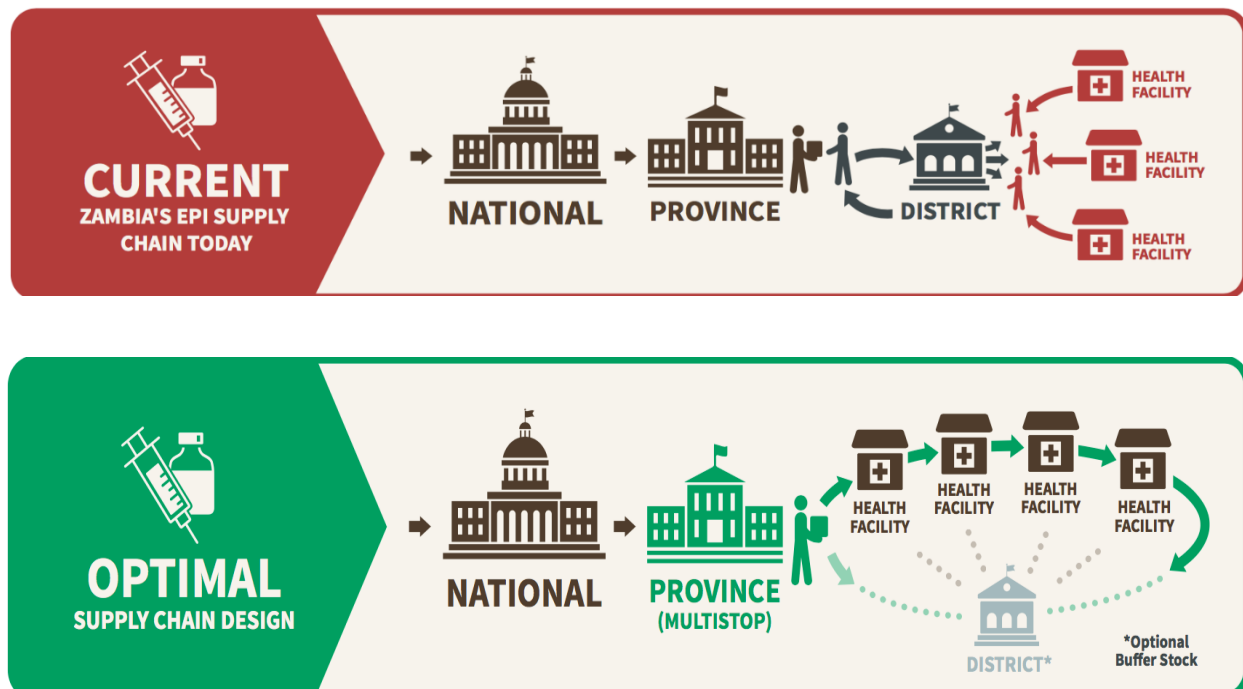
The immunization-coverage data and the results from the various assessments and analyses, and, later, the positive results from the experience of other countries making changes to iSCs, prompted the Zambian Ministry of Health in 2016 to convene a four-day system-design workshop to identify current problems and bottlenecks in the existing iSC and identify potential changes and improvements. In addition, modeling exercises were conducted to examine potential benefits of different designs. The workshop and the modeling resulted in a number of recommendations for change, including:

- removing a layer from the distribution system
- optimizing the use of cold-chain equipment
- improving transportation routes
- involving dedicated logisticians for delivery and data management.

Figure 1.3 depicts the current Zambian iSC distribution system and the proposed alternative design of the iSC distribution system. These designs were an output from the systems-design workshop. Specifically, the alternative design calls for:

1. the removal of the district-level vaccine storage in favor of distribution from the provincial level directly to the health facilities/posts, the lowest level in the system (note: district-level stores would still maintain a reserve or buffer stock of vaccines to fill gaps); and
2. a change in the distribution to a multistop looping design, where a truck from the province loops to all of the facilities delivering vaccines and supplies, rather than single trips by health-facility staff going “up the chain” to fetch vaccines.

**Figure 1.3: Current and proposed alternative iSC distribution system designs in Zambia**



The modeling exercise informed the systems-design workshop and determined that the proposed changes to the iSC distribution system would achieve the following results<sup>4</sup>:

- 9% reduction in the logistics cost per dose of vaccine
- 9% reduction in the overall total vaccine cost per dose
- 15% reduction in the transportation costs
- 94% reduction in the staff time spent on logistics

The change modifies or eliminates many of the activities and responsibilities of the district-level EPI staff. These staff include:

- district medical officer
- district maternal & child health coordinator
- district pharmacist
- health facility maternal & child health officer in charge
- district cold-chain technician

In almost all cases, these district staff have other full-time responsibilities outside of their roles in the EPI program, and the proposed change to the iSC would result in a significant change in their roles

<sup>4</sup> Source: Zambian Immunization Supply Chain Assessment: Baseline Modeling Results presentation, 2016. Zambian Ministry of Health, VillageReach, CIDRZ.

in the system. This is the intention. Staff time spent traveling, often long distances, to district medical stores to fetch vaccines reduces time available for patient care and other responsibilities.

The proposed alternative iSC can be seen as a significant organizational change. Specifically, key participants in the iSC are being asked to adopt a new system, and at various levels, roles and responsibilities will change. In keeping with organizational readiness for change theory, which is described further below, the success or failure of the change to the iSC is contingent in part on the readiness of the organization to make the change. Therefore, assessing the level of readiness of EPI staff and determining areas for strengthening readiness is warranted.

### **Organizational readiness for change**

In implementation science, ORC and the role that readiness plays in ensuring successful uptake and implementation of new or modified systems, policies, and interventions have been well documented in a number of sectors, including health services (Weiner 2008; Drzensky 2012). The interest in ORC is based on the view that many change initiatives fail to achieve their aims due to a lack of attention to or understanding of organizational readiness for change. (Kotter 1995; Drzensky et al. 2012). Despite the extensive change-readiness literature, the definition of ORC and its constructs remains varied and elusive (Holt 2006; Weiner 2008; Raftery 2013).

A review of the literature finds many definitions of ORC, reflecting the evolution of the thinking around ORC. Earlier research looked at ORC from an individual level of analysis, which considered primarily individual psychological components. More recently, the view has expanded to include analysis of structural and contextual components of ORC as well (Weiner 2009; Armenakis et al. 2007).

In his 2009 paper, Weiner provides a set of foundational elements when considering ORC that are particularly relevant to assessing ORC of district and provincial EPI staff in Zambia to adopt a new iSC distribution system. First is a definition for[?] ORC that will serve as the basis for this research project:

*“Organizational readiness refers to organizational members’ change commitment and change efficacy to implement organizational change.”*

Weiner focuses his theory and the level of analysis on the “supra-individual” (e.g., team or department) and goes on to state that, “implementing complex organizational change involves a collective action by many people, each of whom contributes something to the implementation effort.” This attention to collective action is particularly relevant to individuals working within a system, such as the iSC distribution system.

Based on the definition and theory provided by Weiner, as well as others, Scaccia and colleagues developed a conceptual framework for assessing organizational readiness for change, as well as an approach for building or strengthening organizational readiness for change. The Scaccia framework identifies the three components of organizational readiness as: *motivation* to implement the innovation, *general capacities* of the organization, and *the innovation-specific capacities* for the innovation (Scaccia 2015).

The research project described here applies Weiner’s definition and theory of ORC, and utilizes the Scaccia conceptual framework, to assess through qualitative analysis of focus-group results the readiness of district- and provincial-level EPI staff in Zambia to adopt a new iSC distribution system and establishes a plan for change—increasing readiness for a new iSC distribution system among provincial and district EPI staff—which is further enhanced by KIIs with the TWG advising Zambia’s National Immunization Program.

### **Purpose and specific study objectives**

The two-fold aims of this research project are to (1) apply the Scaccia conceptual framework to assess the readiness of district- and provincial-level EPI staff to adopt a new iSC distribution system; and (2) provide a plan to strengthen or improve readiness where possible. To achieve these aims the following objectives were pursued:

Objective 1: Through focus groups assess the readiness of provincial and district EPI staff in Zambia to adopt the proposed new iSC distribution system.

Objective 2: After completion of Objective 1, conduct KIIs to validate the findings from the focus groups and to assess the overall commitment to change among members of the national EPI Technical Working Group. The TWG provides input and guidance to the National Immunization Program and consists of representatives from global organizations such as UNICEF, WHO, and Gavi, as well as the MOH and local NGOs supporting vaccine programs.

Objective 3: Using the results from Objectives 1 and 2, develop a plan for change that increases the readiness of provincial and district EPI staff in Zambia to adopt the proposed new iSC distribution system through training, technical assistance, quality improvement, and the application of specific tools, or through other mechanisms that may emerge from the focus groups and KIIs.

## **CHAPTER II: LITERATURE REVIEW**

In implementation science, the role of ORC in ensuring successful uptake and implementation of new or modified systems, policies, and interventions has been the subject of research and commentary in many sectors, including health services. The interest in ORC is based on the view that many change initiatives fail to achieve their intended outcomes due in part to a lack of consideration of and attention to ORC (Kotter 1995).

Despite the extensive change-readiness literature in a number of sectors, the definition of readiness, its constructs and components, as well as the validity of the various ORC measurement tools, remain elusive (Greenhalgh et al. 2004; Holt et al. 2006; Weiner 2008; Raftery 2013). This may be due to the fact that ORC is widely viewed as a broad, highly contextual, multidimensional and multilevel construct, but at the same time is influenced largely by intuitive understanding of change and of readiness.

In 2008, Weiner and colleagues conducted an exhaustive and widely cited review of the ORC literature to determine how readiness for change was being defined and to assess the validity of the various tools being used to measure readiness. A subsequent review of the literature in 2016, also by Weiner and colleagues, further detailed the level of evidence and/or psychometric qualities of published readiness measures.

This literature review draws heavily from the articles considered in the two Weiner reviews. Of the 106 articles considered in the 2008 review, 47 were published in health-care related journals, the remaining appeared in business, education or other non-health-related journals. The subsequent 2016

review looked at 183 articles, 42 of which were published since the initial 2008 Weiner review. Of those 42, 11 were health-care related. The 47 health-care-related ORC articles from the 2008 review and the 11 from the 2016 review were reviewed for additional references and to establish a conceptual understanding of the topic. In addition, the non-health-care-related articles that are referenced frequently in the health-care articles, and which provide theoretical or conceptual insights into ORC, were also reviewed.

The aim of the review was to identify the following elements of ORC:

- The commonly used definitions of readiness and ORC
- The components of readiness
- The levels of assessment (e.g., individual, organizational, etc.)
- Mechanisms for assessing ORC
- Assessing the parallels between frameworks for ORC and for “scaling-up”

This review also confirms what Weiner’s 2008 review first indicated and which he reconfirmed in 2016: There is almost no published literature that considers ORC in the context of low-income or developing countries. Of the 187 reviewed in 2016, Weiner found that fewer than four articles pertained to ORC in the developing-country context. However, despite the dearth of literature pertaining to ORC in developing-country settings, there are a few that are worth noting and are discussed towards the end of this review.

This dissertation is intended to help fill the information gap pertaining to ORC in developing countries. It identifies a plausible ORC conceptual framework and its relevant application in assessing the readiness of EPI district- and provincial-level staff to adopt a change to the iSC distribution system in Zambia.

## **What is organizational readiness for change?**

Assessing ORC is a part of a larger change process or continuum. It is the preimplementation phase, and is part of, or contributes to, a comprehensive planning framework that includes needs assessment, goal setting, planning, evaluation, and identification of best practices (Scaccia 2014).

Despite the stated importance of assessing readiness for change as part of the overall change process, of the 106 articles in Weiner's 2008 review, more than half of the articles reviewed did not provide any definition of readiness. This may suggest that for many, the definition of readiness is best left to the "collective common sense" or is based on our own capacity to assess our individual readiness for change intuitively (Weiner 2008; Scaccia 2014).

While a single definition of readiness has not fully emerged, the definition established by Armenakis and colleagues in 1993 is arguably the most widely referenced and forms the basis of many subsequent definitions. Of the 106 articles reviewed by Weiner in 2008, 47 provided definitions of readiness for change. Of those, 20 used, modified or supported the following definition provided by Armenakis and colleagues:

*"Readiness is reflected in organizational members' beliefs, attitudes and intentions regarding the extent to which changes are needed and the organization's capacity to successfully make those changes. Readiness is the cognitive precursor to the behaviors of either resistance to, or support for, a change effort."*

ORC, its meaning and constructs, is rooted in the term "readiness." Earlier research mostly focused on the individual and individual readiness for change and heavily emphasized the psychological components of readiness—beliefs, attitudes, intentions—articulated by Armenakis. Since then, the examination of readiness has taken on greater dimension, and the definition has expanded to include perceptions of structural and contextual aspects of the organization that may influence or be antecedents to individual beliefs, attitudes, and intentions.

Weiner's 2009 definition and theory have also been widely cited and reflect the Armenakis view of readiness and its psychological components. Weiner states, "Organizational readiness refers to organizational members' change commitment and change efficacy to implement organizational change." He goes on to expand on this definition and to suggest that change commitment reflects a "shared resolve" for change, and that ORC is a "shared team property" which involves, "*collective* action by many people, each of whom contributes something to the implementation effort."

Others share the view that the psychological components of readiness are greatly influenced by structural factors as well, perhaps building from Armenakis's definition, where he underscores the influence on readiness resulting from "the organization's capacity" (Holt et al. 2009; Lehman, Greener, and Simpson 2002; Greenhalgh 2004; Rafferty 2013; Weiner 2009; Scaccia et al. 2016). These structural components reflect the capacity or capability of the organization, and the effects of these factors on ORC.

Holt et al. provide a useful definition of readiness for change as well as three areas to be considered to effectively evaluate readiness, which reflect the influence of Armenakis, but also the increasing attention being paid to the level of analysis (individual, organizational, or both). They define readiness as, "the degree to which those involved are individually and collectively primed, motivated, and technically capable of executing the change." To effectively assess readiness in the health-care setting using this definition, the authors suggest considering three areas: psychological factors, structural factors, and level of analysis (Holt 2009).

It is difficult to provide a simple definition of ORC. Most of the published definitions are supported by lengthy explanations that draw from psychology, management science, health services, and other disciplines. These variations reflect the highly contextual nature of efforts to understand or influence ORC. However, as the discipline evolves, there seems to be some consensus as to the psychological and structural roots of ORC.

## **What are the components of readiness?**

Taking the view that ORC includes both psychological and structural components, Holt and colleagues commented that ORC, “is comprised of both psychological and structural factors, reflecting the extent to which the organization and its members are inclined to accept, embrace, and adopt a particular plan to purposefully alter the status quo” (Holt et al. 2009). The Armenakis definition and the others spawned by it reflect the psychological and structural elements of ORC, which are often referred to in more specific terms—motivation and capacity—which are detailed, discussed, and debated extensively in the ORC literature.

### Motivation

Scaccia wrote that motivation is the “cognitive and affective perceptions of a change” that influence enthusiasm, acceptance, or resistance to change (Scaccia 2014). This definition is supported by the “five key change beliefs” developed by Armenakis, which can be viewed as the underlying components of motivation, and which are widely supported in the literature, either directly or conceptually. Table 2.1 lists and defines each component of beliefs and references the articles which reflect agreement or further support.

**Table 2.1: Armenakis's "Five Change Beliefs" Defined**

Component	Definition	Author(s)
1. Discrepancy	Discrepancy between the desired end-state and the present state/status quo.	Self and Schraeder 2008; Holt et al. 2010
2. Efficacy	Belief that the change recipient can successfully implement a change.	Armenakis and Harris 2009; Holt et al. 2007, 2009; Weiner et al. 2008, 2009; Vakola 2014
3. Appropriateness	Belief that a change is needed.	Armenakis and Harris 2009; Holt et al. 2007, 2010; Self and Schraeder 2008
4. Personal valence	The change is viewed as valued, or beneficial, to the change recipient.	Jones et al. 2005; Holt et al., 2007, 2010; Shea et al. 2014; Boukenoughe 2010; Rafferty et al. 2013; Weiner 2009
5. Principal support	Belief or understanding that formal leaders in an organization are committed to the success of a change.	Holt et al. 2007, 2010; Self and Schraeder 2008

Readiness for change, and a successful outcome, depends upon "buy-in," which is reflected in high or positive levels of each belief component (Armenakis 2007).

In addition to the five beliefs, many have come to believe that there is a significant affective component to motivation for change (Rafferty 2013; Holt 2013; Vakola 2012; Weiner 2009; Damschroder 2009). Affect refers to the emotions an individual might experience as a result of change or the potential for change (Rafferty 2013). Holt et al. wrote that change readiness does have an affective or emotional content, stating that readiness is, "the extent to which an individual or individuals are cognitively and emotionally inclined" to accept or implement change (2013).

#### Capacity

The view that structural components are critical to readiness is widely shared (Holt et al. 2009; Lehman, Greener, and Simpson 2002; Greenhalgh 2004; Rafferty 2013; Weiner 2009; Flaspohler 2008). These structural factors generally represent the views of the organization's capacity or capability for change. Components of capacity include infrastructure, skills, abilities, environment, functioning, and processes (Greenhalgh 2004; Flaspohler 2008).

## Context, culture, and climate

Additional components that influence ORC overlap with or underlie motivation and capacity, but are significant enough in the literature that they are important to mention.

Context is a widely discussed component of readiness. These are primarily structural in nature, and may include leadership (Kavanagh and Ashkanasy 2006; Bouckennooghe et al. 2009), communications (Armenakis et al. 2009; Holt 2007); management support (Cinte, Duxbury, and Higgins 2009), and organizational support (Cinte, Duxbury, and Higgins 2009). Weiner indicated that readiness is “highly situational,” which could be interpreted to mean it is contextual, and it is not a “general state of affairs” (Weiner 2009). Similarly, Damschroder and colleagues stated, “context is the set of unique factors that surround a particular implementation effort” (2009).

Jones et al. pointed out that a key contributor to the success of ORC is the culture of the organization. The culture reflects the organizational values and habits that shape or influence beliefs, attitudes, and intentions (2005). Greenhalgh affirmed the importance of context, culture, and climate components, specifically labeling them “leadership style, power balances, social relations, and attitudes toward risk taking” (2004).

Lehman et al. developed a widely used ORC assessment tool that assessed four domains that reflect motivational, climate, culture, and capacity components. These domains included motivation for change, institutional resources of the program, personality attributes of the staff, and organizational climate of the program (2002).

### **Level of analysis: individual vs. organizational**

An important area of discussion and debate within the ORC literature regards the level of analysis. Weiner found that of the 96 articles reviewed that offered a viewpoint, 46 percent suggested

that readiness was an individual-level construct, and 57 percent indicated that readiness as an organizational construct (2008).

At the center of the debate is the belief that, historically, most of the research has focused on the individual and individual readiness for change, which is then used, often incorrectly, as a proxy for the readiness of the organization (Bouckennooghe 2010; Vakola 2013; Rafferty 2013). Instead, there is a perception that organizational readiness reflects shared beliefs, shared resolve, and collective impact (Weiner 2009; Raferty 2013; Vakola 2013), and can be assessed at both the individual and organizational levels (Holt et al. 2009).

Raferty wrote, “a work group’s change readiness and an organization’s change readiness attitude emerge from the cognitions and affects of individuals that become shared because of social interaction processes and that manifest as higher level collective phenomena: work group and organizational readiness for change” (2013).

As the definition of ORC has evolved from primarily psychological and cognitive components of the individual to including also capacity and related structural components, the level of analysis has expanded to include both individual and organizational constructs and theories (Holt et al. 2009; Weiner 2008). Both individual and organizational constructs have applications to the change being considered to the iSC because the iSC distribution system involves the *collective* efforts of many in ensuring implementation, so it seems appropriate that both organizational- and individual-level constructs should be applied.

### **Assessing readiness for change**

Assessing readiness generally involves measuring across a scale the level or presence of specific readiness components. The underlying components are described and contextualized in many ways, but tend to be rooted in psychological and structural terms mentioned above.

Measuring readiness can be qualitative, quantitative, or some combination of the two (Armenakis et al. 2009). However, establishing valid approaches for assessing readiness for change has proven very challenging. In the 2008 review, Weiner and colleagues found in their review of the 43 published instruments for measuring organizational readiness for change, most exhibited “limited evidence of reliability or validity.”

Rather than an established and valid methodology, there seems to be a tendency to manipulate existing instruments to fit a single context or purpose. Weiner’s subsequent review in 2016 found that of the 183 articles reviewed, 76 provided readiness measures. Of those, “72 percent of readiness measures were used only once by the authors who developed them and never used again.” While this undermines efforts to establish reliability, when measures are applied it seems as though the context and environment for change are typically unique to a particular circumstance, so much so that establishing a one-size-fits-all instrument may be very challenging.

In concluding his 2016 review, Weiner identified several ORC measures that do have merit, based on a relatively high degree of validity and reliability, and could be considered for application in the health-care setting. These are summarized below in terms of the components or factors considered.

Individual Readiness for Organizational Change (Holt et al. 2007). The authors contend that readiness is an attitude that is influenced by a set of beliefs about the content (what is being changed), the process (how is change being implemented), the context (circumstances in which change is occurring), and the individuals (characteristics/attributes of those being asked to change). Using these four components as basis for their conceptual framework, they identified five themes important to readiness. These themes were closely aligned with Armenakis’s five beliefs (discrepancy, efficacy, appropriateness, personal valence, principal support). They then established a quantitative survey instrument utilizing a Likert scale to measure the quantitative level of readiness and readiness

components. As the name implies, this instrument was designed to measure individual readiness and has been used in several subsequent readiness studies.

Organizational Readiness for Implementing Change (Shea et al. 2014). ORIC was designed as a brief, reliable, and valid measure for assessing readiness of the “supra-individual,” that is, anything more than the individual (team, department, organization). The authors base ORIC on Weiner’s theory of organizational readiness for change (2009) and the two key components: change commitment and change efficacy.

ORIC establishes the determinants of the two components: task knowledge, resource availability, situational factors. Measuring the level of these components is then the focus of the quantitative survey and reflect an underlying consideration of both psychological and structural components.

A relatively new construct, ORIC was found to be valid and reliable, but, as yet, there are very few instances of it being applied.

Perceived Organizational Readiness for Change (Cinite, Duxbury, and Higgins 2009). The PORC construct was designed to assess the readiness and unreadiness for change in the public sector and to determine what organizational actions are often associated with organizational readiness and unreadiness. It primarily examines contextual factors associated with change and identified the following behaviors as important influencers of change management:

- Commitment of senior management to change (readiness)
- Competence of the change agents (readiness)
- Support of the immediate manager (readiness)
- Poor communications of change (unreadiness)
- Adverse impact of the change on work (unreadiness)

The PORC measurement then established a subscale to assess the relevant factors for each of the five determinants.

Organizational Change Recipients' Beliefs Scale (Armenakis et al. 2007). Not surprisingly, after establishing the five beliefs, Armenakis and colleagues established the OCRBS as a framework for a questionnaire to assess organizational readiness. This 24-question instrument consists of subscale measurements of each of the five beliefs: discrepancy, appropriateness, efficacy, principal support, and valance.

The OCRBS focuses on the individual level of analysis and has been used in several studies and was viewed by Weiner and colleagues as having excellent structural validity and good reliability.

$R=MC^2$  (Scaccia et al. 2015). This conceptual framework consists of a formula for determining the relative strength and weakness of three ORC components that include both psychological and organizational factors: (1) an organization's *motivation* to implement a change or innovation; (2) the *general organizational capacities*; and (3) the organization's *specific capacity* for a specific change or innovation. They developed a shorthand nonmathematical formula for their conceptual framework:  $R=MC^2$ , where R=readiness, M=motivation, and  $C^2$ =general organizational capacity times innovation specific capacity. Each of the three OR components consist of a number of subcomponents.

The Scaccia conceptual framework borrows critical elements of both individual psychological constructs and structural and organizational components established by the frameworks described above, and others. It provides an approach for assessing the level of each of the three components and their subcomponents, and can help to identify areas of strength and weakness within each component. The results are then used to inform efforts to strengthen areas of weakness or to build greater readiness.

Several health-care organizations have used the Scaccia formula to generate quantitative survey tools to assess their readiness to adopt certain health services, programs, or systems (Wandersman 2016; IHI 2015). In addition, a qualitative survey and discussion guide were developed using the Scaccia

model and implemented by the Healthy Teen Network, a public health program in Baltimore, Maryland, and supported by the Centers for Disease Control (Lamont et al. 2014).

Because Scaccia includes aspects of several influential frameworks mentioned above and incorporates both individual and psychological components in an assessment, as well as offering a method for strengthening readiness as a result of the assessment, it appears to be a good framework for assessing the ORC of EPI staff in Zambia.

### **Organizational readiness for change in developing countries**

The few published articles related to ORC that reflect the context of developing countries are generally focused on the concept of “e-readiness”—readiness to adopt internet-based technologies for health and business (a.k.a. “e-health” or “e-commerce”).

In the business literature, Molla and colleagues published a description and assessment of two interrelated e-readiness constructs aimed at assessing the capacity of businesses to adopt e-commerce approaches (internet-based operations and sales), which were tested in South Africa. One construct is focused internally, the perceived organizational e-readiness construct, and the other, externally focused, the perceived external e-readiness construct (Molla and Liker 2010).

The internal construct isolated several key e-readiness variables that are primarily related to capacity: awareness, commitment, human resources, technological resources, business resources, and governance. The external construct is largely focused on context, which includes the role of government and product markets in e-commerce. These tools look exclusively at the individual’s assessment of the organization and the larger business environment.

To assess e-health readiness, Khoja and colleagues developed an assessment tool for use with health-care providers in Pakistan. They defined e-health readiness as the “degree to which users,

health-care institutions, and the health-care system itself are prepared to participate and succeed with e-health implementation” (2007).

Through a sequential exploratory design they developed a 50-question instrument that had five categories of inquiry: core readiness, technological readiness, learning readiness, societal readiness, and policy readiness. These categories and their subscales were wide ranging, at times capturing beliefs, but also assessing need for and access to technology. The authors did not present any foundational conceptual framework or theory to guide the development of their assessment (Khoja et al. 2006, 2007). A search did not find any subsequent published results using the Khoja approach, and the Weiner assessment did not find any level of validity or reliability.

### **Organizational readiness for change and scaling-up**

In global health and development, the implementation-science domain that most mirrors readiness for change is “scale-up.” Mangham and Hansen describe scale-up as “the ambition or process of expanding the coverage of a health intervention” (2010). Others used the definition established by Expandnet ([www.expandnet.net](http://www.expandnet.net)),, a community of practice for global public-health practitioners focused on developing and promoting best practices at scale. They describe scale-up as “the deliberate efforts to increase the impact of health service innovations successfully tested in pilot or experimental projects” (WHO 2009). Clearly ORC and scale-up are rooted in change and the adoption of new innovations, practices, and policies. As a form of change, scale-up is often hugely challenging and often slow, haphazard, and frequently unsuccessful (McCannon, Berwick, and Massoud 2007). Scaling-up also suffers from a lack of consensus around a definition (Yamey 2011).

The scale-up literature also shares with ORC a strong influence of the work by Everett Rogers and his seminal book *Diffusion of Innovations*. His views have shaped many implementation-science theories, including scale-up and ORC (Yamey 2011; Barker, Reid, and Schall 2016; Damschroder et al.

2009; Greenhalgh et al. 2004). Despite the similar roots of scale-up concepts and ORC, and a focus by both on change, there seems to be almost no acknowledgement of ORC or its components in the scale-up literature.

A sampling of articles appearing in Expandnet was reviewed to identify references, frameworks, or approaches that might overlap with or reflect similar constructs as ORC.

Several articles reference context as a key component of scale-up, but in almost all cases the context references the setting in which the intervention is introduced (e.g., primary care) (Milat, Bauman, and Redman 2015; Moran et al. 2012).

A comprehensive review of the scale-up literature by Milat and colleagues identified the critical success factors and barriers—in rank order—associated with scaling-up health interventions which are listed in Table 2.2 (2015):

**Table 2.2: Success factors and barriers to scaling-up public-health interventions in rank order**  
(Milat, Bauman, and Redman 2015)

Success factors	
<ol style="list-style-type: none"> <li>1. Establishing monitoring and evaluation systems</li> <li>2. Costing and economic modeling of intervention approaches</li> <li>3. Active engagement of a range of implementers and the target community</li> <li>4. Tailoring scale-up approaches to local context and use of participatory approaches</li> <li>5. Systematic use of evidence</li> <li>6. Infrastructure to support implementation such as training, delivery systems, technical resources</li> <li>7. Strong leadership and champions</li> <li>8. Political will</li> <li>9. Well-defined strategy</li> <li>10. Strong advocacy</li> </ol>	<ol style="list-style-type: none"> <li>11. Flexible responses to human resource constraints</li> <li>12. Formative research to ensure appropriate design</li> <li>13. Equity of intervention delivery and monitoring of intended and unintended consequences across sociodemographic profiles</li> <li>14. Effective communications strategy</li> <li>15. Effective governance and coordination</li> <li>16. Clear role definition and delineation</li> <li>17. Keeping the intervention model simple</li> <li>18. Financing models</li> <li>19. Programs are visible, publicized, and effectively packaged</li> <li>20. Developing strategies for integration into existing services</li> </ol>
Barriers	
<ol style="list-style-type: none"> <li>1. Not adapting intervention approaches to the local context Intervention costs and other economic factors</li> <li>2. Lack of human resources</li> <li>3. Resistance to the introduction of new practices due to capacity constraints</li> <li>4. Insufficient investment in implementation infrastructure including training, monitoring, and evaluation systems</li> <li>5. Maintaining quality and consistency of health interventions</li> </ol>	<ol style="list-style-type: none"> <li>6. Staff recruitment and staff turnover</li> <li>7. Lack of political will</li> <li>8. Traditional research funding processes are not flexible enough to support evaluation of scale-up</li> </ol> <p>Leadership changes amongst implementation agencies</p> <ol style="list-style-type: none"> <li>9. Poor engagement with stakeholders and thought leaders</li> <li>10. Poor role delineation</li> </ol>

These factors are based on the needs of a system or program but have little correlation with ORC. It seems as though ORC and scale-up, while rooted in the same implementation-science discipline, and which share a forward-thinking perspective, have yet to be viewed in a way that suggests a possibly

mutually reinforcing relationship. It seems as though scale-up is primarily concerned with the beneficiaries of change, while ORC is concerned with the implementers of change.

## **Discussion**

This review set out to find a viable definition of ORC, an understanding of its components, and a plausible conceptual framework to utilize in assessing the readiness of EPI staff to adopt a new iSC distribution system.

What it found is that ORC is a complex and disorderly implementation-science discipline, made more so by the confusing lack of standard definitions and terms. What one author refers to as components of readiness, others use terms like variables, factors, aspects, elements, attributes, etc. The lack of concrete terminology hinders understanding of the subject and its many determinants.

Often, readiness for change is defined by what it is not. Much of the literature points out that readiness for change is distinct from resistance to change, need for change, attitudes towards change, commitment to change, etc. (Armenakis 1993; Holt 2007; Weiner, in press). Despite this distinction, components of these other constructs play an influential role in ORC, which makes isolating an ORC construct difficult.

The review found very little research applying ORC theories or constructs to the developing-country context, and a cursory review of the literature around scaling-up interventions and innovations, a process widely used in global health and development, did not find references to any of the influential ORC literature.

Clearly a gap exists in terms of ORC assessment and its application in the context of developing countries and global health, a gap this dissertation hopes to begin narrowing.

### CHAPTER III: METHODOLOGY

As a qualitative research study, this dissertation follows a grounded theory of inquiry to inform data collection and analysis. Grounded theory is an approach to qualitative research that “derives a general, abstract theory of a process, action, or interaction grounded in the views of the participants” (Corbin and Strauss 2007). This approach is used to achieve the following objectives: Objective 1: Through focus groups, assess the readiness of provincial- and district-level EPI staff in Zambia to adopt the proposed new iSC distribution system.

Objective 2: After completion of Objective 1, conduct key informant interviews to validate the findings from the focus groups and to assess the overall commitment to change among members of Zambia’s national EPI Technical Working Group.

Objective 3: Using the results from Objectives 1 and 2, develop a plan for change that increases the readiness of provincial- and district-level EPI staff in Zambia to adopt the proposed new iSC distribution system through training, technical assistance, quality improvement, and the application of specific tools.

#### Conceptual framework

In 2015, Scaccia and colleagues published a conceptual framework that assesses readiness for change by measuring both the psychological factors as well as the organizational factors associated with ORC. Their formula consists of determining the relative strength and weakness of three OR components: (1) an organization’s *motivation* to implement a change or innovation; (2) the *general organizational capacities*; and (3) the organization’s *specific capacity* for a specific change or innovation. They developed a shorthand nonmathematical formula for their conceptual framework:  $R=MC^2$ , where R=readiness, M=motivation, and  $C^2$ =general organizational capacity times innovation-specific capacity.

Each of the three OR components consists of a number of subcomponents which are defined in Table 3.1 below. The subcomponents listed are illustrative and nonexhaustive.

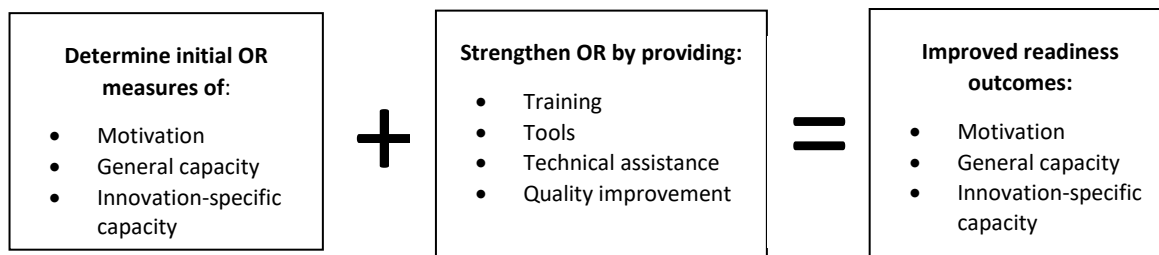
**Table 3.1: Components and subcomponents of organizational readiness for change**  
(Scaccia et al. 2015)

<b>Readiness = motivation x general organizational capacity x innovation-specific capacity</b>	
<b>Component 1: Motivation</b>	
<b>Motivation subcomponents</b>	<b>Definition</b>
Relative advantage	Degree to which a particular innovation is perceived as being better than what it is compared against.
Compatibility	Degree to which an innovation is perceived as being consistent with existing values, cultural norms, experiences, and needs of potential users.
Complexity	Degree to which the innovation is perceived as relatively easy to understand.
Trialability	Degree to which an innovation can be tested and experimented with.
Observability	Degree to which outcomes that result from the innovation are visible to others.
Priority	Extent to which the innovation is regarded as more important than others.
<b>Component 2: General organizational capacities</b>	
<b>General-capacity subcomponents</b>	<b>Definition</b>
Culture	Expectations about how things are done in an organization; how things function.
Climate	How employees collectively perceive, appraise, and feel about their current working environment.
Organizational innovativeness	General receptiveness towards change.
Resource utilization	How discretionary and uncommitted resources are devoted to innovation.
Leadership	Whether power authorities articulate and support organizational activities.
Structure	Processes that affect how well an organization functions on a day-to-day basis.
Staff capacity	General skills, education, and expertise that the staff possess.
<b>Component 3: Innovation-specific capacities</b>	
<b>Innovation-specific capacities subcomponents</b>	<b>Definition</b>
Innovation-specific knowledge, skills, and abilities	Knowledge, skills, and abilities needed for the innovation.
Program champion	Individual who put charismatic support behind the innovation through connections, expertise, and social influence.
Specific implementation climate supports	Extent to which the innovation is supported: presence of strong, convincing, informed, and demonstrable management support.
Interorganizational relationships	Relationships between (a) providers and support systems, and (b) between different provider organizations that are used to facilitate implementation.

This conceptual framework allows for a critical examination of each of the three components and can help to identify areas of strength and weakness within each component, which in turn can inform efforts to strengthen areas of weakness and to achieve successful change.

Several health-care organizations have utilized the Scaccia framework to generate survey tools to assess their readiness to adopt certain health services, programs, or systems (Wandersman 2016). The information collected by the assessment of OR is then used as the basis for strengthening OR through a number of approaches suggested by Scaccia and colleagues, including training, technical assistance, quality improvement, and application of specific tools (Scaccia 2015). Figure 3.1 shows the process diagram for building or improving OR. This approach will support the achievement of Objective 3.

**Figure 3.1: Building organizational readiness**  
(Modified from Scaccia et al. 2015)



### Study setting

The purpose of this dissertation is to provide an assessment of the readiness for district- and provincial-level EPI staff to adopt a new iSC distribution system in Zambia. Zambia is a landlocked country in sub-Saharan Africa, with a population of approximately 16 million; three million of whom are under the age of five years. It has one of the highest fertility rates in the world, with 6.2 births per woman. More than half the population live in rural or semirural areas. Figure 3.2 maps the country's 10 provinces.

**Figure 3.2: Provincial map of Zambia**



According to the *Zambia Demographic and Health Survey 2013–2014*, the most recent national data, the DPT 3 immunization coverage rate for Zambia was 86 percent. Complete coverage of routine immunization was 68 percent.<sup>5</sup> Zambia performs better than sub-Saharan Africa in all three categories. Table 3.2 provides DPT 1 and 3 and routine coverage rates for each of Zambia’s 10 provinces and for urban and rural areas, and provides a comparison with overall rates for countries in sub-Saharan Africa.

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<sup>5</sup> Complete coverage is defined by WHO as those children who receive all of the following routine immunizations in the first 12 months of life: Bacillus Calmette–Guérin, measles, and three doses each of DPT–HepB–Hib and polio vaccine.

**Table 3.2: Coverage of DPT1 and DPT3 by province and urban/rural areas, and all vaccines, in Zambia with comparison to sub-Saharan Africa.**

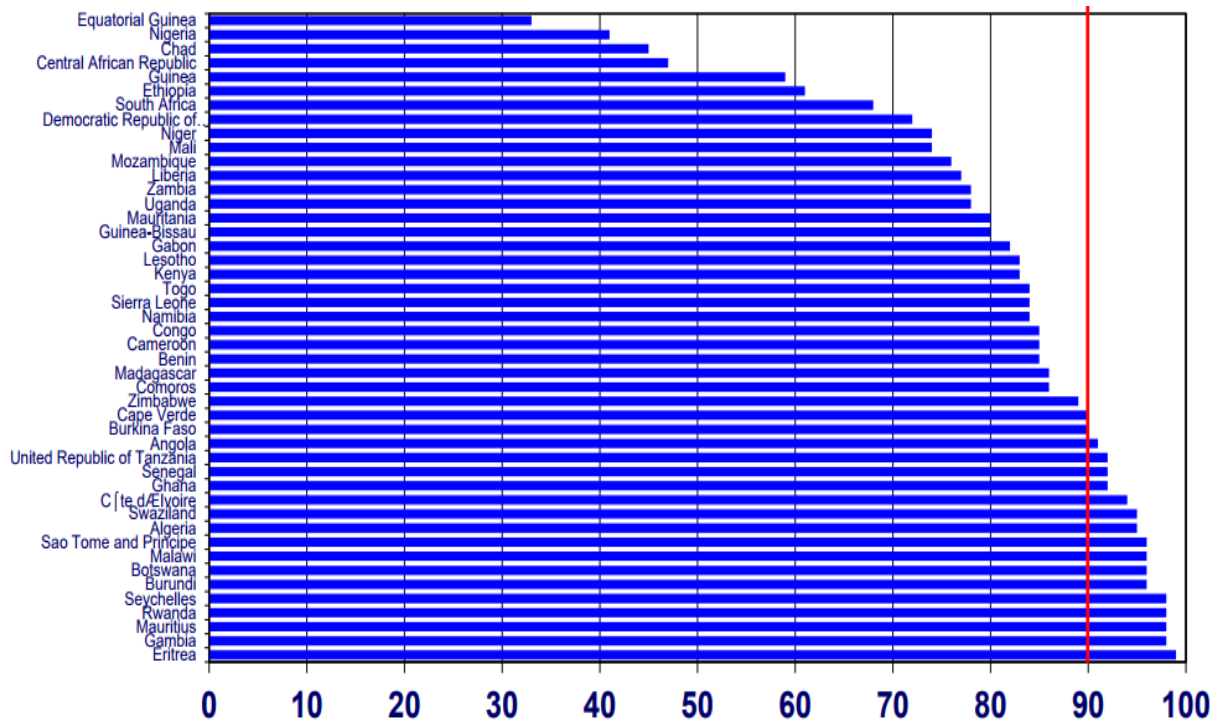
Province	DPT1 (%)	DPT3 (%)	Complete coverage of all vaccines (%)
Central	90	82	66
Copperbelt	98	94	81
Eastern	96	87	63
Lusaka	97	91	59
Luapula	95	80	72
Machinga	95	79	60
Northern	97	86	72
Northwestern	96	82	62
Southern	95	83	69
Western	93	81	63
Urban areas	97	92	75
Rural areas	93	82	64
Sub-Saharan African Countries (2016)	83	74	80

Sources: *Zambia Demographic and Health Survey 2013–14*; WHO/UNICEF

Ideally, DPT1 and DPT3 would be the same, however loss-to-follow-up results in lower coverage of DPT3, and has several causes including lack of access in rural areas. The most significant disparity between coverage of DPT1 and DPT 3 in Zambia is happening in the most remote and rural provinces (Central, Machinga, Northwestern, Southern, Western), where coverage of all vaccines is low.

Coverage of DPT 3 in Zambia is lower than many other African countries. Figure 3.3 shows rates of DPT 3 coverage for all of Africa in 2012, when a goal of 90 percent coverage was established for the region by WHO. Zambia, at that time, had the 13th lowest coverage rate of all African countries (WHO /UNICEF 2016).

**Figure 3.3 DPT 3 coverage, Africa, 2012**



Source: Progress Towards Global Immunization Goals-2016. WHO/UNICEF

In Zambia, routine immunization is provided largely through the public health system, with some variations in contributions by private or nonprofit organizations in the 10 provinces. Immunization service is provided by staff based mostly at public health facilities run by the districts. However, private health facilities also offer routine immunization services through affiliation with the public health facilities in their catchment areas.

The district health office (DHO) headed by a district medical officer (DMO) oversees immunization services at the district level. The maternal and child health (MCH) coordinator, under the supervision of the DMO, is directly in charge of delivering immunization services, and a pharmacist manages logistics.

At the provincial level, the provincial medical officer is responsible for all health service provisions, while the principle nursing officer and/or a pharmacist under the MCH is in charge of immunization. At the national level, the EPI program sets strategy, establishes budgets, procures vaccines and supplies, and evaluates the overall system.

A local research partner, the Center for Infectious Disease Research in Zambia (CIDRZ), assisted with the implementation of this research project. CIDRZ is a well-respected and well-established nonprofit research organization that works closely with the government of Zambia, the University of Zambia, and other local and international NGOs ([www.cidrz.org](http://www.cidrz.org)). CIDRZ played an instrumental role in leading the system design phase of the redesign of the iSC distribution system. For this study, CIDRZ helped to facilitate the Institutional Review Board process in-country, obtained permission of central MOH and provincial-level authorities, and facilitated the focus groups. In addition, because of their strong reputation and relationships with key stakeholders, they initiated initial contact with the participants in the key informant interviews and served as a conduit to the MOH for obtaining permissions and to provide background on the study aims.

### **Study design**

Assessing ORC using the Scaccia framework has primarily been conducted using quantitative surveys administered to individuals within an organization (ASPE 2014; Wandersman and Scaccia 2016). These surveys generally utilize a Likert scale for measuring levels of perceived readiness and its components. The context and location of district and provincial EPI staff in Zambia, and in Africa generally, makes administering a survey or one-on-one interviews very challenging. These staff live and work in remote and isolated areas, typically without access to internet, reliable transportation, and cell phone service, making it difficult to administer a survey. For this reason, it was decided that using focus-group methodology would be the best way to obtain the necessary data and information.

### Focus groups

Focus groups are also useful in this study because they provide insights into the *collective* responses of the EPI team, recalling, as Weiner stated, that ORC involves “*collective* action by many people, each of whom contributes something to the implementation effort.” Nili and colleagues write, “compared to other methods, such as individual interviews and surveys, the interactive and synchronous group discussion aspect of focus groups allows participants to discuss, agree, or dissent with each other’s ideas and to elaborate the opinions they have already mentioned” (2017).

EPI and the ISC distribution system that supports it, is very much a team or collective effort, and each individual relies on others to fulfill their responsibility in order to implement a successful system. Their interaction in the focus group should provide additional collective input and views that would be helpful in designing approaches to improving readiness. The focus-group approach seems well suited to capture the collective views of EPI staff relative to ORC.

The results of the focus groups were shared with key stakeholders through key informant interviews for interpretation of the focus-group findings and to elicit feedback pertaining to EPI’s ORC and reflect on the potential approaches to increasing ORC among EPI staff at district and provincial levels.

### Focus-group sampling and recruitment

A purposive sample of EPI staff working at district and provincial levels was selected from Western Province in Zambia, the province with one of the lowest immunization coverage rates in the country. The national coverage of routine immunizations is 68 percent. In Western Province the coverage is 62 percent. Western Province is a rural and remote province consisting of 16 districts and a population of approximately one million.

The rationale for selecting districts mostly from the same province is that they are likely to be served by the same ISC distribution system originating at the provincial level, which ensures a similar or shared understanding of existing system characteristics, strengths and weaknesses, as well as a shared experience with the system among the participants.

Three districts in Western Province were selected for focus groups: Limulunga, Shang’ombo, and Nalolo. A fourth focus group was conducted in Mongu, the Western Province capital, with provincial-level EPI staff. In addition, a focus group was held in Lusaka District for purposes of testing the focus-group guide. Data from the Lusaka focus group was included in the overall assessment, where relevant. Table 3.3 provides a summary of the four district-level and one provincial-level focus-group participants.

**Table 3.3: Summary of focus-group sample characteristics for four districts and the province in Western Province, Zambia**

<b>Districts</b>		
<b>Name of district</b>	<b>Rate of DPT3 coverage</b>	<b>Participants in each of the four focus groups</b>
Limulunga	66% Very low coverage	<ul style="list-style-type: none"> <li>• District medical officer</li> <li>• District pharmacist</li> <li>• District maternal &amp; child health coordinator</li> <li>• District cold chain technician</li> </ul>
Nalolo	74% Low coverage	<ul style="list-style-type: none"> <li>• District pharmacist</li> <li>• District maternal &amp; child health coordinator</li> </ul>
Shang’ombo:	97% High coverage	<ul style="list-style-type: none"> <li>• District pharmacist</li> <li>• District maternal &amp; child health coordinator</li> </ul>
Lusaka	96% High coverage	<ul style="list-style-type: none"> <li>• District medical officer</li> <li>• District maternal &amp; child health coordinator</li> <li>• District pharmacist</li> <li>• Health facility maternal &amp; child health Officer in charge</li> <li>• District cold-chain technician</li> </ul>
<b>Province</b>		
Western Province (Provincial Health Office in Mongu)	81% (National coverage = 86%)	<ul style="list-style-type: none"> <li>• Provincial medical officer</li> <li>• Provincial public health specialist</li> <li>• Provincial maternal &amp; child health coordinator</li> <li>• Provincial pharmacist</li> <li>• Provincial cold-chain technician</li> </ul>

Following Zambian research protocols, approval to conduct the focus groups was first obtained from the central MOH in Lusaka. Once approval was granted, local Institutional Review Board approval was obtained (ERES Converge; reference # 2017-April-015). The University of North Carolina determined the study non-research and IRB approval was not required (study reference # 17-042).

#### Informed consent and protecting confidentiality

Per protocol, a letter requesting permission to conduct the focus groups at the district and provincial levels was sent by CIDRZ to the Western Province DMO. Once permission was granted at the provincial level, the relevant district and provincial EPI staff were sent a letter and/or an email explaining the study, demonstrating the approvals obtained at national and provincial levels, and inviting them to participate in the focus group. In addition, an informed-consent form was included. The informed consent outlined the purpose of the study, the voluntary nature of the study, the risks, and confidentiality protection measures. They were assured in writing that their participation was strictly voluntary, and their responses would be anonymous and confidential. A follow-up phone call was made to participants to obtain verbal agreement or refusal. Everyone who was invited agreed to participate.

#### Focus-group guide and data collection

The focus-group guide for measuring ORC using the Scaccia formula was adapted from several existing ORC survey instruments and interview guides developed by other organizations and agencies using the formula (Wandersman 2016). These tools have been developed primarily for use in domestic US public health programs and utilized qualitative measures such as Likert scales to measure levels of readiness. This kind of survey method presents significant challenges in low-resource settings such as Africa, where accessing a valid number of survey participants and administering surveys is logistically difficult. Many do not have reliable internet access or work in isolated environments where providing

survey documents is difficult. In addition, many health-care workers have limited literacy skills in English. Therefore, focus groups provide a viable method for gathering data in these settings.

The focus-group guide uses open-ended questions to probe the levels of the subcomponents to motivation, general organizational capacities, and capacity specific to adopting changes to the iSC distribution system.

The focus-group guide was tested with a preliminary focus group consisting of provincial-level EPI staff in Lusaka District to detect any flaws in the guide, assess timing, and get input and reactions to specific questions and topics. The complete guide is available as Appendix A. This testing revealed that the original draft of the guide would take too long to complete, so several subcomponent questions were eliminated. It was decided that those questions to be eliminated were those that were designed to obtain psychological input—beliefs and attitudes—reflecting individual attributes and components. The perception was that these kinds of questions (such as those about morale) would be subject to social-desirability bias, already a risk in the focus-group setting. In addition, some felt that at the district level, questions probing psychological components, such as personal feelings and attitudes, might not be fully understood in the context of immunization and supply chains, and without translation into the local Lozi language for better interpretation. Lastly, it was thought that questions pertaining to organizational leadership should be eliminated. Input from the research partner and the pilot focus group revealed that questions about leadership would not provide useful answers since most EPI staff at the subnational level, and particularly those working in remote areas, are seldom exposed to the leadership of the MOH's EPI system, nor do they themselves have the opportunity to exhibit leadership skills in a meaningful and visible way. Organizational decisions are passed down administratively, with little explanation or input, and a lack of clarity about who makes decisions, how, and where.

The focus groups were conducted between September 11 and 17, 2017. At the outset each participant signed the letter acknowledging informed consent. Each focus group lasted approximately 90

minutes and was moderated by the same trained Zambian social-science researcher from CIDRZ. A notetaker and coordinator was also present. Audio recordings and written notes and transcripts were obtained from each focus group. District-level focus groups were conducted in the respective district health offices. The provincial-level focus group was carried out at Western Provincial Health Office (PHO) in Mongu. After each of the first two focus groups, a debriefing with the moderator, notetaker, and researcher was held to identify any problems or challenges and to make adjustments if needed.

### Key informant interviews

Once the focus groups and preliminary analysis were completed, semistructured interviews were held with members of a supply-chain subcommittee to Zambia's EPI Technical Working Group, an influential advisory body to Zambia's MOH. It advises on EPI-related policies, makes recommendations, provides technical input, and reviews and evaluates programs and systems. It consists of EPI experts representing global and national organizations, such as UNICEF, WHO, local and international NGOs, and the MOH. Members of the TWG had considerable input into the iSC distribution system redesign. Selected TWG members were invited to participate in the KII via email, which detailed the overall purpose of the study and the format of the interview. The following TWG members agreed to participate:

- EPI director, Ministry of Health
- Chief logistician, Ministry of Health
- Deputy director, Better Immunization Data project, PATH (NGO)
- Deputy director, Primary Care and Health System Strengthening, Center for Infectious Disease Research in Zambia
- Director, Supply and Logistics, Churches[?] Health Association of Zambia (NGO)
- Consultant to the Ministry of Health, Expanded Program on Immunization (formerly with CIDRZ)

Invitations to and repeated attempts to contact the WHO and the UNICEF representatives were unsuccessful. This may be due to the burdensome approval process that these two organizations impose on staff who are invited to participate in research.

The key informant interviews were conducted with members of the EPI TWG using an interview guide with semistructured and open-ended questions (Appendix B). The instrument was intended to (1) gain insights into readiness for change by asking the informants what they viewed as the advantages and disadvantages of the proposed system and to compare those answers with those from the focus groups; (2) identify the challenges that provincial, district, and health-facility staff might confront in making the change; and (3) to get feedback and interpretation of conclusions stemming from the focus groups. Verbal informed consent was obtained at the beginning of the interview.

KIIs were conducted by the researcher in English via Skype. The length of the interviews varied from 45 minutes to 70 minutes.

#### Data management

Participants in both the focus groups and the KIIs were reminded that their responses would remain anonymous and that the recordings and transcripts would be kept in a password-protected electronic file accessible only to the researcher and the focus-group facilitator, and would be deleted within one year of the study completion.

The audio recordings of the focus groups were transcribed by a private transcription service. To protect confidentiality, each focus-group participant was given a numeric identifier and was referred to during the focus groups by an alphanumeric identifier (e.g., Speaker 1, Speaker 2).

#### Data analysis

##### Focus groups

The recordings and transcripts were converted into files and imported into NVivo11™, a qualitative analysis software program for in-depth analysis. Using NVivo, a constant comparison analysis was conducted of the themes, terms, and concepts related to the three ORC variables in the Scaccia formula. Constant comparison analysis is a form of deductive analysis in which one identifies codes and

categories based on existing theory or prior research (Nili, Tate, and Johnstone 2017). There are three stages of constant comparison: (1) data are grouped into small units and assigned a descriptor or code; (2) codes are grouped into categories; (3) themes are established that express the content of the groups (Onwuegbuzie et al. 2009).

The codes established were designed to assess the three variables in the Scaccia formula and were further subdivided for analysis of the subcomponents. Chapter IV, “Results,” provides a complete analysis of the focus groups.

#### Key informant interviews

After each interview a summary was prepared that identified key themes and main points, areas of concern, interpretations and reactions to the focus-group results, and feasibility and recommendations for the potential readiness-strengthening proposal. The KII results and written notes were analyzed using a modified (no software utilized) content-comparison approach to identify common and unique themes. The results were also compared to the findings and themes that emerged from the focus groups to identify any common themes between the two groups, and any areas where they diverged in terms of opinions or perceptions.

## CHAPTER IV: RESULTS

This chapter presents the findings and analysis of the focus groups conducted to assess the readiness of district- and provincial-level staff to adopt a proposed alternative iSC distribution system (Figure 4.1) and subsequent key informant interviews.

**Figure 4.1: Proposed alternative supply chain distribution system, Zambia**



These discussions were designed to achieve Objectives I and II:

Objective I: Through focus groups, assess the readiness of provincial and district EPI staff in Zambia to adopt the proposed new iSC distribution system.

Objective II: After completion of Objective I, conduct KIIs to validate the findings from the focus groups and to assess the overall commitment to change among members of the national EPI Technical Working Group.

The chapter is divided into three parts. Part I analyzes the first portion of the focus group in which participants respond to and discuss the presentation of the diagram depicting the current iSC distribution system, followed by a discussion of the diagram of the proposed iSC distribution system. This initial discussion revealed the context and setting in which the iSC currently functions, and the needs that should be considered when designing changes. The discussion of the current and proposed systems set the stage for assessing organizational readiness for change (ORC) and ensured that all the participants were in agreement about the current system and its components, where and how it is

functioning and not functioning, and illuminated critical issues that should be considered when considering changes to the system. Part I concludes with a description of two critical system-related issues pertaining to the current iSC design that influence immunization coverage and the effectiveness of the current system.

Part II is an analysis of the focus-group results using the Scaccia conceptual framework for assessing ORC and elaborates key findings from the focus groups in the context of ORC (Scaccia et al. 2015). Specific questions were asked that correspond with the three ORC components established in the Scaccia framework: motivation, general organizational capacity, and intervention-specific capacity, as well as their subcomponents.

Part III provides the results of the KIIs and the informant's interpretations and feedback to the proposed changes and the findings from the focus groups. Table 4.1 provides the number and characteristics of the focus-group participants.

**Table 4.1: Location, title, and number of focus-group participants**

Location	Participants	Number
Lusaka District Health Office (DHO)	District pharmacist District maternal and child health coordinator District cold-chain <sup>6</sup> technician District medical officer Health facility maternal & child health officer in charge	5
Nalolo DHO	Pharmacist Maternal and child health coordinator	2
Shang'ombo DHO	Pharmacist Maternal and child health coordinator	2
Limulunga DHO	District pharmacist District maternal and child health coordinator District cold chain technician District medical officer	4
Mongu (Western) Provincial Health Office	Provincial pharmacist Provincial maternal and child health coordinator Provincial cold chain technician Provincial medical officer	4
<b>Total</b>		<b>17</b>

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<sup>6</sup> The cold chain consists of a series of supply-chain links that are designed to keep vaccines within WHO-recommended temperature ranges, from the point of manufacture to the point of administration.

The following is the list of the EPI Technical Working Group participants and/or organizations included in the key informant interviews:

- EPI director, Ministry of Health
- Chief logistician, Ministry of Health
- Deputy director, Better Immunization Data project, PATH (NGO)
- Deputy director, Primary Care and Health System Strengthening, Center for Infectious Disease Research in Zambia
- Director, Supply and Logistics, Churches Health Association of Zambia (NGO)
- Consultant to the Ministry of Health, Expanded Program on Immunization (formerly with CIDRZ)

#### **Part I: Focus-group responses to the current and proposed iSC**

The focus groups began with a few minutes of introductions and preliminary questions intended to “break the ice.” That was followed by a presentation of the current iSC design diagram (Figure 4.2) and questions to confirm its accuracy. The diagrams of the current iSC and the proposed iSC (Figure 4.3) were the result of the MOH’s systems-design workshop and were agreed upon by key stakeholders as adequate summary representations of the current and proposed iSC. The sidebar provides the narrative used to describe the current and proposed iSCs in the focus groups.

#### **Sidebar**

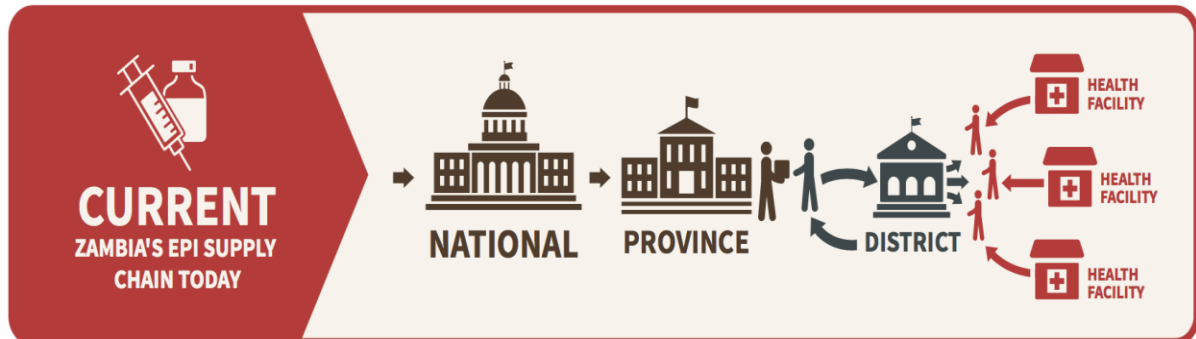
##### **Narrative description of current and proposed alternative iSC distribution system function.**

Current iSC distribution system: *Currently vaccines are brought into the country procured from manufacturers or by a third party such as UNICEF and delivered directly to the central MOH. From there the MOH delivers to the provincial-level medical stores. The quantity delivered to the province is based on population estimates as well as additional buffer stock needed for unanticipated demand. District-level EPI staff travel to the PHO to obtain their allotment of vaccines and buffer stock and return to the DHO, usually monthly or quarterly. Health-facility staff then travel to the DHO to obtain vaccines for their health facility and then travel back.*

##### Proposed iSC distribution system:

*The system and process for bringing vaccines into the country and dispersed to the provincial level remains unchanged. However, the provincial EPI staff will then distribute the vaccines directly to the health facilities following a multistop looped design connecting with several facilities in a single trip. DHOs will maintain a quantity of buffer stocks and district staff will accompany provincial staff on the delivery loops.*

**Figure 4.2: Zambia's current EPI supply chain**



Several participants noted that the distribution-design diagram was accurate in theory but not always in practice, and leaves out critical components of the overall iSC system. In particular, it was noted that the diagram did not depict “feedback.” Feedback, upon exploration, was described as the data monitoring, reporting, and communication exchanges between central, provincial, district, and facility levels to ensure adequate vaccine stocks were obtained and dispensed appropriately. This was described as being a very critical function of the EPI staff at every level. When working effectively, the feedback system generates and transfers the data collected by EPI staff at facility levels and is passed along to district staff who collate the data and send it on to provincial levels. This reporting or feedback system ensures the right quantity of vaccines are obtained and managed appropriately. This data also informs supervision, tracking, and cold-chain functioning. This data also helps evaluate overall EPI system quality and effectiveness. Ensuring that this reporting process functions is fundamental to the iSC function.

The feedback process and reporting mechanisms are a critical function of the iSC system, and it was made clear that it is the primary role and responsibility of EPI staff at all levels, particularly at the district and provincial levels. The lack of feedback and reporting responsibilities and functions depicted in the diagram was widely noted. In addition, some indicated that facility-level staff have not been adequately trained in vaccine data management, which contributes to vaccine over- and under-stocks.

*“But it's also the other arrows where there should be some information, some sort of feedback somewhere, from the district to the province, the province to the health facility then like that. There should be some feedback of some sort.”*

- Participant, Nalolo DHO

*“There's a lot of feedback in the province to the districts, and facility to district, there is feedback there.”*

- Participant, Limulunga DHO

The discussion about the current design also identified additional system infrastructure components that do not currently function adequately and which impede coverage, especially transportation, electricity, and telecommunications. These challenges impact not only the iSC, but health access generally. It is a weakness across the health-care system, and because of this, these infrastructure challenges should be seen as an indication of a weakness or limitation to structure, a general capacity subcomponent. This is an important distinction from the innovation-specific capacity.

Transportation: In each of the focus-group discussions, it was made clear that insufficient transportation of vaccines and staff, exacerbated by difficult terrain, is a huge challenge, perhaps the biggest challenge, and contributes to perpetually low rates of immunization coverage. Whether it is the district staff going to the province, or, especially, for the health-facility staff in remote areas going to the district, the lack of dedicated vehicles, volatile weather, and difficult terrain isolate many facilities and staff. In some cases areas are cut off for much of the year due to flooding. Facility and district staff have to think of creative ways to get vaccines to these facilities, but in many instances stock-outs are frequent and may last months.

*“I think the other challenge that we are facing is that we find that in Limulunga District we have 16 facilities, but only six out of 16 have access to transport. ...The District only has one utility vehicle, which is also acting as an ambulance.”*

- Participant, Limulunga DHO

*“During the rain season, some places are impassable, are inaccessible ... places that would be cut off for three months or more, so you have to have enough stock for those months in that facility.”*

- Participant, Lusaka DHO

*“As a district, we need more vehicles. ... All in all, I would say I need a dedicated vehicle.”*

- Participant, Nalolo DHO

Electricity: Many of the facilities do not have reliable electricity needed to maintain the cold-chain equipment. While some facilities do have solar power available, the solar equipment tends to be unreliable or requires specific technical skill when repairs are needed. As a result, in facilities without electricity and cold chain, the staff have to travel to the nearest facility that does have adequate cold chain, obtain vaccines, return to their facility, and then go back with any left-over vaccines for appropriate storage in the cold chain. This back and forth is often very time and resource consuming.

*“Because there are difficulties, like the one pointed out [lack of electricity], people have to store vaccines in the next power system, maybe five kilometers away, or eight, 10 sometimes. And if the motorcycle is broken down, people have to walk. And they have to walk twice: to collect and to take back.”*

- Participant, Mongu PHO

*“Some facilities, they do not have backup power, which means they cannot stock the commodities.”*

- Participant, Shangombo DHO

Telecommunications: The lack of access to telecommunications was also identified as a common problem in the current iSC, further hindering its effectiveness.

*“These three facilities mentioned, which are very, very far, they also don’t have any type of network, so for them to get in touch with us when they are having problems, whether on the fridge or on the vaccines, whatever, it’s really tough.”*

- Participant, Nalolo DHO

The discussion of the existing iSC confirmed that in most instances, the district staff travel “up the chain” to the provincial office to obtain vaccines, and similarly, staff from the health facilities travel to the district to retrieve vaccines.

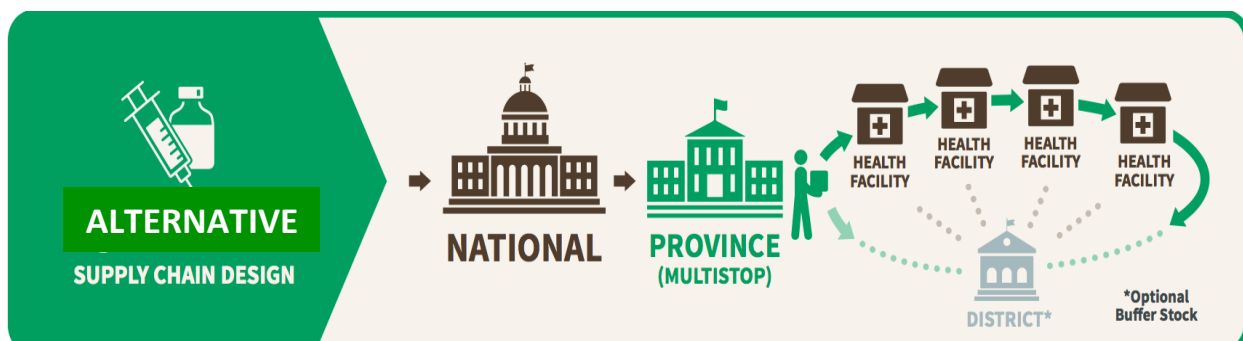
*“Mostly you have the district picking from the province. The same system exists at a lower level where [at] the last mile you have every single health facility coming to the district to pick [up] vaccines.”*

- Participant, Shangombo DHO

This aspect of the current system, where district and facility staff travel up the chain to obtain vaccines, is a key focus of change for the new system.

The presentation of the new iSC design (Figure 4.3) and its description was positively received by 12 of the 17 focus-group participants. The remaining five did not voice a viewpoint, positive or negative. However, most expressed the opinion that there are a number of contingencies to be met for the system to work effectively, many of which are associated with the existing infrastructure challenges listed above. The discussion focused on the implications of the change, the advantages, and the disadvantages.

**Figure 4.3: Proposed alternative supply chain distribution system, Zambia**



A significant implication from the change to the new design is the shift in workload from district EPI staff to provincial staff. With the new system, vaccines would be delivered directly from the province to the health facilities, bypassing the districts.

*“I think this option would be more efficient. ... It reduces the last mile of distribution. The facilities are not turning to the districts to get the vaccines. The provinces are delivering them.”*

- Participant, Mongu PHO

A significant benefit seen by all the participants was eliminating the need for facility staff to travel to the district for vaccines.

*“The facility staff will benefit because it will lessen their movements coming to the district. They will be receiving vaccines there, at their facility, which is better for them. They’ll even have time to do their work!”*

- Participant, Nalolo DHO

*“Instead of people moving from where they are, coming to the district all the time, you are assured, if there is good storage, you are assured that those movements will be cut off. People will concentrate on their jobs.”*

- Participant, Lusaka DHO

This sentiment was also expressed in terms of greater cost-effectiveness. At the district level, EPI staff are allocated a monthly budget that they use to cover a number of expenses, including the costs for facility staff to travel to and from the district to obtain vaccines, and similarly for district staff to travel to and from the province.

*“The alternative supply chain design looks plausible all right. If a round-trip is made through the health facilities to drop off the supplies, the vaccines, I think it’s okay in the sense that it is cost-effective. They’re using one truck to go around to more than one health facility, other than just making return trips to one facility and then back to the storage.”*

- Participant, Lusaka DHO

*“It would be cost-effective for us, looking at this scenario.”*

- Participant, Shangombo DHO

The presentation of the new iSC distribution design returned the discussions to the topic of monitoring and reporting, who would be responsible, and the absence of clarity in this regard:

*“I think it’s a good decision, but I can see some problems when the commodities are just taken straight from the province, distributed to the facilities. What about the district? Because the district needs all the reports, how many commodities the facility distributed? How many children immunized? What of the stocks? So if the commodities are straight from the province to the district, I don’t know even the reporting system will also do this?”*

- Participant, Nalolo DHO

*“And then we also need to have feedback from the province; how much does this new system do that? We need a lot of real-time feedback. Because, right now, those facilities are relying on us [for vaccine stock], so if we’re stocked out, then those facilities are stocked out. But if those facilities are stocked out in this new scenario, it is very difficult for us to know what is happening there.”*

- Participant, Limulunga DHO

*“We will also need to ensure that data management at generation point, at the facility level, is able to give feedback. And then the province is able to deliver according to what feedback we have received. So, data management, it includes data usage at the facility. So that the data they are managing, collecting, it’s helping them to plan how best to implement the immunization program at the facility level.”*

- Participant, Mongu PHO

The ability of the provincial staff to effectively distribute was frequently questioned. Specifically, there was a strong sense that not enough provincial staff were currently available to implement the new iSC, nor do they have adequate transport.

*“I’m trying to imagine the province delivering to my remote facilities. And sometimes the amount of transport to actually reach these facilities is not actually one that even the province doesn’t normally use. You would have to use boats the province doesn’t have . . . and motorbikes as well.”*

- Participant, Limulunga DHO

*“Our provincial pharmacists, there are two who are managing the vaccines. Now if you scale it down, in our district, there are 17 facilities, Nalolo District. Now, how is that pharmacist to move [vaccines] to facility levels, within a period of one month or so, how are they going to manage their duties?”*

- Participant, Nalolo DHO

*“We will need a lot of resources at provincial level, especially to do with transportation. Because in Western Province you are talking more than 200 facilities.”*

- Participant, Mongu PHO

*“If you look at half of the facilities under the districts, they get flooded. So, unless there will be some alternative transports to be used during the flooding periods, then that would be fine, because if not, then they will be challenged. The facilities will suffer the consequences of not receiving because of the challenge of the floods that the province still cannot reach the facilities.”*

- Participant, Limulunga DHO

Not surprisingly, because of the added responsibility of distribution by provincial staff in the new iSC design, the issue of transport challenges and limited human resources was a major concern expressed in the focus group of provincial EPI staff:

*“So, I think this one is still okay, but I think at the provincial level, like I said, you need a lot of transport, we need human resources.”*

*“I think we need to take into consideration a number of issues, issues of transportation and human resources. I think they’re quite key if we are able to make this strategy.”*

- Participants, Mongu PHO

The new design was not entirely unfamiliar to the participants. In Zambia, the system for distributing essential medicines follows a similar distribution system. Essential medicines are distributed from the central MOH to regional hubs and are then distributed to health facilities. Provincial and district levels are bypassed except in very remote areas where districts may hold some stocks of essential medicines.

*“I think the alternative [iSC] is okay because this is currently, in fact, that’s what we do even for other drugs. We load the truck with medical supplies, essential medicines rather, and then we make a trip through to the health facilities. So that is also the current method that we use for delivery of essential medicines. I think it’s okay.”*

- Participant, Lusaka DHO

*“This is the way they are taking the drugs, isn’t it?”*

*“Yes.”*

- Participant exchange, Mongu PHO

Several participants felt the new design would be informative for provincial staff, that they would get a better sense of the realities faced by the facilities.

*“They [provincial staff] will literally see what we are seeing, that at times the health facilities, there is nothing, and that’s why we keep knocking on them to tell them, please, we need these commodities.”*

- Participant, Shangombo DHO

Another benefit raised was the potential for greater efficiency of the cold chain.

*“I also see one thing, the cold chain, the shorter the route, the more effective. So really, here, we’re eliminating the district, making it shorter. ... That’s one of the things I noticed, which is good. The shorter the route, the better. They eliminate a lot of the other difficulties that they come across.”*

- Participant, Mongu PHO

There was some disagreement, however, that the temperature of the vaccines could be maintained traveling from facility to facility.

*“I think the trucks to transport these vaccines have to be super conditioned because what you don’t want to do is expose the vaccines for too long to the outside environment. What I mean is, you reach at one point, you open, you allow air in. Okay, they’re refrigerated, I know. But still, the temperature might be tampered there. The period that you are off-loading, then you close, then you travel to another, then open again, expose the vaccines. Temperatures have to be properly controlled as you deliver to multiple facilities.”*

- Participant, Lusaka DHO

In addition to these common views and perceptions of the existing and proposed iSC distribution system, the focus groups revealed some key issues that may also constrain vaccine availability and, ultimately, coverage and which need further explanation.

## **Key issues**

In addition to the discussion about the specifics of the current and proposed iSC, the discussion revealed two system constraints that contribute to vaccine shortages and disruption: the “push-pull” method for determining the quantity of vaccines allocated by the central MOH, and the utilization of campaigns and “Child Health Weeks” to increase immunization coverage.

### Supply vs. demand formulas for determining quantities of vaccines to be delivered

In each of the focus groups, there was concern expressed about the current method used to determine the quantities of vaccines delivered, and in particular the use of the “push-pull” approach, which is common in Africa (Eboreime et al. 2015). Using this method, the quantity of the vaccines distributed to the provinces from the national MOH is based on census data collected by the National

Statistical Office (NSO). The NSO recalculates its population estimates every two years, however, resource limitations have resulted in less frequent data-collection efforts and updates. Based on these population figures, the MOH “pushes” the necessary quantities of vaccines to the province, who in turn “push” quantities to the districts based on district population estimates. The facilities then go and “pull” the needed quantity from the districts. When facilities determine the amount of vaccine required to be pulled in a month or in a quarter, they typically use current stock on hand, consumption, and overall demand estimates. Frequently, facilities request to “pull” more vaccines than were “pushed” from the upper levels in the system, leading to insufficient quantities and stock-outs.

*“If children are going to be vaccinated, we need the right quantities, which we are not having at the moment. They are running out of it in some facilities.”*

- Participant, Mongu PHO

*“Our role is to ensure that we give [provincial] pharmacy the correct numbers, the target population numbers for them to quantify what we need in terms of vaccine. There are times when you find that our consumption is higher or more than the given population, the NSO population figures.”*

- Participant, Lusaka DHO

*“There are several occasions where we receive less stock as compared to the demand out there. ... Currently the CSO underestimates our district population by 5,000.”*

- Participant, Limulunga DHO

The focus groups revealed several reasons for the discrepancy between population-based supply estimates and demand. First, the populations in rural areas tend to be highly transient, often moving to new locations seasonally. In these cases, people may be cut off from their usual facility due to rain, or they are tending livestock in other areas and visit different facilities.

*“When people move from the plains in the rains, then these facilities will have virtually no clients; others many. So logistically, we also need to be able to account for these seasonal adaptations that people have. ... But the province is not sensitive to this.”*

- Participant, Limulunga DHO

Secondly, there are populations that come from neighboring countries, over the national border to access health care at the facilities in Western Province. The increase in the number of patients increases the demand for vaccines and drugs.

*“We tend to have a lot of children coming in from other countries, whose immunization status is not known.”*

- Participant, Mongu PHO

The disconnect between what is supplied and what is needed was a frequent topic of discussion, and there is some hope that the new system might help to address this by exposing provincial staff to the realities and needs at the facility level. As earlier indicated, some felt that if the provincial authorities take responsibility for distribution, they will develop a better sense of the demand vs. supply challenge, as suggested by this exchange between the facilitator and a participant in Shangombo:

Participant: *“Because, if it is the people from the province, if they’ll be coming with adequate vaccines, and then they even look at how many we immunized the previous month. Looking at consumption, they will give us vaccines accordingly.”*

Facilitator: *“Thank you.”*

Participant: *“So, that’s what I feel. If they just say, ‘No for you. You’re just a small district. No, this is what we are giving you according to your population.’ We are missing out.”*

Facilitator: *“So we are talking about consumption here, isn’t it? You’re saying this is how much you’re actually consuming at the health facilities, and this is what we actually need.”*

Participant: *“But when it comes to supplying [facilities], they don’t follow consumption data. They still follow the population.”*

Similarly, if the new iSC allows for allocation to be determined based on demand and consumption, then there is further support for the new system:

*“If they stick to the consumption data, then it will be okay. ... If they go [to the facility] they’ll be able to again to look at it, the consumption data at the facility, at the service delivery point.”*

- Participant, Shang’ombo DHO

## Campaigns

In many low-resource countries, immunization campaigns are a tool for increasing coverage of target populations. Campaigns focus on raising awareness through additional community outreach and promotion, increasing access through village and community gatherings and festivals, and increasing attention through the participation of celebrities and politicians. Campaigns are used to increase coverage of routine immunization, introduce a new vaccine, or in cases of disease outbreaks, and can last from a week to a month. Broader child health campaigns are also common, in which the campaign focuses on a range of child health and development issues, including nutrition, education, and immunization.

Zambia utilizes campaigns to boost immunization coverage rates and address outbreaks such as measles. In addition, at least twice a year, there are Child Health Weeks throughout the country, intended to address a range of child health issues, including immunization.

The focus groups revealed that these campaigns and Child Health Weeks can be extremely disruptive to the EPI system and often fail to achieve their aims because they are not well funded or adequately supplied, and seldom include the additional infrastructure improvements needed to make the campaigns a success.

*“Child health campaigns. It is a big challenge. It’s a very, very big challenge. I don’t know if at all, one day, the ministry would have a deliberate policy whereby during these campaigns, they could provide transport.”*

- Participant, Nalolo DHO

*“And sometimes what we order is not what we will receive. More especially when it comes to Child Health Week, we normally receive less logistics as compare to the needs of the community.”*

- Participant, Limulunga DHO

During campaigns and Child Health Weeks, vaccines are distributed from the national MOH or the provincial level directly to the facilities, which the new proposed iSC system would do.

*“Sometimes when we have campaigns, distribution changes from national to the district; they don’t even go through the province.”*

- Participant, Limulunga DHO

*“There are times when we go direct from national to district. Especially during the campaign.”*

- Participant, Lusaka DHO

*“All of a sudden, you have a campaign, and you don’t know what is happening. When they’re introducing the campaign, that’s when they tell you, ‘This is what happens. This is what we will do.’ And then you, as a service provider, you are set off balance.”*

- Participant, Limulunga DHO

*“I think, in addition, there are also programs which we feel maybe we could put the resources towards other programs and be able to achieve the same goal. But because it is a national program, we are compelled to do it. Yeah, programs like Child Health Week. In Lusaka, we would like to strengthen routine immunization, instead of putting a lot of money for a program like that. And sometimes, you don’t even have the resources. We are being told there to do it, but we have no money.”*

- Participant, Lusaka DHO

In general the alternative design was greeted with enthusiasm because it is perceived to be better than the existing system in terms of cost-effectiveness and efficiency, and would reduce the burden on the lower levels of the EPI systems, specifically district and facility staff. However, the benefits are unlikely to be realized if the infrastructure challenges are not addressed simultaneously. These infrastructure challenges—lack of transport, energy, routes, and access—are broad and as noted previously, impact more than just EPI and therefore reflect limited general organizational capacity and its subcomponent, resource utilization, and, ultimately, readiness for change.

## **Part II: Organizational readiness for change**

While the first part of each focus group discussion probed the general perceptions of the existing iSC and elicited reactions to the proposed changes to the iSC, the remainder of the discussion

examined specific components of readiness for change guided by the Scaccia framework, which provides the components and subcomponents of readiness for change.

As mentioned, the time-limited structure of focus groups necessitated that some subcomponents be eliminated from the discussion. Those that were eliminated tended to be subcomponents that in the testing of the guide did not elicit detailed or meaningful response, or were felt to be too abstract among the participants. Table 4.2 lists the components and the specific subcomponents as presented by Scaccia. Those that were not explored are indicated by an asterisk.

**Table 4.2: Organizational readiness for change components and subcomponents (Scaccia et al. 2015)**

Component	Motivation	General Capacity	Innovation-specific Capacity
<b>Subcomponents</b>	Relative advantage Compatibility* Complexity Trialability Observability* Priority	Culture Climate* Staff capacity Organizational innovativeness Resource utilization Leadership* Structure	Innovation-specific knowledge, skills, and abilities Program Champion* Specific implementation climate supports* Interorganizational relationships
*Indicates those subcomponents that were not probed in the focus groups			

Both of the two capacity-related components, general capacity and innovation-specific capacity, have subcomponents that are closely related. Staff capacity is a subcomponent of general capacity, and innovation-specific knowledge, skills, and abilities are subcomponents of the innovation-specific capacity. Both deal with the ability of EPI staff to do their existing jobs and also their ability to take on this new iSC distribution system. What emerged from the focus groups is that the participants viewed the subcomponent staff capacity as being a reflection on the capacity of facility staff specifically to their existing job. They viewed the subcomponent of specific knowledge, skills, and abilities as relevant to themselves and to others at district and facility levels. This seems to be an appropriate but nuanced distinction but does fit within the parameters of the framework as designed.

Table 4.3 provides a summary of responses and comments related to each component and subcomponent. The table includes a description of each subcomponent as it applied to the context of the iSC change, and related illustrative quotes from the focus groups. In addition, the table presents the frequency—high, medium, low—with which the subcomponent or its related themes were discussed. *High frequency* indicates the subcomponent was a topic in all five of the focus groups. *Medium frequency* indicates the subcomponent was a topic in three or four of the focus groups, and *low frequency* indicates one or two of the focus groups.

The questions were designed to elicit responses that could be used to interpret the relative strength of a number of the subcomponents at once. For example, the first two questions were designed to elicit responses related to the motivation component of the change by engaging participants in a discussion of the advantages and disadvantages of the change. What emerged were responses that also provided insights into a number of the motivation subcomponents as well.

**Table 4.3: Results of focus groups assessing motivation, general capacity, and capacity specific to a new iSC distribution system design**

Component: Motivation					
Subcomponent: <u>Relative advantage</u>			Subcomponent: <u>Complexity</u>		
Description	Illustrative quotes	Frequency discussed	Description	Illustrative quotes	Frequency discussed
Advantages and disadvantages of the current and proposed iSC.	<p><i>"I think it's a good one [proposed system], but only that we will need a lot of resources at the provincial level, especially to do with transportation."</i></p> <ul style="list-style-type: none"> <li>Participant, Mongu PHO</li> </ul> <p><i>"One of the challenges we have in the delivery of our health system, it is transport. ... So the system is welcome if it is well equipped."</i></p> <ul style="list-style-type: none"> <li>Participant, Lusaka DHO</li> </ul>	High	Degree to which the new iSC is perceived as relatively easy to understand.	<p><i>"So, for the health facilities, this is being a new innovation in that, they'll be receiving logistics directly from the province for the first time. ... So you need to actually get the very good buy-in and actually display your benefits. It may appear straightforward on paper like this, but you need to actually show the benefits in real-time or what are the true tangible benefits of the new system over the other one."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul>	Low
<p><u>Summary of relative advantage:</u> The relative advantage of the proposed changes was generally seen by all participants as greater than the current system, largely because it eliminates the need for facility and district staff to travel to pick up vaccines, and therefore is viewed as more cost-effective. However there were a number of contingencies expressed, especially transportation, capacity building, and human resources. If those contingencies are not met, the proposed system was not seen as an improvement.</p>			<p><u>Summary of complexity:</u> The district and provincial staff easily grasped the change and the benefits of the change. This may be due to the fact that they generally have a full understanding of the existing system in its entirety, and its strengths and weaknesses. There was considerable concern that the facility staff, who may not have the full view of the system, may not fully grasp the change. It was suggested that steps should be taken to ensure facility staff were fully informed of the changes, the rationale, and the impact.</p>		

Subcomponent: <u>Trialability</u>			Subcomponent: <u>Priority</u>		
Description	Illustrative quotes	Frequency discussed	Description	Illustrative quotes	Frequency discussed
Degree to which the new iSC can be tested out or piloted.	<p><i>"I don't know how possible this is; we haven't yet implemented. So, we are just hoping to try it and see the outcome."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"We have piloted a lot of programs in Lusaka, and we want to spearhead this program for the nation and our colleagues."</i></p> <ul style="list-style-type: none"> <li>Participant, Lusaka DHO</li> </ul>	Low	Degree to which this change should be seen as a priority for the EPI program.	<p><i>"It is a priority, like I said. I said my core is to ensure that there isn't a break in the flow of commodities, vaccines are available all the time. So, it is one of my core priorities to ensure that the vaccines are taken to the facilities, and they should actually reach the end users who are in their community."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"[The priority] has already been mentioned, the issues of transport. Then the other things can come later."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul> <p><i>"So if this system of taking straight to the facilities from the province is going to improve immunization coverage, for me it is a priority."</i></p> <ul style="list-style-type: none"> <li>Participant, Mongu PHO</li> </ul> <p><i>"I think the priority is the infrastructure at the moment, in my view. I think that once that is in place, then I think we'll be</i></p>	High

				<i>ready to receive the drugs and the vaccines.”</i> <ul style="list-style-type: none"><li>Participant, Lusaka DHO</li></ul>	
<u>Summary of trialability:</u> There is some sense that this would need to be tested or piloted as part of the standard process for introducing a new intervention, and as an important step for generating evidence for success and feasibility. There is familiarity with pilot programs, and this new iSC seems to be an intervention that can be piloted or demonstrated.			<u>Summary of priority:</u> The change is seen as perhaps not as high a priority as some of the underlying infrastructure improvements that the change might bring, such as improved transport, communications, and capacity building.		
Component: General organizational capacities					
Subcomponent: Culture			Subcomponent: Staff capacity		
Description	Illustrative quotes	Frequency discussed	Description	Illustrative quotes	Frequency discussed
Extent to which the MOH creates an environment conducive to change or innovation.	<i>“We are encouraged to be innovative in order to improve the system and the service delivery.”</i> <ul style="list-style-type: none"><li>Participant, Lusaka DHO</li></ul> <i>“I don’t think we have any forum where we sit down and look, discuss what our achievements or challenges are in the area of immunization.”</i> <ul style="list-style-type: none"><li>Participant, Mongu PHO</li></ul>	Low	Level of knowledge and training of staff to carry out all of their responsibilities, including those associated with the current iSC, as well as other duties.	<i>“Right now, the health facility staff, they just keep vaccines like tomatoes. They don’t manage them properly.”</i> <ul style="list-style-type: none"><li>Participant, Mongu PHO</li></ul> <i>“Capacity building is an on-going issue.”</i> <ul style="list-style-type: none"><li>Participant, Lusaka DHO</li></ul> <i>“[Logistics] is still a problem for them [facility staff] because they have not been trained.”</i> <ul style="list-style-type: none"><li>Participant, Shangombo DHO</li></ul> <i>“They [facility staff] really need to be taught. And, we are always</i>	High

				<p><i>having new staff. This one comes today. Tomorrow it is a different one."</i></p> <ul style="list-style-type: none"> <li>Participant, Shangombo DHO</li> </ul>	
<p><u>Summary of culture:</u> The discussions did not reveal much at all in terms of organizational culture. In the developing-country context, organizational culture may not be a well-established concept, particularly in the public sector, which is very hierarchical.</p>			<p><u>Summary of staff capacity:</u> The ability of the health-facility staff to do their current job was a common topic of discussion. These staff are often poorly trained and isolated, and have limited literacy levels. There is high turnover. Capacity of district and provincial staff was viewed as quite high.</p>		
<b>Subcomponent: <u>Organizational innovativeness</u></b>			<b>Subcomponent: <u>Resource utilization</u></b>		
Description	Illustrative quotes	Frequency discussed	Description	Illustrative quotes	Frequency discussed
Degree to which there is experience with change in the past; extent to which the change was successful.	<p><i>"Previously we used to have a system where commodities would be supplied to us on a monthly basis, but now, there's been a change where essential medicines are given to us on a bimonthly basis, one in two months only. Ideally, that's how it's supposed to be, but actually what is happening is that we'd have products being given to us once in three months, which has created stock-outs in most facilities."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"We may accept change if it is for the better."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul>	High	The extent to which resources are devoted to the current system and the likelihood resources will be made available for the change.	<p><i>"We have a lot of ideas. We have a lot of drive, but you see, the constraining factor, is the funding."</i></p> <ul style="list-style-type: none"> <li>Participant, Lusaka DHO[?]</li> </ul> <p><i>"It depends on what you are planning to invest. But if things continue the way they are, then this [new] system is far worse than the [current] system."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul>	Medium

	<p><i>“I can think of a change which has come as a very positive change for us. In the past, vaccines were being handled by the MCH staff only. Now, the pharmacy is responsible for ordering, distribution.”</i></p> <ul style="list-style-type: none"><li>• Participant, Lusaka DHO</li></ul>				
<p><u>Summary of organizational innovativeness:</u> In four of the focus groups, there was a discussion about the change in responsibility for ordering vaccines from the MCH coordinator to the pharmacist. This was largely seen as a very positive change. Additional changes were the addition of new vaccines to the routine system, and adoption of a computer-based inventory-management system. There wasn’t discussion pertaining to how well the MOH or EPI program manage or adopt changes in general. Training and education were seen as critical to successful change, as well as a well-articulated rationale for change.</p>			<p><u>Summary of resource utilization:</u> The theme of limited resources—human, communication, transportation—was constant in the discussions and is applicable across the public health system. Related to that, there was considerable interest in building or investing more capacity for EPI program management (reporting, monitoring, etc.), especially among facility staff. On all levels the current system is underresourced, and there was a strong sentiment that without investments into infrastructure, the change would not be successful. The participants did not express any indications that they were in any way in a position to influence resource availability, and there was no discussion about whether or not participants believed the investments would or could be made.</p>		
<b>Component: Innovation specific capacities</b>					
<b>Subcomponent: <u>Innovation-specific knowledge, skills, and abilities</u></b>			<b>Subcomponent: <u>Interorganizational relationships</u></b>		
Description	Illustrative quotes	Frequency discussed	Description	Illustrative quotes	Frequency discussed

<p>Extent to which participants believe that staff supporting the iSC have the skills, knowledge, and abilities to implement change to the iSC. These are skills, etc. over and above what is needed to implement the existing iSC.</p>	<p><i>"We will need to be trained to be more efficient and competent in handling this new scenario if it is to be implemented."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"I think we need to take into consideration a number of issues of transportation and human resources. I think they're quite key if we are able to make this strategy."</i></p> <ul style="list-style-type: none"> <li>Participant, Mongu PHO</li> </ul> <p><i>"Because it's not possible that they'll be able to visit all the facilities in the entire province. No. No."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"I think for the introduction of a new supply chain, I think we would need training as well as mentorship, and on-the-job training for new people that are coming."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul>	<p>High</p>	<p>Strength or weakness of relationships and communication between various levels in the iSC that will be necessary for successful change.</p>	<p><i>"I have a good working relationship with the province. I can call them any time."</i></p> <ul style="list-style-type: none"> <li>Participant, Nalolo DHO</li> </ul> <p><i>"[At the district level] we are quite independent in decision-making. We have to communicate to the province our change, but we are independent."</i></p> <ul style="list-style-type: none"> <li>Participant, Limulunga DHO</li> </ul> <p><i>"I think our communication with the national level, we have no problems so far. Whatever we want, we know the people to contact."</i></p> <ul style="list-style-type: none"> <li>Participant, Mongu PHO</li> </ul>	<p>High</p>
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Summary of innovation-specific knowledge, skills, and abilities:

The sentiment of the participants appears to be that additional skills and training will be needed to implement the new iSC design. The knowledge skills and abilities are not discernable between those that are needed to implement the existing iSC and those needed to implement the alternative iSC. Regardless of which iSC is being discussed, there is the need for more advanced training.

With the existing iSC there is a need for more training of the facility staff. The alternative iSC will require facility-staff training, as well as more training for district and provincial staff.

Summary of interorganizational relationships: There appears to be a strong belief that the interorganizational relationships are strong and built on trust and respect. Most participants indicated that staff at the provincial and national levels are responsive and helpful. District staff also have considerable flexibility and autonomy to problem solve and make changes as needed.

## Summary of readiness components

Below are interpretations of Scaccia's ORC components and subcomponents (*italicized*), as they relate to Zambia's readiness to adopt a new iSC.

### Motivation (subcomponents probed: relative *advantage*, *complexity*, *trialability*, *priority*):

Unequivocally, from the district level to the national level, there is strong motivation for improving immunization coverage. It is the stated priority of EPI staff and stakeholders. Therefore, if a change to the iSC can help achieve that overarching goal, then there is similar motivation for the change. However, there is a question about whether the change being proposed will actually address the underlying infrastructure challenges and the barriers to improved coverage that currently exist, and which are unique to the distribution of vaccines in remote and isolated areas, in particular. The motivation component is therefore strong but limited or hindered by the challenges and constraints of the two capacity-related components.

The district and provincial staff consider the proposed alternative iSC distribution system as having several *advantages* over the existing system. The primary advantage is the reduction of the time and resources required by the current system for facility and district staff to travel "up the chain" to retrieve vaccines. Because of the time and financial resources required for these trips, this current process is seen as highly inefficient. However, some see these trips are seen as having value for maintaining connection and communication with others in the MOH, and that completely eliminating these trips would have the unintended consequence of eliminating a critical touch point with the overall EPI and public health system, particularly for the health-facility staff. Some mechanism for providing connections between facility and district staff should be preserved.

The proposed change was recognizable and understandable, with limited *complexity*, in part because the proposed iSC would function similarly to the system already used to distribute essential medicines, which is generally regarded as well functioning. The evidence and experience of the

essential-medicines program create a conceptual familiarity with the proposed iSC and further strengthens support and motivation.

Among both focus-group and KII participants, the change seems *trialable*, and is ripe for a demonstration project at either the district or provincial level. Demonstrations and pilots were seen as the proving ground for the concept and the operations.

As a *priority*, the focus group participants viewed the change as a means to the overarching priority of increasing immunization coverage. Among the KIIs, there is strong support and political will, however, the priority of this change was more muted because of concern about availability of resources. For some informants, despite the will to make the change, they understand there is a risk to take on this change without long-term funding mechanisms for training and infrastructure improvements.

General capacity: Scaccia defines *general capacity* as the, “skills, characteristics, and the overall functioning that are associated with the ability to implement any innovation. General capacities include the infrastructure, skills, abilities, context, environment, and processes in which the innovation will be introduced” (2015). In the low-resource and remote context in which this framework was applied, discussions pertaining to general capacity tended to elicit discussion about current challenges with the existing iSC and the limited capacity, knowledge, and ability of current EPI staff to implement their current job and to meet existing system requirements. Specifically, there was much discussion about the inability of facility-level staff, in particular, to implement the current iSC distribution system, impeded in large part by lack of training and supervision, and inadequate and unreliable infrastructure. This perception was reinforced by the comments of the key informants.

The current infrastructure challenges, which dominated the focus-group discussions, are due mostly to the fact that large geographic portions of Zambia are isolated and very difficult to access. This is particularly the case in Western Province, where several of the focus groups were conducted. There is broad agreement that these geographic and infrastructure challenges are the most significant capacity

barriers to vaccine distribution and immunization coverage in these areas. These capacity limitations include insufficient roadways and transport routes, and lack of reliable transportation, electricity, and telecommunications. More generally however, underlying these capacity challenges is the *resource utilization* component. Improvements in infrastructure is a resource issue and in Zambia, as it is throughout sub-Saharan Africa, lack of financial, human, and technical resources limits the readiness for change. Any change to a new iSC system has to address the infrastructure and underlying resource issues, or the change will be viewed as simply shifting the burden from one level in the system to another. Specifically, without resource investment, the infrastructure challenges will just shift from the facility and district levels to the provincial level and remain unresolved.

The participants in the KIIs, in particular, felt that the government did not have the resources necessary to make the infrastructure improvements that will be necessary, and that outside funding will be required. The KII participants play an advisory role for the EPI system, including the budget, and have a firm grasp of these financial constraints.

In addition, the limited *staff capacity* and insufficient training, education, and supervision of facility-level staff to inform their current duties and responsibilities, and subsequent poor data management and cold-chain performance, is a general-capacity constraint of the existing iSC. Record keeping and managing stocks of vaccines are key functions of the facility-level staff and directly impact the available stock of vaccines at the facility level, but there is wide variability of quality and know-how. This is largely due to limited training and supervision that is provided to these, often isolated, staff working at the last link of the supply chain. In addition, turnover is high, which further contributes to the lack of trained and experienced staff necessary to implement the current iSC.

On a positive note, the new iSC distribution system is seen as something that can be tried first, before a nationwide rollout. *Trialability* is a subcomponent of general capacity, and demonstration of

the new iSC is seen as a likely first step, which will help establish evidence and learning needed for successful change.

One can reasonably conclude that currently the general capacity of Zambia is inadequate to successfully make the change to the proposed iSC distribution system, unless the system needs are met and investments into infrastructure, human resources, training, and education are secured.

Innovation-specific capacity: Within innovation-specific capacity, a key subcomponent is *knowledge, skills, and abilities*. Where the discussions around general capacity looked at ability of EPI staff to implement the current system, the innovation-specific capacity looked at the ability of staff to implement the proposed iSC system. The discussions revealed that there was broad agreement that all staff would need more training and also supervision and mentoring. Supervision and mentoring seemed to be important activities that would help, particularly, district and provincial staff make the change to the new system.

The diagrams developed as a result of the systems-design exercise were helpful in conveying the overall change in the distribution system, but far more detail will need to be provided through training to all EPI staff about “feedback”: how data will be collected and shared pertaining to the routine management of vaccine inventory and distribution. Data collection, management, and transfer is the primary function of the various EPI staff at different levels, and it is likely to be the area where much of the change to the iSC system will be realized. Many questions were raised about who will do what and how, with regards to data management.

The relationships between the staff at various levels is professional and very strong, with trust and open communications being a hallmark. *Interorganizational* relationships will be important to the effective training and supervision that will be needed to successfully establish ORC. In addition, the relationships and the communications between the levels will help support information exchanges about how data-management responsibilities will be carried out.

Additional human-resource constraints were felt to be significant at the provincial level, where, under the proposed system, significant increase in workload and changes to assignments are likely. While district- and provincial-level staff were confident in their abilities to make the change, there is widespread concern that there is not nearly enough staff at the provincial level to implement the proposed iSC system.

It is appropriate to conclude from the assessment performed that Zambia is not ready for a change to the iSC distribution system, however, greater readiness can be achieved through a program that invests in training and education, increased human-resource capacity, infrastructure, and new or alternative transportation methods. A demonstration program to gather evidence on the implementation of this change and the necessary investments required for capacity building is described in chapter VI, “Plan for Change.”

### **Part III: Key informant interviews**

In order to get input and feedback from staff of the national EPI program and key advisors, semistructured KIIs (Appendix B) were held with members of the EPI Technical Working Group, to discuss the results of the focus groups and their interpretations. The following participants were interviewed:

- EPI director, Ministry of Health
- Chief logistician, Ministry of Health
- Deputy director, Better Immunization Data project, PATH (NGO)
- Deputy director, Primary Care and Health System Strengthening, Center for Infectious Disease Research in Zambia
- Director, Supply and Logistics, Churches Health Association of Zambia
- Consultant to the Ministry of Health, Expanded Program on Immunization (formerly with CIDRZ)

Attempts were made to interview the representatives from UNICEF and WHO, however, those requests went unanswered.

The interviews lasted between 45 and 70 minutes and began with a verbal informed consent request. It was followed by a short description of the study. All of the informants had full understanding of the proposed changes to the iSC distribution system. Each had participated in the system-design workshop that developed the proposed system-design change.

All of the informants, much like the focus-group participants, indicated that the advantage of the proposed change was the improved efficiency within the system from eliminating the need for facility- and district-level staff to have to travel up the chain to retrieve vaccines.

*“Less moving around means more time and attention to the health needs of the community.”*

*“It can take two days for some staff to reach the district. It’s expensive and wasteful. Now we are addressing it.”*

However, two of the informants mentioned that there would be the unintended consequence of further isolating facility staff by eliminating critical interactions with supervisors and peers that happen when they go to the district.

*“It is not as if nothing else happens [when they go to the district for vaccines]. They have important conversations, receive updates and explanations, and can get questions answered. How will we be sure that these face-to-face encounters will continue?”*

*“They see friends and family, colleagues. They get information about many public health issues when they see their supervisor. They have responsibilities to their villages that go beyond vaccines. This must continue.”*

An overarching concern or disadvantage mentioned by several informants is cost of the new system and the investments needed in infrastructure and human resources.

*“This [change to a new iSC] will be expensive. The government does not have the money to pay for it. It will have to come from a donor.”*

*“You will need many more trained technical experts at the province. Pharmacist, logistician, cold-chain technician. Probably also trucks and motorbikes. They are expensive.”*

There was also concern that the change would go forward without adequate communication about how and why the change was being made, and without needed training and education.

*“To make this new system work, you have to communicate with everyone about why it is happening. Many will not understand, but they have to. I think most will embrace it if they have understanding.”*

*“Staff in the facilities have not received the training they need to do the job they already have. Let’s use this change to provide training and education, but also on-going supervision. Supervision is where we have troubles. You cannot just train once and hope it works.”*

The informants were generally supportive of using the routine visit by the provincial staff to the health facility as an opportunity for formal training and education of the health-facility staff, although the details would need to be worked out to satisfy some.

*“We should always provide training and supervision, at every level. It is worth trying.”*

*“It makes sense, but we still need to have more provincial staff. If there is only one or two, covering more than two hundred facilities, they will not have time to train. They will just drop and go.”*

When asked for specifics on what kind of training would be needed, the most frequently cited topics were related to vaccine stock and data management, cold-chain maintenance, and improving outreach. In addition, several felt that the training and education should be targeted at all levels, not just the facility level, and that periodic refresher training was critical to sustained success.

In the focus groups, many of the participants indicated that the methods used to forecast the quantities of vaccines needed at the community level are not reliable and often under-estimate the quantities needed, which contributes to stock-outs. The participants in the KIIs acknowledged that this is an issue, but were somewhat dismissive of this concern.

*“Sometimes this happens; they just need to ask for more.”*

*“It’s really just a distribution problem, which we are fixing.”*

Many of the informants felt that more specific details are still to be worked out and communicated, and believed that the government should conduct a demonstration project to test the alternative iSC and to learn what works and what does not.

Two topics were probed: Did the workshop identify the most significant barrier to vaccine coverage in the rural and remote areas? And, is the problem of efficiency a concern in these areas, or is it more about effectiveness?

The general consensus was that the workshop accomplished its objective of developing an improved design for the entire EPI in Zambia, but several acknowledged that the remote and rural areas will always have challenges that the system cannot meet.

*“[Rural populations] are far, far and they will always have challenges accessing any health care, not just vaccines. They have challenges accessing anything. Our system, if it is more efficient, might be able to stretch further and reach them consistently. But who knows.”*

*“Even this new system needs support from the faith groups and NGOs to reach these [remote] areas. We need to be creative with them to figure it out and to do it together. Otherwise, we just create more inefficiency, and we will never get to the hard-to-reach places.”*

Regarding efficiency or effectiveness, informants believed that both issues need to be addressed, but that a specific program to more effectively reach remote populations would be very expensive.

*“We only can do so much for them [remote areas]. We have to reach as many as we can, but we cannot reach everyone. We don’t have the money or system to be successful that way. Many countries have this problem.”*

Generally, the informants shared similar views as the focus-group participants and were similarly motivated by the goal of improving coverage. The political will and support for the alternative iSC is strong. The concerns of the informants, however, were more focused on the costs, barriers to uptake, and lack of trained human resources at all levels. Generally they did not give extra consideration to the needs of remote areas but took a holistic, centralized view of the iSC and its ability to function.

## **CHAPTER V: DISCUSSION**

In many countries of Africa and Asia, the current iSC system for distributing immunizations was designed and developed more than 40 years ago. That design, while contributing to significant reductions in morbidity and mortality in the past, is now outdated and under strain as a result of new, more complex and expensive vaccines being added to the system. Evaluations of the iSC distribution system are finding that the system is not sufficient to meet the management and distribution requirements of the next generation of vaccines, and increases in coverage of current routine immunizations have stagnated. Reaching remote and isolated populations—achieving equity—is a persistent challenge. Global leaders have called for improved iSC to ensure greater access and availability of new and existing vaccines (Zafran et al. 2013).

In parts of Zambia, immunization coverage has leveled off, in part due to limitations on the existing iSC distribution system and its ability to effectively reach segments of the population, particularly those living in rural and remote areas, where immunization coverage is stubbornly low. To increase the coverage and efficiency of the iSC distribution system and to prepare for new vaccines, a change to the distribution system design has been proposed. The proposed new iSC distribution system mirrors that of new systems proposed and demonstrated in several other countries in sub-Saharan Africa. The new system removes a layer from the distribution system—the district level—and the provincial level becomes responsible for distributing vaccines directly to the facility level, which is the final stop and the point of vaccine administration. Modeling studies using distribution, logistics, and procurement data from Zambia, and the experience of the demonstration projects in other countries, suggest that this new system would be more efficient, one that could better accommodate new vaccines entering the supply chain, and potentially boost coverage.

The implementation-science literature indicates that organizational readiness for change is an important determinant of change success (Kotter 1996; Weiner 2009). This study was designed to assess the readiness for change—a new iSC distribution system—among key district- and provincial-level staff, as well as EPI stakeholders in Zambia. The qualitative assessment utilized an ORC theoretical model, the Scaccia model, which established three key components that influence ORC: motivation, general capacity, and intervention-specific capacity.

This discussion chapter has four parts. The first part provides a conclusion to the assessment and answers the questions: Were the objectives of the study met and is Zambia’s EPI program ready for change to the iSC distribution system? The second part looks at some of the key issues that emerged that raise questions about the cultural and contextual applicability and relevance of some components of the Scaccia model, and ORC theory in general, as applied in low-resource settings. The third section describes the limitations to the study and suggestions for future study. The fourth and final section provides a conclusion and final thoughts.

### **Study objectives**

The objectives for this study are listed below. Objectives 1 and 2 pertain to the data collection—focus groups and KIIs—to assess readiness. These were successfully achieved, and the results indicate significant deficits to readiness, particularly the general capacity and innovation-specific capacity. However, these deficits could be overcome with the proper investments in training, education, and infrastructure. Objective 3 is detailed in the following chapter, “Plan for Change.”

Objective 1: Through focus group,s assess the readiness of provincial and district EPI staff in Zambia to adopt the proposed new iSC distribution system.

Objective 2: After completion of Objective 1, conduct KIIs to validate the findings from the focus groups and to assess the overall commitment to change among members of the national EPI Technical Working Group.

Objective 3: Using the results from Objectives 1 and 2, develop a plan for change that increases the readiness of provincial and district EPI staff in Zambia to adopt the proposed new iSC

distribution system through training, technical assistance, quality improvement, and the application of specific tools.

### **Is Zambia ready for change to the iSC?**

It would be difficult from this assessment and some of its limitations to fully answer whether or not Zambia is ready for change to the iSC distribution system. The application of the Scaccia framework through focus groups and key informant interviews revealed several limitations of these methods, and also contextual challenges that further limited the effectiveness of the assessment.

By removing a number of the subcomponents from consideration (e.g., leadership, program champion, specific implementation climate supports), key attributes of readiness were lost, which may limit the assessment's utility. However, these subcomponents were removed, in part due to time limitations, but also because they were deemed by research advisors and the test focus-group participants as not having strong meaning or application in the context of the EPI system and its participants.

It was learned that the context in which this assessment was completed was one in which change is not a participatory or inclusive event. It happens, ready or not. EPI is a system that is implemented, where change is also implemented but seldom influenced. Those at the end of the system do not have access to leadership or a voice in the shape of change. As a result, the context for change, in the case of Zambia's iSC distribution system, lacks the necessary avenues for influencing that change.

Despite the contextual challenge, the assessment did reveal that, in general, the EPI program is not ready for change, but critical elements for ORC are present. For instance, the motivation for change is high, but highly contingent. This is a positive basis for making change, provided the contingencies are met. Those contingencies are the other critical elements of ORC, which are in need of strengthening: general capacity and innovation-specific capacity. The participants are highly motivated if steps are made to build greater general capacity and innovation-specific capacity.

## **Key issues**

By matching the strong motivation of staff and stakeholders with investments in infrastructure improvements and a strategy for providing comprehensive training, education, and supportive supervision at each level, readiness for a new iSC distribution system can likely be obtained. However, several issues arose during this assessment that raise questions about the generalizability of the findings, the appropriateness of the change being considered, and the applicability of ORC theoretical applications in low-resource, non-Western cultures.

### Key issue 1: A tale of two Zambia's

Most of the focus groups took place in Zambia's Western Province, a region characterized by its remote and sparse population, and isolated by seasonal flooding and challenging terrain. The needs and requirements of a system intended to provide immunizations, or any health services, to populations in these areas, where access is paramount, are much different than the needs and requirements of less-isolated and easier-to-reach areas. This distinction has to be a significant consideration for designing health systems in Zambia, where several of the provinces share similar characteristics (Figure 5.1). Western Province and Northwestern Province are the two largest provinces by geography, each approximately 125,000 square kilometers, and the least densely populated with seven and six people per square kilometer, respectively. Muchinga and Northern Provinces have similarly low density and large geographies, but are less subject to the seasonal flooding, which isolates much of the West. Other provinces have greater accessibility and denser populations.

**Figure 5.1: Provincial map of Zambia**



The participants in the focus groups made it very clear that any change had to be able to overcome these geographic challenges, which are the key contributors to the underperformance of the current iSC. The participants in the KIIs made similar comments. Clearly the current system has not been successful in the more-isolated districts, and any change should consider the unique challenges and specific needs of these areas, possibly adopting two systems—one for remote areas, and one for the rest of the country.

Key issue 2: Did the stakeholders make the right diagnosis of the problem in remote areas?

In their 2009 article, Armenakis and Harris, reflecting on the lessons learned from their careers researching ORC, identified a key theme: effective organizational diagnosis. “Organizational diagnosis consists of recognizing problem symptoms and identifying root causes of these symptoms” (2007). They state that, “change recipients must believe that whatever change emerges as the one to be implemented is appropriate to correct the root cause of the problems facing the organization. ... Misdiagnosis can result in identifying the wrong problem to solve and then deciding on a solution that is not appropriate.”

Recall that the design of the change to the Zambia iSC stemmed from concern about the low or stagnated rates of immunization coverage in rural and remote areas, and subsequent evaluations of the current iSC that indicated underperformance. This led to the decision to consider redesigning the iSC through a systems-design process which looked at the current system design and its functioning. The new design that resulted emphasized efficiency. However, system inefficiency may not be the root cause of the problem. Instead, as stated above, the focus groups and the KIs point to the ineffectiveness of the current system caused by woefully insufficient transport mechanisms and nearly impenetrable geography as possibly the more significant root cause, one that is not fully addressed by the proposed new iSC system. Granted, greater efficiency may be necessary to increase availability and access, but inefficiency is partly a symptom of the ineffectiveness of the current system. Redesigning the process by which vaccines reach their intended recipients does not address the root cause of the problem in remote areas, which is a question of effectiveness and equity. Therefore, it seems reasonable to ask if the stakeholders made the right diagnosis of the root cause.

### Key issue 3: The dominance of resource constraints on readiness in low-resource settings

While the general conclusion from this study is that the Zambian EPI program in its current state is not fully ready for change, but could be with further investment into building general capacity and innovation-specific capacity (e.g., infrastructure, training, and education), a significant change-readiness constraint is the lack of financial resources. Readiness is contingent upon making available more financial resources.

The Scaccia model relegates this resource issue to a subcomponent of general organizational capacity, *resource utilization*, which he defines as “how discretionary and uncommitted resources are devoted to innovations” (Scaccia et al. 2015). In a context where there is almost no discretionary funding or uncommitted resources, this definition seems inadequate. In addition, the Scaccia model

suggests that resource utilization is a subcomponent that has influence equal to that of other subcomponents. In the Zambia context, it far outweighs the other subcomponents.

Some have indicated that these resource constraints are not measures of readiness but of capacity for change. Weiner wrote, “It seems preferable to regard organizational structures and resource endowments as capacity to implement change rather than readiness to do so.” However, in the context of low-resource settings it seems very difficult for change agents to separate capacity from readiness. Not having money outweighs all other components, whether it’s assessing underlying capacity or readiness for change.

#### Key issue 4: Limitations of ORC constructs in non-Western context

Armenakis defined ORC as follows:

*“Readiness is reflected in organizational members’ beliefs, attitudes and intentions regarding the extent to which changes are needed and the organization’s capacity to successfully make those changes. Readiness is the cognitive precursor to the behaviors of either resistance to, or support for, a change effort” (1993).*

However, beliefs, attitudes, and intentions are psychological constructs that are largely defined, expressed and interpreted using Western terms and narratives. In Zambia, while the official language of business is English, there are over 70 local languages, many of which are used in day-to-day social interactions and contain words and expressions that people use to express their individual thoughts, to share personal stories, and which reflect one’s attitudes and psychological disposition. In Western Province, where the focus groups were held and conducted in English, most people speak Lozi in social settings, personal interactions, and person-to-person small-business transactions. As a result of this language nuance, the focus-group participants seemed more likely to consider or discuss the iSC from a structural and organizational perspective, using English to share insights into the practical functioning of the system. But in the rural areas of Zambia, English may not effectively or accurately capture the psychological aspects of personal or individual beliefs and attitudes. In the focus groups, the

psychological and individual components of readiness were not revealed through the dialogue, only the structural and organizational components. As a result, key components of ORC assessment were lost in translation. The focus group dialogues tended towards issues of system function and structure, and were unable to adequately capture or probe some of the critical individual psychological components. The Scaccia model was selected for this assessment because it was able to assess both psychological and structural components of readiness, however, it did not provide an adequate approach in a context with unique cultural and language barriers.

This gap between Western and non-Western culture and language, and the resulting lack of understanding of the psychological components of ORC in this assessment contributed to a lack of insights into individual readiness components. Instead, most of the dialogue and insights reflected the organizational readiness components. Here too, however, a significant cultural disconnect may call into question the limitations of the ORC theoretical approaches: In non-Western cultures there may not be a strong sense of the term “organization,” what it means and how it functions. Even though many of the leading theoreticians of ORC suggest that an organization can be broadly interpreted to include work units, teams, and departments, as well as large institutions (Armenakis et al. 1993; Weiner 2009), the underlying concept may not be well established. If one works mostly independently in a highly isolated environment with very little interaction and communication with peers or leaders in the organization, one could ask, is it really an organization? In these settings, what organizations—large or small—exist to model organizational behaviors, constructs, and structures from which to make comparisons, shape attitudes, and inform opinions?

Rogers defined an organization as “a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labor. Organizations are created to handle large-scale routine tasks through a pattern of regularized human relationships” (2003). One could question whether the Zambia EPI program is a stable system, particularly in remote areas where

opportunities for regularized human relationships are limited, models of organizational excellence are almost nonexistent, and interactions with change agents and leadership are fleeting, at best.

Instead of an organization, many EPI staff may be more likely to see themselves much more narrowly, as part of a *structured system* which may be more recognizable to them than is an organization. Returning to Rogers, who, when considering a government agency, stated, “such a system consists of hierarchical positions, giving individuals in higher-ranking positions the right to issue orders to individuals of lower rank. Their orders are expected to be carried out. Such patterned social relationships among members of the system constitute a social structure” (2003). Ministries of health in developing countries—government agencies—are extremely hierarchical, with rigid structures, and change is often the result of a mandate. Those at the lowest end of the hierarchy seldom influence what or how change is made, or indicate its appropriateness, which can limit commitment to change.

The key issues listed above suggest that the underlying challenge in applying an ORC theoretical framework in a non-Western setting is one of context. Damschroder and colleagues wrote that context is “the set of unique factors that surround a particular implementation effort” (2009). In Zambia, and likely other countries in sub-Saharan Africa, the contextual factors are dominated by significant resource constraints that influence all aspects of organizational and system functioning.

An ORC framework for Africa needs to establish and define additional components that are relevant to this context, including infrastructure (e.g., transportation, energy, telecommunications, and technology), financial resources, and culturally appropriate terminology that reflect and capture the true meaning of key ORC constructs such as organization, systems, beliefs, and self-efficacy.

### **Study limitations**

As mentioned, by eliminating a number of the subcomponents from the focus-group consideration and discussion, the assessment only partially utilized the Scaccia framework and may have resulted in an incomplete assessment. However, this was due to time constraints of a focus group and

the consensus that some of the subcomponents, and questions about them, would not be well understood by the participants.

The assessment, and a more complete understanding of the readiness for change, would have benefited from the input and perspectives of facility-level staff, those at the very end of the iSC and for whom the alternative iSC represents a significant change to their responsibilities and functions, and likely some improvement to job satisfaction. However, contacting, recruiting, and engaging with facility-level staff would have been a significant and expensive challenge. They are remote and hard to contact, and some would have had to travel significant distances, at significant expense, to participate in focus groups. Alternative methods, such as a survey, would have been limited by lack of access, and many of the health-facility staff are semiliterate, creating challenges with written surveys.

The overall sample size of the focus group was also diminished by the challenging nature of the setting. In two of the focus groups, there were several “no-shows”: district-level staff who had agreed to participate but did not show up on the appointed day and time for the focus groups. In these areas, it is often difficult to obtain reliable transport unless absolutely necessary, and communication is difficult. Because the facilitator and the notetaker had traveled long distances and overnighted at each focus-group site, it would have been very difficult to reschedule those who did not show up or hold additional focus-group sessions, nor were there available and appropriate staff substitutes.

Among those who did participate, there was the risk that their responses were influenced by social-desirability or acquiescence biases, which are common in focus groups of peers. Specifically, they may have made statements indicating a higher level of readiness or ability than they might have in a more anonymous setting.

In addition, the number of KIIs was also less than had been expected. Two organizations represented on the EPI Technical Working Group declined to participate: WHO and UNICEF. In order for WHO representatives to participate in surveys or studies that might be published, they have to get

permission from a higher-level official in either the regional office or from headquarters. The time and effort required to obtain this permission is considerable, and the representative perhaps decided it was not worth the effort. There was no reply from UNICEF to several requests for the interview. They may have faced similar internal requirements and approvals as WHO.

The nature of focus-group protocols that allow for conversation to follow an organic path limits the amount of time that can be devoted to specific topics. As a result, many of the readiness subcomponents suggested by the Scaccia model were not effectively probed, which limited the development of a complete understanding of readiness. In addition, the qualitative nature of this study is not an adequate substitute for psychometric evaluations of change readiness. The lengthy nature of most assessment tools, even quantitative surveys, is potentially a weakness of current ORC theoretical applications. In considering the available instruments for measuring ORC, Shea et al. wrote, “Those with desirable psychometric properties have too many items to be practical in busy healthcare settings.” That was likely the case with the Scaccia model and its application through focus groups. Shea and colleagues went on to conclude, “Until a brief, reliable and valid measure is developed, we cannot advance scientific knowledge of the determinants or outcomes of readiness or provide evidence-based guidance to organizational leaders about how to increase readiness” (2014).

## **Conclusion**

Zambia’s EPI team in Western Province is an extremely dedicated and motivated group. They overcome significant challenges to reach infants and children in remote areas with vaccines, to the extent that resources, infrastructure, and know-how allow. They are willing and able to adapt and make changes if those changes help them obtain their goal of 100 percent immunization coverage. The assessment indicates a high motivation for the proposed change, but it is countered by the lack of resources to do so and a complex environment that may not be suited to a one-size-fits-all system. In

addition, the psychological components of change readiness were not fully obtainable due to language and cultural nuances.

The proposed change to the Zambian iSC distribution system is driven largely by a desire for greater efficiency, which is not the same as effectiveness and may not be reflective of the true root cause of the problems that plague the current iSC in remote areas. The focus-group discussions suggest that there could have been a misdiagnosis, or perhaps, only a partial diagnosis, of the problem by the stakeholders who designed the alternative iSC system. A solution to the unique iSC challenges of remote areas must include improvements to effectiveness, access, and equity.

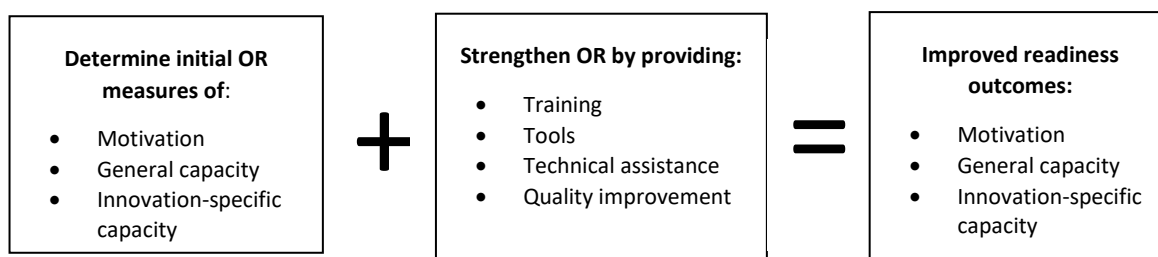
Focus groups are often viewed as having mostly formative value, contributing to the development of quantitative surveys or demonstration projects. A follow-up quantitative survey would not be a practical or useful next step in this instance. However, enough understanding of readiness was obtained from this assessment to inform a demonstration project, the results of which would further contribute to an increased level of readiness for change among EPI staff in remote areas and is the focus of chapter VI, “Plan for Change.”

## CHAPTER VI: PLAN FOR CHANGE

The research and assessment results of this study provide the formative information intended to guide the development of a plan for increasing Zambia's EPI readiness for change and to adopt a new iSC distribution system. The assessment has revealed that motivation for change among staff and influential stakeholders is high, however, overall, organizational readiness for change in rural and remote provinces and districts is greatly limited by insufficient general capacity and innovation-specific capacity. Specifically, these areas lack the infrastructure (transportation, energy, telecommunications) needed for change, as well as persistent gaps in knowledge, training, and supervision of facility-level staff.

This plan for change follows the framework provided by Scaccia (Figure 6.1) in which the ORC assessment is conducted to determine initial level of readiness. The assessment informs efforts to strengthen ORC by identifying a number of inputs, specifically training, tools, technical assistance, and quality improvement. The outcome from this building effort is improved ORC and its components.

**Figure 6.1: Building organizational readiness**  
(Modified from Scaccia et al. 2015)



This plan for change is intended to gather evidence for specific approaches to strengthening ORC among EPI staff at provincial, district, and facility levels, through a provincial-level demonstration project that focuses on building greater general capacity and innovation-specific capacity, the two

components that the assessment identified as weak. The demonstration project will be conducted in Western Province and will emphasize training, professionalization of staff, and the testing of novel tools. The demonstration project will take advantage of a number of established resources, tools, and curricula developed and tested by UNICEF, WHO, and other global health organizations. The evidence generated will inform uptake of the new iSC distribution system in the rest of the country and potentially by other countries where similar context and challenges exist.

In advance of the demonstration project, it would be very beneficial to complete a stakeholder analysis that fills some of the gaps in knowledge and understanding unfilled by this study about the readiness for change among participants in the iSC, including, and especially, health-facility staff. This would be done during the planning process for the demonstration project.

## **Goal**

The goal of the plan for change is to increase readiness of the EPI program to adopt a new iSC by addressing both general capacity and innovation-specific challenges. To do so, the plan for change recommends conducting a demonstration project in Western Province that would generate evidence of performance, quality, and access by achieving the following four iSC-specific objectives:

Training: Through training provided by district-level and provincial-level staff, improve the vaccine-management performance of facility-level staff in Western Province.

Logistician: Hire and train professional medical-supply logisticians at the provincial level.

Tools: In four of the most remote districts in Western Province, demonstrate the effectiveness of unmanned aerial vehicles (UAVs; aka “drones”) to routinely deliver vaccines from the district or provincial offices to the hardest-to-reach health facilities.

Policy: Specify the unique needs of populations living in remote and isolated areas and steps for meeting those needs in the next version of the National Immunization Strategic Plan (due in 2018) and offer specific steps (including training, logistical support, and UAV utilization) for meeting those needs to ensure equity and access.

## Training objective

Both the focus groups and the KIIs revealed that a significant barrier to ORC is a lack of training, education, and supervision, particularly among facility-level staff. This contributes to inadequate vaccine-management practices, such as over and under reporting, stock-outs, and cold-chain malfunction. The aim of the training objective is to prioritize capacity building of facility-level staff through in-service training and on-going supervision that will be carried out by the district-level staff and/or provincial-level staff, with particular *focus on meeting the needs of staff working in remote areas*.

The training would be provided by district- and provincial-level staff who have received advanced training and who understand the needs of the province. The training content will support facility-level staff in achieving a specific level of vaccine-management competency as identified by supervisors.

The WHO and the People that Deliver (PtD) program<sup>7</sup> have established an evidence-based and widely used competency framework and curriculum for supply chain, distribution, and logistics for vaccines and essential medicines.<sup>8</sup> Below are the levels of competency for effective supply-chain management established by PtD. The competencies are cumulative and the iSC training program would be aimed at moving facility-level staff from one level to the next through semiannual workshops sponsored and conducted by the district health office, coupled with in-service training and supervision provided by district- or provincial-level staff. Avenues for linking competency level with compensation will be explored.

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<sup>7</sup> People that Deliver is a global partnership of organizations focusing on professionalization of supply-chain personnel by advocating for a systematic approach to human resources for supply-chain management at the global and local level. PtD's stated mission is "to build global and national capacity to implement evidence-based approaches to plan, finance, develop, support and retain the national workforces needed for the effective, efficient and sustainable management of health-supply chains." [www.peoplethatdeliver.org](http://www.peoplethatdeliver.org).

<sup>8</sup> Accessed 12/18/2017:

[https://peoplethatdeliver.org/ptd/sites/default/files/resource\\_contents\\_files/Feb%2014th%20FINAL%20PtD%20Public%20Health%20SCM%20Competency%20Compendium%20with%20ISBN%20and%20CC%20and%20publisher.pdf#overlay-context=resources/stepped-approach-documents](https://peoplethatdeliver.org/ptd/sites/default/files/resource_contents_files/Feb%2014th%20FINAL%20PtD%20Public%20Health%20SCM%20Competency%20Compendium%20with%20ISBN%20and%20CC%20and%20publisher.pdf#overlay-context=resources/stepped-approach-documents)

1. Basic: Have a basic awareness or understanding of the activity; limited to administrative or supporting activity.
2. Foundational: Have a general understanding of the activity and demonstrate an understanding of key issues and their implications; demonstrate behaviors and outcomes at the minimal level for the professional area.
3. Intermediate: Have a broad understanding of the activity and display competencies which are further developed and require the demonstration of enhanced skills and behaviors.
4. Advanced: Have an in-depth understanding of the activity and can define requirements and output; requires the demonstration of skills and behaviors which are more developed and strategic.

The training curriculum recommended for establishing competency and meeting the needs of Zambia's facility-level staff would be established by the EPI Technical Working Group, with input from provincial-level EPI staff, and with specific consideration given to the needs of facility staff in remote and isolated areas. It would incorporate the vaccine management, logistics, and outreach programs of the new iSC.

There are a large number of available supply-chain training curriculum designed and tested for countries in sub-Saharan Africa, therefore developing a new curriculum is unnecessary. Instead, the TWG will build a hybrid curriculum using the relevant components of three existing training programs (described below) that have demonstrated a high level of success in building capacity for vaccine management, particularly in hard-to-reach areas of sub-Saharan Africa.

- *A Process Guide and Toolkit for Strengthening Public Health Supply Chains through Capacity Development* (UNICEF 2016).<sup>9</sup>
- *Building Routine Immunization Capacity, Knowledge and Skills (BRICKS)* (John Snow International 2013)<sup>10</sup>
- *Vaccine Management and Immunization Basics Training Curriculum* (National Primary Health Care Development Agency, Nigeria, 2018)<sup>11</sup>

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<sup>9</sup> Accessed 12/18/17: <http://supplychainsforchildren.org/en/news/guide-and-toolkit-for-strengthening-publichealth-supply-chains-through-capacitydevelopment>

<sup>10</sup> Accessed 12/18/17: [www.jsi.org/immunizations](http://www.jsi.org/immunizations)

<sup>11</sup> This curriculum is not yet available publicly, however, a presentation of the training results was presented at a summit hosted by the Bill & Melinda Gates Foundation in 2015, *Teach to Reach: Innovative Methods for Immunization Training*. A description can be found at a Gates Foundation blog post: <https://www.impatientoptimists.org/Posts/2016/06/Innovative-Immunization-Training-in-Nigeria#.Wk6DxN-nGM8>

The final training curriculum will support the MOH's aim of improving the overall EPI performance as measured by the standards established through WHO's Effective Vaccine Management (EVM) initiative<sup>12</sup> by improving access, equity, and effectiveness of the proposed iSC distribution system in remote districts.

In addition to developing the curriculum, the TWG will advise the MOH on the appropriate approach and method for evaluating the training program by establishing the critical indicators. This evaluation will also be tested as part of the Western Province demonstration project. Evaluation of the training and its effectiveness will be the responsibility of district or provincial staff and will include:

- pre- and posttraining knowledge tests,
- performance-based evaluation or review examining compliance with standard procedures and protocols for record keeping, data management, and vaccine inventory management,
- observations performed by provincial staff during routine vaccine delivery and cold-chain maintenance.

The intention of the training program is to provide quality improvement to the vaccine management and iSC functions through on-going knowledge exchange and advancement of competencies among facility-level staff. Resources for this training should be available through the existing training and education budget, as well as from expenditures realized as a result of facility staff no longer having to travel to obtain vaccines from the district offices.

Additionally, a twice-per-year training/refresher training allows facility staff to have some regular, planned, and structured interactions with other EPI staff. The loss of this kind of interaction was seen as a negative consequence of the new iSC. These interactions have important implications for the performance, knowledge, and skills of the facility-level staff, and the training should help contribute to greater ORC.

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An assessment of the Nigeria program is available from TechNet at: <https://www.technet-21.org/iscstrengthening/index.php/en/data-for-management-documents-and-downloads/simple-but-impactful-transforming-nigeria-s-vaccines-supplies-through-weekly-dashboards>

Additional information is also available through the Targeted States High Impact Project—Nigeria, which incorporated the training as part of an integrated maternal and child health program ([www.tshipnigeria.org](http://www.tshipnigeria.org))

<sup>12</sup> [http://www.who.int/immunization/programmes\\_systems/supply\\_chain/evm/en/](http://www.who.int/immunization/programmes_systems/supply_chain/evm/en/)

## Logistician objective

The focus groups and the KIIs revealed that there is insufficient professional staff at the provincial level to effectively implement the alternative iSC. This was also raised in the system-design workshop. In addition, WHO's EVM standards recommend installing professional logisticians, as well as cold-chain technicians, at the subnational level (WHO, EVM 2016). As a result of the proposed change to the iSC, provincial staff will be responsible for delivering vaccines routinely to the health facilities, which is a significant change and increase in responsibility, and requires effectively implemented supply logistics. Evidence from pilot projects in other countries where new iSCs were demonstrated also found that establishing professional cadres of subnational logisticians was a key success factor (Prosser et al. 2017; Assi et al. 2017; Guillermet et al. 2017).

In the Western Province demonstration project, resources should be made available to hire a dedicated logistician trained using a curriculum and method that will be the model for future use in other provinces. This will require input, direction, and advocacy from the EPI TWG and other stakeholders, and should also be an objective of the new national strategy. People that Deliver, which has established one of the vaccine-management curricula, also has a program to train and certify logisticians. It ties in with the vaccine-management curricula, which is important in ensuring consistent approaches, terms, and shared understanding across the system.

Addressing the need for professional logistics to ensure effective vaccine management has been a common aim of the global community in recent years, particularly since the launch of EVM, which made clear that logistical challenges are a significant bottleneck to effective iSC distribution systems. Several global organizations have been attempting to address this need and in 2016, WHO and UNICEF, with guidance and input from PtD and other public and private entities, developed a comprehensive logistician training program that should be adopted by Zambia's MOH and tested in Western Province.<sup>13</sup>

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<sup>13</sup> Accessed 12/21/17 at [https://peoplethatdeliver.org/ptd/sites/default/files/resource\\_contents\\_files/Suporting%20National%20Logistics%20Working%20Group%20Toolkit%20and%20guidance.pdf](https://peoplethatdeliver.org/ptd/sites/default/files/resource_contents_files/Suporting%20National%20Logistics%20Working%20Group%20Toolkit%20and%20guidance.pdf)

In addition to testing the impact of the training program and the effectiveness of having professional logisticians at the provincial level, the demonstration project should monitor costs of the training and hiring of logisticians for consideration by the TWG and budget authorities for future appropriations.

### **Tools objective**

Over the past few years, a number of private organizations, universities, and research centers have been exploring the feasibility and cost effectiveness of deploying unmanned aerial vehicles for the distribution of vaccines and medicines, as well as blood and tissue transport, in remote and hard-to-reach areas (Theis et al. 2016; Scott M, Scott L, 2017; Haidari et al. 2017). The results have been extremely promising as measured by cost-effectiveness, quality of vaccine management, and access, and there is growing consensus that this technology, or ones like it, has the potential to increase access to health systems, medical sample transport, and supply chains in the near future (USAID 2016; World Bank 2017).

In 2016, the United States Agency for International Development (USAID) issued a report expressing strong interest in supporting further advancement of this novel technology to improve public health in remote areas, stating:

*“One of the possible solutions to resolve the challenges that still exist to transport medicines (especially those medicines that save lives) in a timely manner, to hard-to-reach places, could be the use of technology such as unmanned aerial vehicles (UAV) or drones. In the global context, the United States Agency for International Development (USAID), the World Health Organization, UNFPA, UNICEF, as well as several nongovernmental organizations (NGOs) are paying close attention to the use of UAV in public health.”<sup>14</sup>*

In 2017, the World Bank wrote of UAVs

*“Their versatility, along with plummeting acquisition and operating costs, have made drones a popular tool for many non-military uses, such as aerial photography, land surveying, maintenance assessment, scientific research, product deliveries, agriculture, etc. Thanks to these recent advances, drones can support international development in multiple ways, either by assisting staff in labour-intensive and risky operations, or by conducting work that was previously impossible without UAVs.”*

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<sup>14</sup> [https://pdf.usaid.gov/pdf\\_docs/pa00mhz2.pdf](https://pdf.usaid.gov/pdf_docs/pa00mhz2.pdf)

The World Bank went on to list the benefits of UAVs in development as:

- consistently lower operational costs,
- in project areas, lower operational risk to development workers, local residents, and infrastructure,
- quicker, more efficient planning and implementation of projects,
- higher quality data available in larger quantities, and
- more flexible, affordable verification tools.

A number of organizations have been developing and testing UAV prototypes for use in transporting vaccines and essential medicines (depicted in Figures 6.2 and 6.3). In addition, large multinational delivery companies such as United Parcel Service and DHL have partnered with several ministries of health in sub-Saharan Africa, including Rwanda and Tanzania, to demonstrate UAV vaccine delivery systems. Similarly, several public and private global health donors are supporting advancement of UAV technology.<sup>15</sup>

**Figure 6.2: Artist's rendering of a medical supply UAV (credit: Theis, C.A. 2016)**



<sup>15</sup> <https://www.dronesinhealthcare.com/>

**Figure 6.3: Prototype of medical delivery UAV** (credit: Northeastern University, 2016)



With guidance and leadership from the TWG, and participation from additional stakeholders in the Ministry of Transportation and Civil Aviation, a working group will be established to look at the feasibility, training, and system requirements for conducting a demonstration of UAV delivery of vaccines to remote health facilities. They will also work with other stakeholders to identify potential donors and private-sector partners to support implementation. Recently, financial support for UAV demonstration has been provided by the United Kingdom’s Department for International Development, USAID, the National Science Foundation (US), and the World Bank, as well as private foundations, including the Bill & Melinda Gates Foundation.

A demonstration project will be conducted in one or more remote districts in Western Province that will serve as test sites for UAV implementation. In these locations district- and facility-level EPI staff will receive special infrastructure, training, and support for UAV system operation as directed by the TWG, and a process for integration into the iSC will be proposed. In addition, collaboration with the MOH’s essential medicines supply-chain program will be pursued. Evaluations of cost-effectiveness, quality, and user satisfaction will be conducted.

**Policy objective**

In 2018 and 2019 two key MOH strategy documents will be updated that provide the vision and guidance to the delivery of vaccines and immunizations in Zambia. Specifically, the Comprehensive Multi-year Plan for Immunizations and the Health Sector Supply Chain Strategy and Implementation Plan will be revised and updated. These documents should reflect the potential adoption of the new iSC, including UAV demonstration, the criteria for success of the new iSC, and should be informed in part by the findings of this ORC assessment. In addition, the plans should adhere to the standards and principles established by WHO's Effective Vaccine Management initiative and the role that the new iSC will play in achieving these global standards.

## APPENDIX A: FOCUS GROUP MODERATOR GUIDE

### Introduction

- Welcome and thank you for agreeing to participate in this Focus Group Discussion.
- My name is \_\_\_\_\_ and I will be your moderator today. I am a \_\_\_\_\_ (state position) from the Centre for Infection Disease Research in Zambia (CIDRZ).
- Helping me to take notes today is \_\_\_\_\_, who is a \_\_\_\_\_ (state position) from CIDRZ.
- We are very interested to hear your valuable opinions on the immunization supply chain and your thoughts on potential changes to the system that may increase coverage and efficiency.
- I want to emphasize that while there are discussions about potential ways to improve the immunization supply chain, no decisions have been made on whether to adopt any changes. The Ministry of Health and other stakeholders are looking at data to determine potential changes that could be made, if any, to ensure vaccines reach every child. Because you play an important role in the immunization program we are interested in learning more about your views and opinions, which will help, inform the process going forward.
- Each of you has been randomly assigned a number between 1 and 7. This helps us to transcribe the discussion and maintain your anonymity.
- We would like to use a voice recorder to capture everything that will be discussed in order for us to not misinterpret anything you say. The information you give us is completely confidential, and we will not associate your name with anything you say in this Focus Group Discussion. If you do not feel comfortable about this, please let us know before we begin the discussion.
- We would like to tape the Focus Group Discussion so that we can make sure to capture the thoughts, opinions, and ideas we hear from the group. No names will be attached to the Focus Group Discussions and the tapes will be destroyed as soon as they are transcribed.
- You may refuse to answer any question or withdraw from the Focus Group Discussion at any time.
- If you have any questions now or after you have completed the Focus Group Discussion, you can contact a study team member like me, or you can contact the study co-Principal Investigator at CIDRZ. (Thandiwe Malambo, +260 978764189 or Cheryl Rudd Mallaghan +260 969320638).

## **Explanation of the process**

Focus groups are relevant to understand the views and opinions on a particular issue of a group of people with similar characteristics. In this project, we are conducting Focus Group Discussions in three districts and one at the provincial level, as well as interviews with key stakeholders to get your input on changes that might help improve the immunization supply chain system.

### *Logistics:*

- Focus group will last about 90 minutes
- Feel free to move around
- Where is the bathroom? Exit?
- Help yourself to refreshments

## **Ground Rules**

Here are some basic ground rules for the focus group.

- Everyone should participate.
- As a group member you have the responsibility to keep whatever has been discussed by fellow group members confidential.
- We ask that only one person speak at a time so we can hear from everyone.
- Stay with the group and please don't have side conversations
- Turn off cell phones if possible
- Have fun

## **Turn on tape recorder**

Are there any questions before we get started?

## Introduction

1. I would like to start by going around the table and have each of you state briefly what your job is here, your role in the immunization supply chain system, what you like about your job, and how long you have been in the job?

## Overview of proposed changes or scenarios

I am handing each of you a piece of paper that has a diagram showing how the current immunization supply chain flows.

[Facilitator provides a short overview of how immunizations move through the supply chain and the role of staff at the district and health facility level.]

### SCENARIO A



1. Can you tell me if this diagram accurately shows how the supply chain functions in Zambia today? If not, what is not accurate?
2. Are there any steps that are missing from here? Is there a role or function that is not shown here?

Now I am sharing with you a diagram of an alternative supply chain design.

### SCENARIO B: ALTERNATIVE



Moderator describes **major system changes**:

- 1) Change in delivery method to service delivery level (multi-stop and direct delivery)
- 2) Human Resources: Change in who is responsible for the delivery to Health Facilities (Province with District support).

1. Can you tell me what you think of this alternative scenario and the changes being suggested?

Now that you have seen some possible changes or modifications to the supply chain, I would like to have a discussion about these changes.

**I. Motivation**

I.a. In comparison to the current system, what benefits do you think can come out of the alternative scenario?

I.b. In your view what disadvantages might the alternative scenario create for your specific roles?

I.c. Can you tell us what changes you would need to make in your roles in order to implement the alternative scenario and how willing and able you would be to make these changes? (Probe: Challenges for Health Facilities)

I.d. Do you think this change should be a priority, or are there other priorities that you see as more important?

I.e. On a scale of 1-5, how motivated are you to make this change, with one being not motivated to make this change at all, and five being highly motivate to make this change (ask each participant).

**II. General organizational capacity**

II.a. Can you think of a time when National level made a change to any system or process that affected your roles? What was that change? How did that turn out? (Probe: MOH capability to make successful change, keys to success, challenges)

II.b. Which areas of your work environment would you like to improve? (Probe: work relations, salaries, training, leadership?)

II.c. How would you describe your working relationship with Provincial and National level EPI staff (*for District Focus Group Discussions*) OR with National and District level EPI staff (*for Provincial Focus Group Discussions*)? How does it affect your ability to make change or get your work done? (probe: Would your relationship need to change to make this change to the alternative supply chain system?)

II.d. How easy is it to communicate with your supervisors? What decision-making processes are you involved in? Are you satisfied with your level involvement?

II.e. Does your position or role allow you to make changes to systems and processes when you see a need?

### **III. Intervention specific capacity**

III.a. What would you need to be successful in making this change to the alternative supply chain? (Probe: training, resources, equipment, etc.).

III.b. What is the possibility of having these things realized (in relation to these things you have mentioned)? On a scale of 1-5, 1 being not possible at all and 5 being completely possible, what is the possibility of making this change? give reasons for your answer.

III.c. What do you think the staff at the health facilities/health posts need to be successful in making these changes? (Probe: knowledge, skills, technical expertise).

III.d. Do you think the other staff at health facilities and health posts who have a role in the immunization supply chain can make the necessary changes for this programme to be successful?

III.e. What type of characteristics should a team leader have to successfully implement this programme?

#### **Additional probes for discussion:**

- Training and education needs
- Kind of leadership needed
- Does the working environment respond well to change?
- Who are the influential stakeholders to iSC?
- Effectiveness of communications with Provincial and National MOH staff
- Adequate staff and structure
- Barriers to change generally

### **IV. Concluding remarks or comments**

This concludes our focus group.

Do you have any final thoughts or comments that might help us further understand the readiness of key staff to make a change to a new immunization supply chain system?

**Thank you so much for coming and sharing your thoughts and opinions with us.**

## **APPENDIX B: KEY INFORMANT INTERVIEW GUIDE**

### **EPI TECHNICAL WORKING GROUP, ZAMBIA**

#### Part I: initial introduction, verbal consent, and study description

As you know, I am a graduate student at the University of North Carolina, in the United States. I am doing my dissertation on the immunization supply chain system in Zambia and potential changes to the system's design. As part of this study I have been working with CIDRZ to conduct focus groups with provincial and district EPI staff in Western Province. I would like to ask you some questions about the proposed changes and the input received from the focus groups.

All of your comments will remain anonymous. If at any time during our talk you feel uncomfortable answering a question please let me know, and you don't have to answer it. If at any time you want to withdraw from this study please tell me and we will end the conversation. I will do everything I can to protect your privacy, but there is always a slight chance that someone could find out about our conversation. Now, I would like to ask you if you agree to participate in this study, and to talk to me about the proposed changes to the immunization supply chain in Zambia. Do you agree to participate?

#### Part II: Questions/discussion

As you know, there have been some discussions about adopting an alternative immunization supply chain in Zambia, and some alternative designs proposed which you have been a part of. The alternative immunization supply chain would change the way vaccines are distributed to health facilities. In the current system district health staff go to the province to obtain vaccines and then return to the district health office. Health facility staff then travel to the district to obtain vaccines for their health facility. Under this alternative/proposed system, provincial staff, accompanied by district staff, would deliver vaccines directly to the health facilities. While Districts would maintain necessary buffer stock, they wouldn't be a distribution site. Instead District staff take on a closer supervisory role during vaccine distributions. In this proposed alternative model, provincial staff would loop from one district to the next making deliveries.

Q1 : I was wondering if you could tell me what you see as the advantages of this system.

Q2: What do you see as the disadvantages?

Probe: Costs, knowledge/training, meeting the needs of remote and isolated areas, current challenges

Q3: What additional capacity, if any, will be needed at the provincial level? At the district level? At the health facility level?

Probe: Infrastructure, training,

Q4: Do you think staff at provincial level will respond positively to this change? At the district level? At the health facility level?

Q5: Some of the focus group participants indicated that the method used to forecast the amount of vaccine needed at the health facility level is based on population estimates and contributes to the “push” mechanism for allocating vaccines. They felt that sometimes this method underestimated the demand and consumption of vaccine at the health facility level and did not provide enough vaccine which contributes to stock outs. Is that a concern and do you think this new system can help solve that problem?

Q6: Some of the focus group participants indicated that staff at the health facility level—the lowest level in the supply chain—lack the training and capacity needed to ensure proper vaccine inventory management, monitoring and reporting, and cold chain maintenance. With the proposed alternative system, provincial level staff, along with district staff, would regularly visit health facilities to deliver vaccines. This also presents a very unique opportunity for provincial and district staff to provide additional training and capacity building for health facility staff. They could then follow up and monitor the health facility staff’s performance in follow-up visits. Would you be supportive of establishing within this new system a mechanism for capacity building? Do you think provincial, district and health facility staff would be receptive to this?

Q7: The proposed change seems to emphasize efficiency. From your perspective, is efficiency or inefficiency the most significant issue facing the immunization supply chain? Are the unique needs of remote areas likely to be met by this new system?

Probe: equity, access, effectiveness,

Part III: Any additional thoughts you might have about the alternative iSC or anything else you want to say?

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