CHAPTER 10

# Measuring Progress Toward the Malabo Declaration Goals in the Midst of COVID-19: A Measurement Approach for a Health Systems-Sensitive Resilience Score

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## Introduction

As an outgrowth of the Comprehensive Africa Agriculture Development Programme (CAADP), the *Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods* (AUC 2014) established both a clear strategic direction and a well-articulated set of agriculture-focused strategic priorities for Africa. Beyond the two overarching commitments to supporting the CAADP process and enhancing investments, the Malabo Declaration drew attention to the goals of achieving zero hunger, halving poverty, boosting intra-African trade in agricultural commodities and services, enhancing the resilience of livelihoods and production systems to climate variability and other shocks, and building mutual accountability to actions and results. With climate change pressures, much of the work on resilience, in connection with the Malabo Declaration and other initiatives, is justifiably based in weather-related shocks. The protracted and pervasive effects of a global pandemic have, however, altered the range of risks to which resilience may be viewed as a strategic response. The present chapter is therefore motivated by the need to explore how indicators related to the shocks and stresses caused by COVID-19 may be incorporated into the CAADP measurement process.

Against the backdrop of COVID-19, the present chapter considers how indicators related to reporting on country-level progress toward the resilience component of the Malabo Declaration goals may be augmented. In this chapter, we introduce both the limited capacity of health systems across Africa and the potential effects of macroeconomic conditions associated with a global health shock as new and important inputs. More specifically, we propose the inclusion of a basic health systems capacity index and an economic country-level resilience capacities score. From an empirical perspective, the motivation for the chapter may be stated as a question: How might reporting on the progress made toward the Malabo Declaration better reflect the effects of a global health shock such as COVID-19? As a first approximation of an answer to this question, we provide a brief empirical demonstration of an approach that examines high-level resilience capacities to global health shocks. Our overall objective is to draw attention to the potential value of including a limited number of health systems and macrolevel indicators as part of reporting on progress made toward the resilience aspect of the Malabo Declaration commitments.

The empirical task was to develop and apply a resilience capacity score for global health shocks ($RCS^{GHS}$). Recognizing the challenges associated with the suggestion of introducing greater demands on the CAADP measurement process, the intent of this chapter is to describe a compact approach for $RCS^{GHS}$, one that provides insights about the impacts of a shock such as COVID-19 but does so in a manner that requires limited data inputs and a small number of analytical steps. Thus, the methods used to compose the indicators were not derived from modelling procedures based in a set of analytical techniques that require a strong foundation of assumptions. The approach, which is purposively simple and easily replicated, generates results that are descriptive. With this background, the goal is to simply introduce and report on a limited set of supplementary indicators to consider as a complement to the Africa Agricultural Transformation Scorecard (AATS), which reports on progress toward Malabo Declaration targets, and in connection with future analyses of progress made toward the Malabo Declaration goals where large-scale health shocks may play a role. The way in which some of these indexes may be applied to more fully developed analytical models is the topic of another chapter in the 2021 Annual Trends and Outlook Report. In Chapter 11 of this volume, d'Errico, Jumbe, and Constas combine elements of the $RCS^{GHS}$ with a well-established Resilience Measurement Index and Analysis (RIMA) [1] to generate a form of resilience analysis that is sensitive to health shocks.

The present chapter is organized into three sections followed by a conclusion. The first section provides a brief overview of the resilience component of the CAADP results framework. This section also builds the case for using a special set of indicators to support the effort to track progress being made toward the Malabo Declaration, during and in the aftermath of COVID-19. To introduce the methodology, the second section of the chapter describes the measurement approach and outlines the empirical objective of including composite health systems indicators and a limited set of high-level macroeconomic indicators. The intent of this part of the chapter is to offer an empirically based strategy to measure COVID-19-related factors that might affect progress toward the Malabo Declaration goals. On an operational level, the second section also describes the

1 Technical details that describe how RIMA is developed, implemented, and interpreted are available from FAO (2016).

selection of indicators and the procedures that were used to analyze the data. Section three presents the results of the measurement approach. The chapter concludes by discussing some of the limitations of the proposed approach and explores the additional work needed to develop and incorporate indicators related to the impacts of a global health shock such as COVID-19.

## *The Need for Indicators Related to COVID-19 and the CAADP Results Framework*

Shocks that affect welfare are generally described as either idiosyncratic or covariate. While the notion of idiosyncratic shocks draws attention to shocks that affect individual households, covariate shocks are concerned with disturbances that affect a larger number of households within and across geographic zones and population groups. Shocks that affect multiple regions across disparate regions of the world are categorized as global shocks. A global shock, as defined by the Organization for Economic Cooperation and Development, is a "major rapid-onset event with severely disruptive consequences covering at least two continents" (OECD 2011, 3). The series of events stemming from undue risk exposure associated with mortgage-backed securities produced a series of global shocks that affected every country in the world, across multiple sectors. Arguably, the effects of COVID-19 as a global shock are more severe than the global financial crisis of 2009. This is particularly true when one considers the immediate mortality risks associated with COVID-19.

The inadequate health care prevalent in developing countries highlights a systemic vulnerability to epidemics and diseases. Preexisting health burdens—such as tuberculosis and other respiratory diseases, HIVAIDS, and widespread diarrheal disease—enable increased disease transmission. Weak governance and the lack of strong institutions hinder the formulation of policies and programs that are now needed. Furthermore, with a high proportion of livestock-related livelihoods found in developing countries, the presence of endemic and episodic zoonotic diseases introduces a special, often overlooked, set of risks.

While the immediate and most conspicuous effects of COVID-19 are health related, the scale and duration of COVID-19 has had a negative impact on almost all aspects of well-being. A joint report issue by the African Union Commission (AUC), the United Nations Development Programme (UNDP), and the Africa Centres for Disease Control (CDC) noted how COVID-19 affected "everything from gender equality to governance to peace" (UNDP 2021, 6). The effects of COVID-19 on food security are highlighted in a policy brief from the United Nations, where it was noted that that the funding needs for food security would increase from approximately US$2 billion to nearly $7 billion as a consequence of COVID-19 (2020a). Illustrating the pervasive effects of COVID-19, the comprehensive response plan issued by the United Nations (2020b) listed 31 organizations whose cooperation would be required for a coherent and effective strategy. As expected, the World Health Organization is the lead agency for the COVID-19 response; however, the breadth and level of participation among other UN organizations is unprecedented. The International Food Policy Research Institute (IFPRI) estimated that an additional 140 million people in developing countries would fall into poverty as the result of COVID-19 (Debucquet, Martin, and Vos 2020).

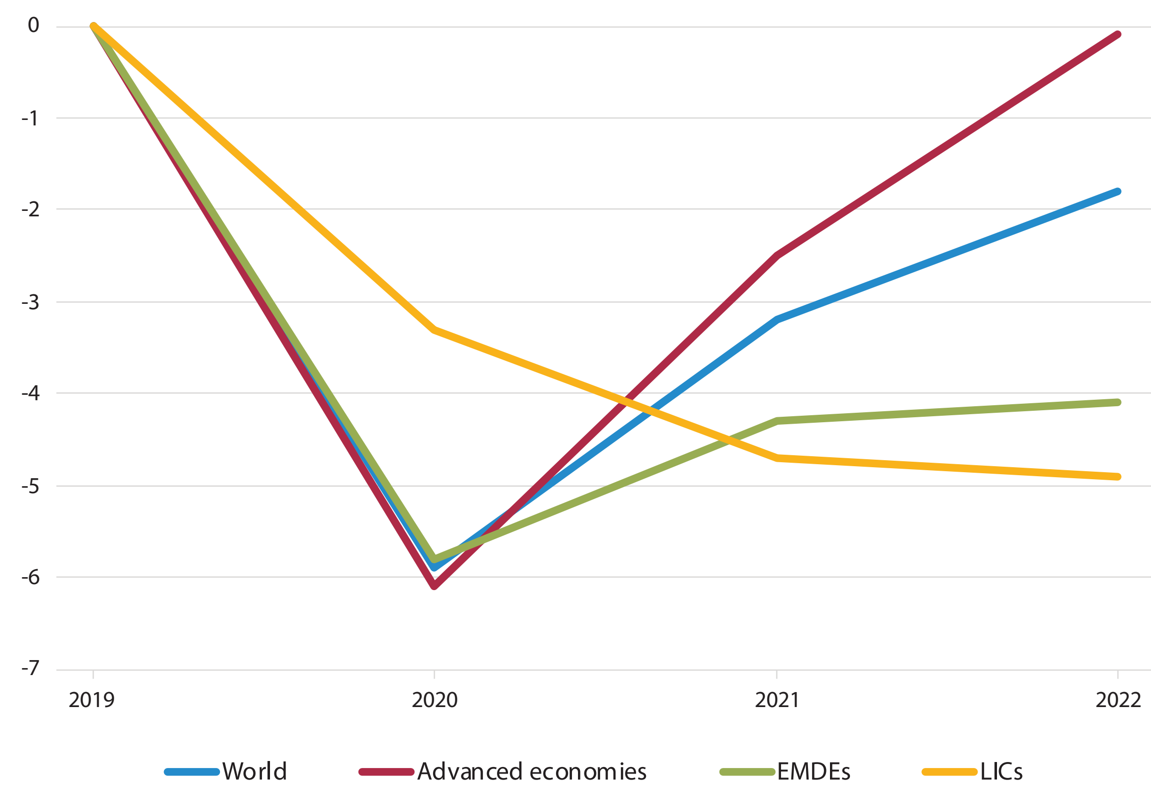
It is now clear that all countries across the globe have been, and will continue to be, negatively affected by COVID-19. Developing countries, however, are particularly vulnerable. The United Nations Department of Economic and Social Affairs noted the potentially "devastating consequences" that COVID-19 may have on least-developed countries (UNDESA 2020). Initial evidence from the United Nations Conference on Trade and Development (UNCTAD) has indicated that declines in foreign direct investment had already begun to emerge toward the end of the first quarter of 2020 (UNCTAD 2020). Similarly, early findings from the Word Trade Organization (WTO) suggest that trade volumes will drop precipitously over the course of 2020, with those effects continuing well into 2021 (WTO 2020). Reductions and reallocations of official development assistance and humanitarian aid as a function of COVID-19 have also been explored (Brown 2021). A study published in The Lancet, for example, reported that progress made toward battling HIV, tuberculosis, and malaria is threatened by altered patterns of health service delivery (Hogan et al. 2020). Problems commonly found in development settings that existed before COVID-19, such as extreme poverty and chronic food insecurity, will not only continue but will likely require more intensive levels of engagement.

For most of 2020, the buffering effects of aid and the early trends on lower disease rates suggested that low-income countries (LICs) might not be the most severely affected by the pandemic. However, the relative damage from COVID-19 is, of course, much worse when one considers the preexisting lower levels of food security and higher levels of poverty found in developing countries. Economic forecasts provided by the World Bank (2021a) compared pre- and post-pandemic outputs of LICs with advanced economies and emerging market and developing economies (EMDEs), leading to projections of both short-term and long-term effects of COVID-19 on outputs. As shown in Figure 10.1, EMDEs and advanced economies have begun to rebound from the initial effects of COVID-19 (World Bank 2021a).

From a resilience perspective, what is perhaps most notable in Figure 10.1 is the varied recovery trajectories among advanced economies, EMDEs, and LICs. While the initial loss was not as severe in LICs, the lack of return to pre-shock levels suggests a lack of resilience.

The effects of COVID-19 on food security and food systems have been raised in the literature (Béné 2020; Devereaux, Béné, and Hoddinott 2020). For example, Deveraux, Béné, and Hoddinott (2020) examined the impacts that COVID-19 has had on food security according to three different frameworks—the four pillars of food security, the food systems framework as conceptualized by the High Level of Panel of Experts on Food Security and Nutrition, and Sen's entitlement approach (FAO 1996; HLPE 2017; Sen 1999). In each case, damage was noted to one or more dimensions of food security. Exploring the breadth of impacts associated with the pandemic, the Food and Agriculture Organization (FAO) published a set of policy briefs that described the negative effects of COVID-19 on food supply chains, trade and markets, smallholder farmers, and safe and sustainable food systems. [2] In each case, FAO reported that the effects of COVID-19 had been, and would continue to be, severe and protracted.

**FIGURE 10.1—DEVIATION OF OUTPUT FROM PRE-PANDEMIC PROJECTIONS**




Source: World Bank (2021a).

On the economic side, the two impacts of the pandemic that have been perhaps most widely cited are trade and supply chain disruptions. In a global shock, such as COVID-19, countries whose economies are based on trade are likely to be more vulnerable to the effects of trade disruptions. UNCTAD (2020) reported that global merchandise trade values and trade volumes decreased precipitously in response to COVID-19. While trade has begun to

2 A complete list of FAO policy briefs can be found at http://www.fao.org/2019-ncov/resources/policy-briefs/en/.

show signs of recovery in the year after the onset of COVID-19, trade data suggest that indications of global recovery are driven by activity in East Asia and the Pacific (UNCTAD 2021). Trade data from Africa show patterns that are less encouraging, with imports indicating marginal recovery while exports remained in decline. The WTO (2020) reported that trade declines associated with COVID-19 in the second quarter of 2020 were the largest recorded in history. As an integral operational component of trade, the negative effects of COVID-19 on supply chains and global value chains have been well documented (UNCTAD 2020).

To generate data on the Malabo Declaration, the CAADP Results Framework (RF) "is earmarked as the tool that will be used in tracking, monitoring and reporting on the progress in meeting the Malabo commitments" (AUC and NEPAD 2015, 3). The CAADP RF is structured around three levels: Level 1 includes agriculture's contribution to economic growth and inclusive development; Level 2 is agricultural transformation and sustained economic and inclusive agricultural growth; and Level 3 is strengthening systemic capacity to deliver results. Drawing on an array of national, regional, and cross-national data sets, a set of indicators for each level is used to track progress across the three CAADP levels.

Indicators within each level of CAADP RF are organized according to results areas that specify priority indicators. Signaling the commitment to resilience under the Malabo Declaration, Goal VI expresses the aim of "Enhancing Resilience of Livelihoods and Production Systems to Climate Variability and Other Related Risks" (AUC 2014, 5). The inclusion of resilience as one of the seven goals of the Malabo Declaration reflected the realities of the shock-prone contexts in which countries in the African Union must function. Most commonly, references made to shocks and stressors are linked to disturbances caused by climate change and weather-related shocks, social unrest and conflict, the constraints of inadequate infrastructure, and economic volatility in its various forms. The Technical Guidelines for the Biennial Review of the Malabo Declaration Goals and Targets (AUC 2017) provide a detailed description of how the measurement targets of Goal VI are to be operationalized. Reflecting the content of Goal VI, the guidelines define the subtheme, measurement objective, and performance indicators for resilience. Performance indicator 6.1i measured the "percentage of farm, pastoral, and fisher households that are resilient to climate change and weather-related shocks" and indicator 6.1ii measured the "share of agriculture land sustainable land management practices" (AUC 2017, 3). The 2019 CAADP Biennial Review report showed that only 11 countries (Burundi, Cabo Verde, Ghana, Ethiopia, Mali, Mauritania, Morocco, Rwanda, Seychelles, Tunisia, and Uganda) out of 55 were on track for enhanced climate and livelihood resilience, compared to 7 in 2017.

Historically, the continent of Africa has long worked to address a range of health risks such as HIV/AIDS, malaria, and diarrheal diseases. These diseases and others represent serious threats to development (GBD 2019 Diseases and Injuries Collaborators 2020). When the Malabo Declaration was drafted, there was no compelling reason to consider the potential impacts of a global pandemic. Although the effects of Ebola (2014–2016) were tragic, they were largely concentrated in the three countries of Guinea, Liberia, and Sierra Leone. Statistics from the CDC reported that Liberia was worst affected, having the highest number of probable cases (10,678) and deaths (4,810) (CDC 2019). The localized nature of the Ebola outbreak and the relatively quick containment did not seem to influence the CAADP RF toward considering the consequences of a global pandemic. When the CAADP RF was developed, the prospect and consequences of a global pandemic were not central to the planning process. Where health is discussed in the CAADP RF, such discussion is focused on food safety. It is apparent that the deep but narrow impact of Ebola did not influence the way in which the African Union would conceptualize and implement measurement plans for its policy initiatives. It is therefore not surprising that the CAADP results framework did not include health systems or indicators associated with the effects of global health shocks.

## Measurement Approach: Resilience Capacities Score for Global Health Shocks

The empirical objective is to better understand how progress made toward the Malabo Declaration might be interpreted in the context of COVID-19. This requires an additional set of indicators comprised of sub-indexes that serve as components of an overall index of resilience in the face of global health shocks. As a simple formulaic expression, the measurement approach for a resilience capacities score in the face of a global health shock may be represented as follows:

$RCS^{GHS} = f\,(HSC, ECRC)$,

Where: $RCS^{GHS}$ = Country-level resilience capacity to a global health shock,
HSC = Health systems capacities, and
ECRC = Country-level resilience capacities.

Indicators for HSC are drawn from readily available data sources provided by the World Health Organization's Global Health Observatory (GHO) and Our World in Data platform. Indicators for ECRC are drawn from the World Bank and Fund for Peace. Further details on the specific indicators drawn from these sources are described below.

While the arrangement of variables in the above expression suggests a causal relationship, the development of $RCS^{GHS}$ represents initial work toward a more modest empirical ambition. As noted at the outset, the goal is to demonstrate how a limited set of proposed resilience capacities specific to COVID-19 may be incorporated into reporting progress on the Malabo Declaration. To connect $RCS^{GHS}$ to the CAADP RF, the results of $RCS^{GHS}$ are combined with the resilience indicator from the Africa Agriculture Transformation Scorecard (AATS) focused on investment in resilience to climate shocks (Indicator 6.2; the details of this combination are discussed later). The integration of the AATS resilience indicator with the $RCS^{GHS}$ is used to construct a simple metric that captures both the resilience capacity to global health shocks and resilience capacity to climate shocks.

## Health Systems Capacity: Health Infrastructure and Vaccination Rates[3]

Drawing on data from the GHO, the HSC is structured around three indicators that are likely to be associated with a country's resilience capacities in the face of a global health shock. The ability of a country to respond to a global health shock is based on the health systems' capacity to respond to a public health challenge. Two basic inputs to public health capacity may be measured by the hospital infrastructure that is required to house patients and by the availability of medical professionals who can administer care. Following this logic, the first indicator of hospital bed density (HBD) score is a simple measure of the number of hospital beds per population of 10,000 people. The second indicator, the medical professionals density (MPD) score, combines data from GHO's physician density index and the nurse and midwives density index to generate a single indicator. The MDP reflects the availability of medical professionals for every 10,000 people in a country.[4] The third indicator, which draws on vaccination rate (VR) data from Our World in Data, conveys the percentage of vaccinations for the total population of a country. To construct a composite HSC, country-level data for the HBD, MPD, and VR were divided into quartiles. The score for each of three HSC components could range from 1 to 4, with the lowest quartile as Q1=1 and the highest quartile as Q4=4, and so forth. Summing quartile scores across HBD, MPD, and VR, the total for all three components could range from 3 to 12. The 3 to 12 range was converted to a 1 to 10 scale by converting a total of 3 as the lowest possible score to a 1 and total score of 12 as the highest possible score to 10.

## Economic and Country Resilience Capacity: Economic Indicators and Country Fragility

As noted above, two consistently cited impacts of COVID-19 are the effects on trade and the effects on supply chains. Indicators related to these two impacts are supplemented by an indicator of a country's overall condition that may affect its ability to function effectively. As described below, we used the inverse of a measure of country-level fragility for this part of the general resilience capacities score.

### Trade

The World Bank defines trade as "the sum of exports and imports of goods and services measured as a share of gross domestic product" (World Bank 2021b). Trade as a percentage of gross product (TGDP) is used as a crude indicator of the role played by trade in each economy. These data were obtained from the World Bank (2021b). Following the same strategy that was used to construct the HSC,

3 All data for the HSC were drawn from the GHO during the month of July 2021.

4 The GHO reports physician density in terms of physicians per 1,000 people. The same ratio is used for nurses and midwifery data. The figures were multiplied by 10 to make the comparable to the hospital bed density data.

data on TGDP were divided into quartiles. For TDGP, the results for quartiles were inverted so that the lower quartile (lower TGDP) was accorded a higher score. Thus, the first quartile was given a score of 4 and the fourth quartile was given a score of 1.

## Supply Chains

As a way to assess supply chains, the World Bank's Logistic Performance Index (LPI) provides a composite score based on a multidimensional measurement framework comprised of six performance components: efficiency of customs and border clearance, quality of trade and transport infrastructure, ease of arranging competitively priced shipments, competence and quality of logistics services, ability to track and trace consignments, and timeliness—the frequency of shipments reaching consignees on time (Arvis et al. 2014). Each component is scored on a scale from 1 to 5, and the composite score is also a range from 1 to 5. Weights are derived from a principal component analysis that generated relatively equal weights, ranging from .40 to .42.

## Country Condition

The inclusion of an indicator on "country condition" acknowledges the effect that a country's functional qualities and operational integrity may have on progress toward the Malabo Declaration goals. Weak governance, lack of strong institutions, and political instability hinder the ability to formulate policies and programs that are needed to respond to covariate shocks associated with pandemics, climate change, or other disturbances. A reasonable composite indicator of a country's overall stability may be obtained from the 2020 Fund for Peace's (FFP) Fragile States Index (FSI). The FSI is comprised of a set of multidimensional constructs based on cohesion indicators, economic indicators, political indicators, and social indicators (FFP 2017). The higher the FSI score, the greater the fragility of the country for a given reporting period. With the intent to measure resilience capacity, we first organized the distribution of FSI scores into quartiles. Those countries in the lowest quartiles (Q1) were coded as 4 and those in Q4 were coded 1, with Q2 and Q3 coded as 3 and 2 respectively.

# *Results*

To illustrate the condition of health systems in Africa, the first part of the analysis explores the findings associated with three components of the HSC: hospital bed density index, the medical professionals index, and the vaccine rate index. The second and main part of the analysis, which presents results of the $RCS^{GHS}$, focuses on a sample of 36 African countries south of the Sahara for which all indicators required for HSC and ECRC could be gathered. In addition to excluding countries with incomplete data for the $RCS^{GHS}$, we also excluded two countries that had unusual profiles because of their economic makeup and one region because of data deficits.[5] Table 10.1.shows the list of 35 countries included in the sample.

**TABLE 10.1—LIST OF SAMPLE COUNTRIES BY REGION**

| Central | Eastern | Southern | Western |
|---|---|---|---|
| 1. Cameroon | 7. Djibouti | 15. Angola | 24. Benin |
| 2. Central African Republic | 8. Ethiopia | 16. Botswana | 25. Burkina Faso |
| 3. Chad | 9. Kenya | 17. Eswatini | 26. Côte d'Ivoire |
| 4. Democratic Republic of Congo | 10. Madagascar | 18. Lesotho | 27. Gambia |
| 5. Equatorial Guinea | 11. Rwanda | 19. Mozambique | 28. Ghana |
| 6. Gabon | 12. Somalia | 20. Namibia | 29. Guinea |
| | 13. Sudan | 21. South Africa | 30. Guinea-Bissau |
| | 14. Uganda | 22. Zambia | 31. Liberia |
| | | 23. Zimbabwe | 32. Mali |
| | | | 33. Niger |
| | | | 34. Nigeria |
| | | | 35. Senegal |
| | | | 36. Sierra Leone |

Source: Authors.

5 Countries excluded by region for incomplete data were as follows: central Africa (Burundi, The Republic of Congo, São Tomé and Príncipe), eastern Africa (Comoros, Eritrea, South Sudan, Tanzania), western (Cabo Verde, Togo), and southern Africa (Malawi). These countries were excluded because of data gaps in one or more of the indicators required for the score. Because of data issues that affected regional representation, a decision was also made to not include countries from northern Africa in the analysis. Mauritius and the Seychelles were excluded because their economies are heavily reliant on tourism.

## Findings on the HSC

To create a reference point for the data on Africa, we first show HBD, MPD, and VRs for G7 countries: Canada, France, Germany, Italy, Japan, the United Kingdom (UK), and the United States (USA). Figure 10.2 shows the combined results for MPD and HBD per 10,000 for the G7 countries.

For HBD, Figure 10.2 displays a range of 24.6 for the UK to 129.9 for Japan, with an average HBD of 54.1 across all G7 countries. For MPD, the results range from a low of 99.1 for Italy to a high of 182.6 for the United States. The unweighted average MPD for G7 countries is 147.3.

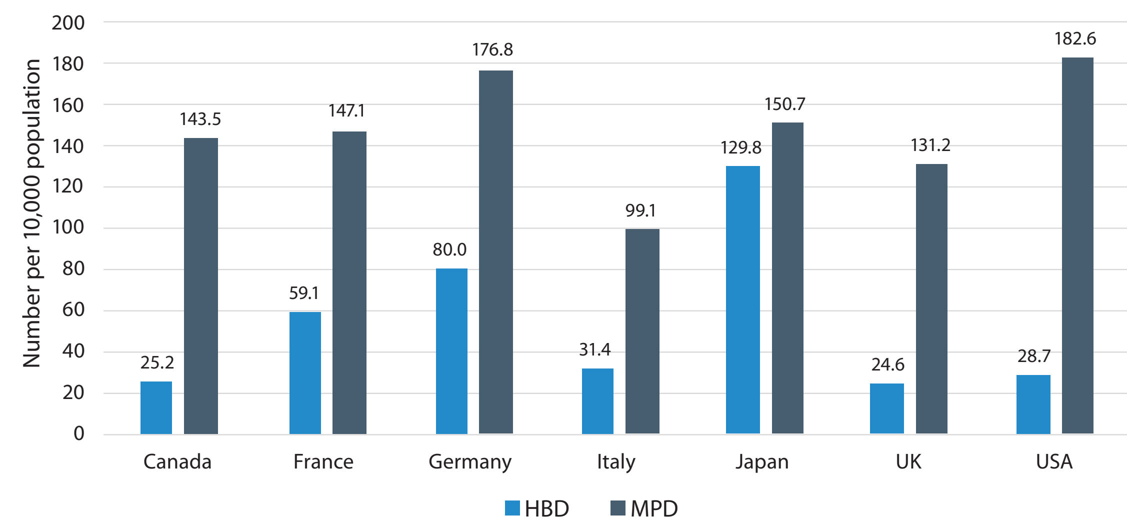
When comparing between G7 countries and Africa on basic infrastructure in the form of hospital beds and medical personnel, a clear contrast becomes apparent. Disparities are observed between African regions, as shown in the results for HBD and MPD in Figure 10.3.

Using regional averages, the HBD ranges from a low of 5.46 for western Africa to a high of 19.83 in central Africa. The approximate average HBD for Africa across regions (unweighted) is 11.50. The HBD for the G7 countries is almost five times the level for Africa. The contrast between G7 countries and Africa is more pronounced when comparing data on MPD. The results of the MPD for Africa range from a low of 8.69 for western Africa to a high of 24.54 for southern Africa. The average MPD for Africa is 12.96. The average MPD for G7 countries is approximately 11 times higher.

Data on vaccination rates for COVID-19 are commonly reported in terms of numbers of persons who have been partially or fully vaccinated.[6] Figure 10.4 shows the vaccination rates for G7 countries.

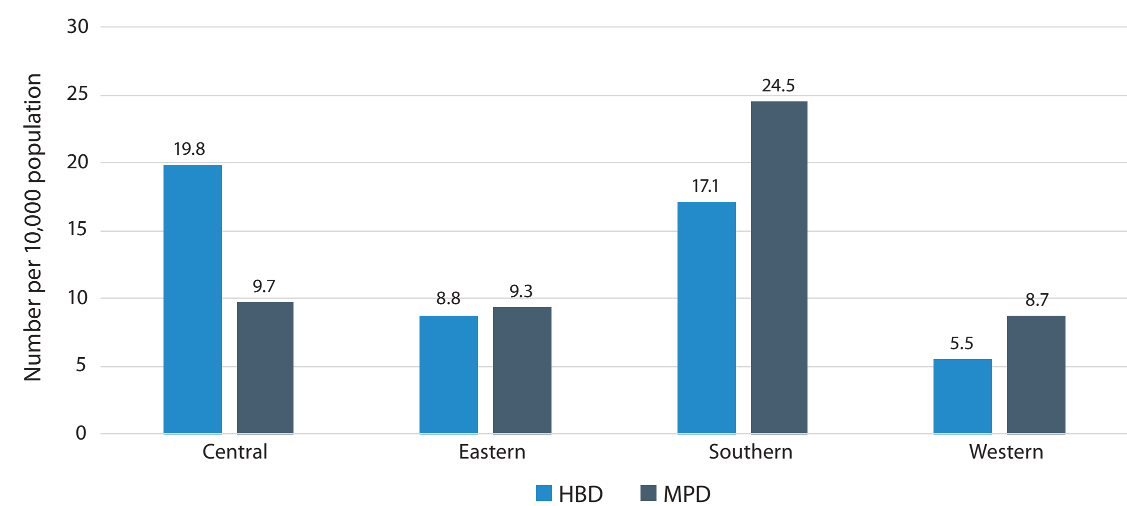
6 Data on vaccination rates was pulled from Our World in Data on July 19, 2021.

**FIGURE 10.2—HOSPITAL BED DENSITY AND MEDICAL PROFESSIONALS DENSITY FOR G7 COUNTRIES**



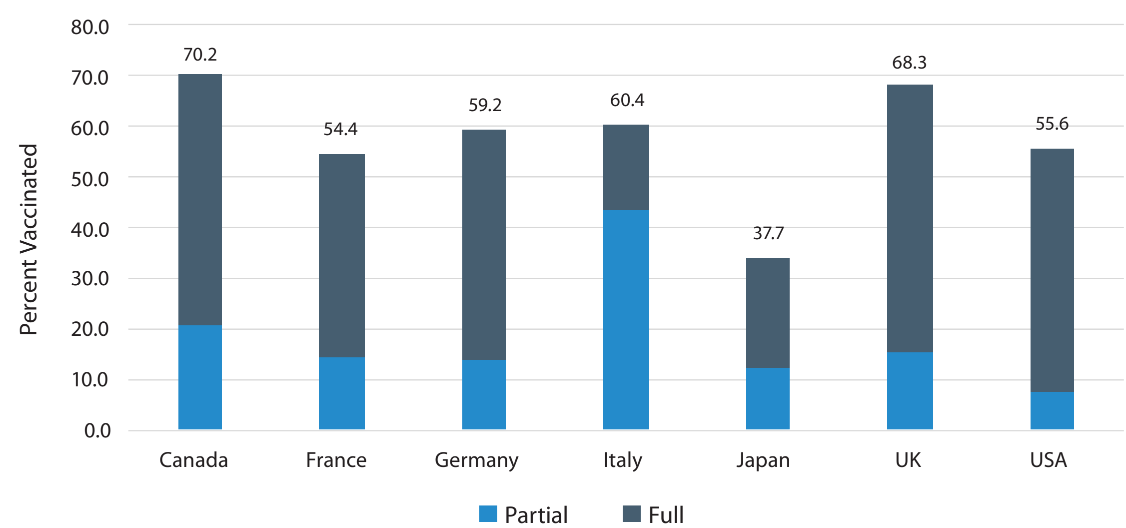

Source: Authors.

**FIGURE 10.3—HOSPITAL BED DENSITY AND MEDICAL PROFESSIONALS DENSITY FOR AFRICAN REGIONS SOUTH OF THE SAHARA**



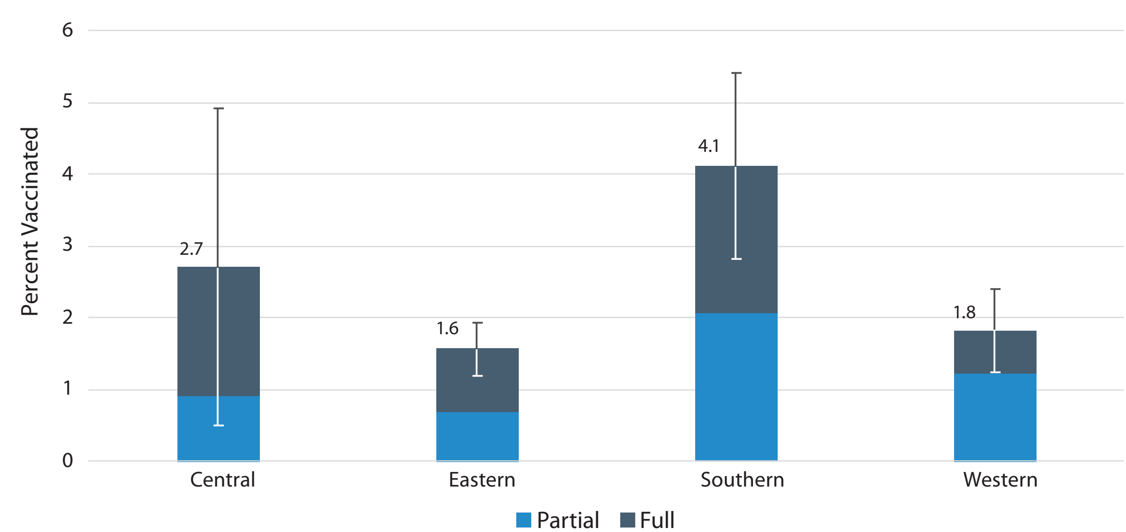

Source: Authors.

## FIGURE 10.4—VACCINATION RATES FOR G7 COUNTRIES




Source: Authors.

## FIGURE 10.5—VACCINATION RATES FOR AFRICAN REGIONS SOUTH OF THE SAHARA




Source: Authors.

Focusing on the total percent vaccinated (partially or fully), the vaccination rate for G7 countries ranges from a low of 37.7 percent for Japan to a high of 70.2 percent for Canada. The average unweighted vaccination rate for all G7 countries is approximately 58 percent.

The average vaccination rate for countries sampled across Africa is 2.5 percent. As illustrated in Figure 10.5, the vaccination rates show the greatest contrast with the G7 countries. G7 countries have an average vaccination rate that is more than 20 times higher than the average for countries in Africa.

## Findings on the RCS$^{GHS}$

The analysis of RCS$^{GHS}$ followed a simple two-stage process. In the first stage, data from the quartile conversions for each component of the HSC and the ECRC were summed and the average score for a given country was treated as the RCS$^{GHS}$ for that country. In the second stage, a more fine-grained analysis was carried out. Each country's data for the HSC and the ECRC were arranged on a distribution to determine if it was below (ranked low) or above (ranked high) the mean score for HSC and for ECRC. Countries that ranked high on both the HSC and the ECRC were regarded as likely to be most resilient to a global health shock. Countries that ranked low on both the HSC and the ECRC were regarded as likely to be least resilient. Countries that had a combination of high and low rankings were categorized as having mixed capacity. As part of the second stage of analysis, the average score for each country was placed in a two-dimensional plot (ECRC by HSC). The objective here was to illustrate a given country's position relative to others.

Results from the first stage of analysis show $RCS^{GHS}$ scores for a sample of 36 African countries south of the Sahara (Figure 10.6). The mean of 5.50 for the distribution of the $RCS^{GHS}$ is used as a plausible threshold to distinguish between more resilient countries and less resilient countries.

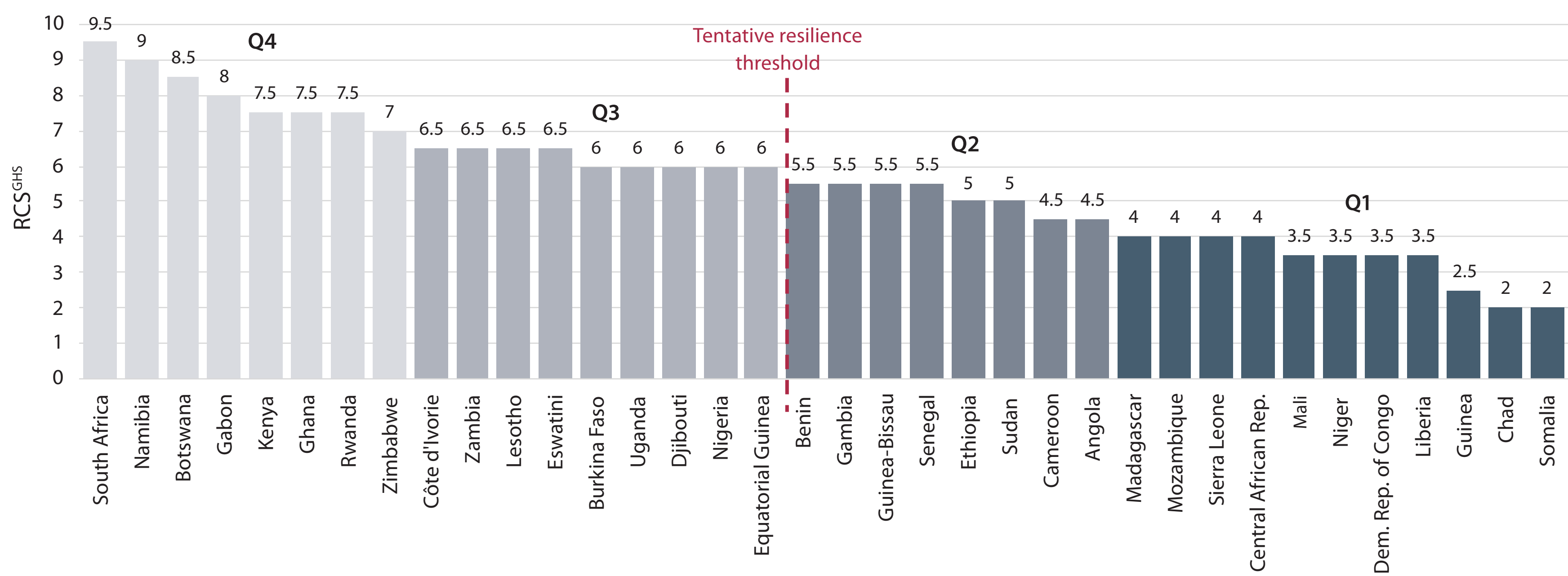
In the second stage of analysis, the coding based on individual components of HSC and ECRC was used to better understand how the two components of the $RCS^{GHS}$ could be used to rank different regions and countries. Those cases that were categorized as mixed remain ambiguous until they are subject to empirical test. Those countries categorized as *most resilient* or *least resilient*, however, can be seen as contrasting cases of resilience capacity. Figure 10.7 presents the findings on most and least resilient countries, with regions arranged in descending order according to most resilient.

The results displayed in Figure 10.7 suggest that southern Africa is, on average, likely to be the most resilient to global health shocks. Eastern Africa follows close behind, with a score that is about 7 percent lower on "most resilient." Southern Africa also has a lower proportion of countries categorized as least resilient. Scoring lowest in the "most resilient" category and highest in "least resilient," central Africa is likely to be the least resilient region of Africa. Western Africa ranks third in terms of proportion of countries categorized as most resilient but has the second highest proportion of countries ranked as least resilient.

Table 10.2 provides a summary of how countries were categorized in terms of their likelihood to be resilient based on the findings from the two inputs of the $RCS^{GHS}$.

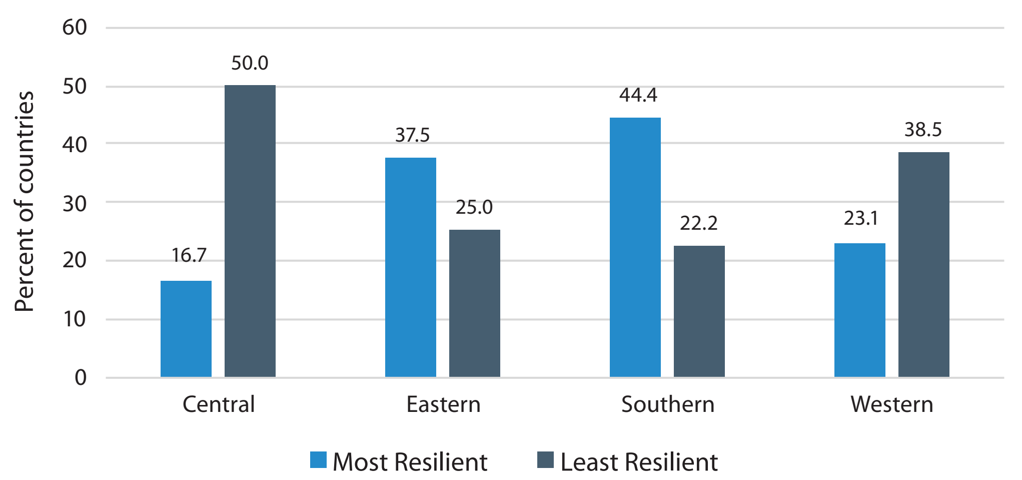
Results for most regions sampled are relatively symmetrical when comparing the most resilient versus least resilient categories. For western Africa, three countries are categorized as most resilient and five categorized as least resilient. Eastern Africa has three countries in the most resilient category

**FIGURE 10.6—RESILIENCE CAPACITIES SCORE FOR GLOBAL HEALTH SHOCKS**




Source: Authors.

**FIGURE 10.7—REGIONAL DISTRIBUTION OF MOST AND LEAST RESILIENT COUNTRIES IN AFRICA SOUTH OF THE SAHARA**




Source: Authors.
Note: Columns for each region do not sum to 100 because mixed capacity categories were excluded.

and two in the least resilient category. Southern Africa has three countries in the most resilient category and two countries in the least resilient category. The findings for central Africa are more lopsided, with one country found in the most resilient category and three countries in the least resilient category. To illustrate a given country's position relative to others, the average score for each country was placed in a two-dimensional plot (ECRC by HSC). Figure 10.8 displays these results.

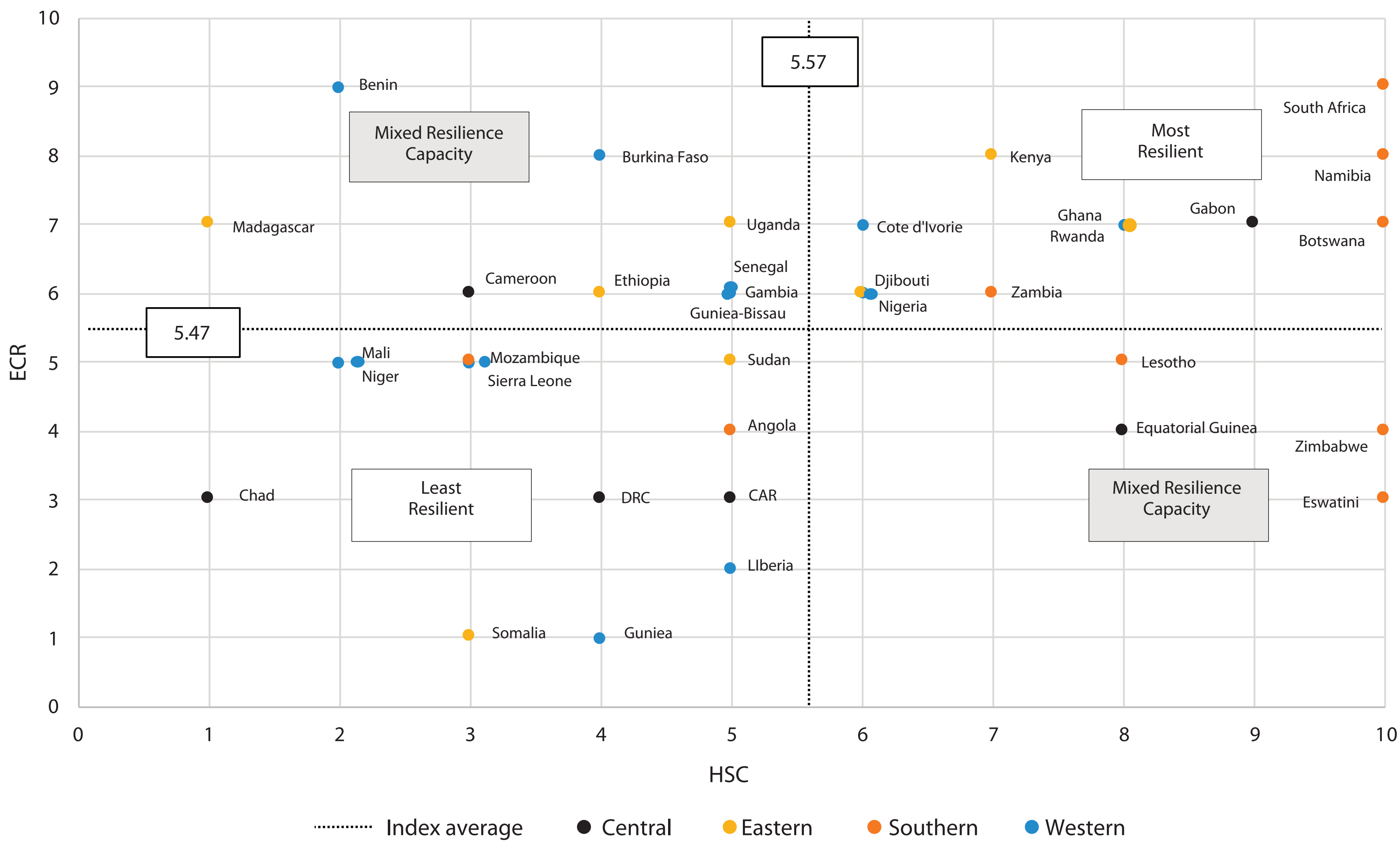
Similar to the categorization used to organize Table 10.2, the results shown in Figure 10.8 are organized according to most resilient, least resilient, and the two categories of mixed resilience capacity. Unlike Table 10.2, Figure 10.8 presents the findings in a way that illustrates spatial differences among countries. In this way, Figure 10.8 offers a more focused way to examine the resilience capacity of a given country relative to other countries. South Africa emerges as the country with the highest composite resilience score, just above Namibia and Botswana.

**TABLE 10.2—COUNTRY-LEVEL RESILIENCE CODING BASED ON RCS$^{GHS}$ COMPONENTS**

| Economic and Country Resilience Index (ECRC) | Health Systems Capacity (HSC) | |
|---|---|---|
| | Above the mean | Below the mean |
| Above the mean | **Most Resilient** (N=11)<br>**Western**<br>• Côte d'Ivoire<br>• Ghana<br>• Nigeria<br>**Central**<br>• Gabon<br>**Eastern**<br>• Djibouti<br>• Kenya<br>• Rwanda<br>**Southern Africa**<br>• Botswana<br>• Namibia<br>• South Africa<br>• Zambia | **Mixed** (N=9)<br>**Western**<br>• Benin<br>• Burkina Faso<br>• Gambia<br>• Guinea-Bissau<br>• Senegal<br>**Central**<br>• Cameroon<br>**Eastern**<br>• Ethiopia<br>• Madagascar<br>• Uganda<br>**Southern Africa**<br>• – |
| Below the mean | **Mixed** (N=4)<br>**Western**<br>• –<br>**Central**<br>• Equatorial Guinea<br>**Eastern**<br>• –<br>**Southern Africa**<br>• Eswatini<br>• Lesotho<br>• Zimbabwe | **Least Resilient** (N=12)<br>**Western**<br>• Liberia<br>• Guinea<br>• Mali<br>• Niger<br>• Sierra Leone<br>**Central**<br>• Central African. Rep.<br>• Chad<br>• Dem. Rep. of Congo<br>**Eastern**<br>• Somalia<br>• Sudan<br>**Southern Africa**<br>• Angola<br>• Mozambique |

Source: Authors.

## FIGURE 10.8—INTERSECTION OF ECONOMIC AND COUNTRY RESILIENCE CAPACITY AND HEALTH SYSTEMS CAPACITY



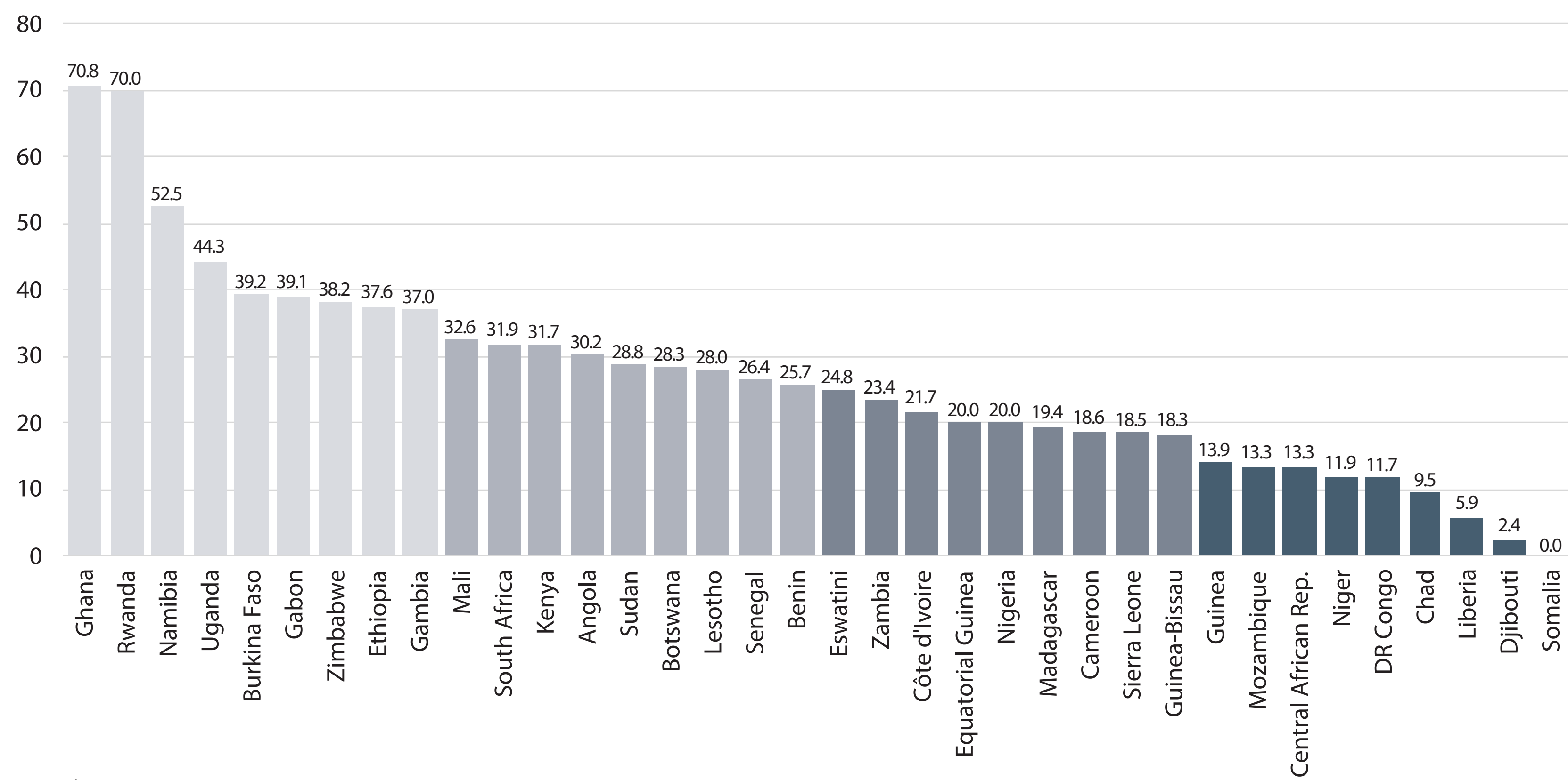

Source: Authors.

## *Toward an Integrated Resilience Metric for the Malabo Declaration*

While the metrics on health systems capacities, economic and country resilience capacities, and macroeconomic factors are important elements of country-level resilience dynamics, the $RCS^{GHS}$ does not consider climate change as a source of shocks to which resilience is a strategic response. With this in mind, we sought to join the $RCS^{GHS}$ with the resilience-focused metric from the Malabo Declaration. The 2019 Africa Agriculture Transformation Scorecard (AATS) reported the most recent progress that each country has made toward the implementation of the Malabo Declaration.[7] Undertaken by the AUC, the AATS provides both an overall ranking of country performance and individual indicators associated with the seven above-referenced Malabo Declaration commitments. Goal VI is focused on "enhancing resilience of livelihoods and production systems

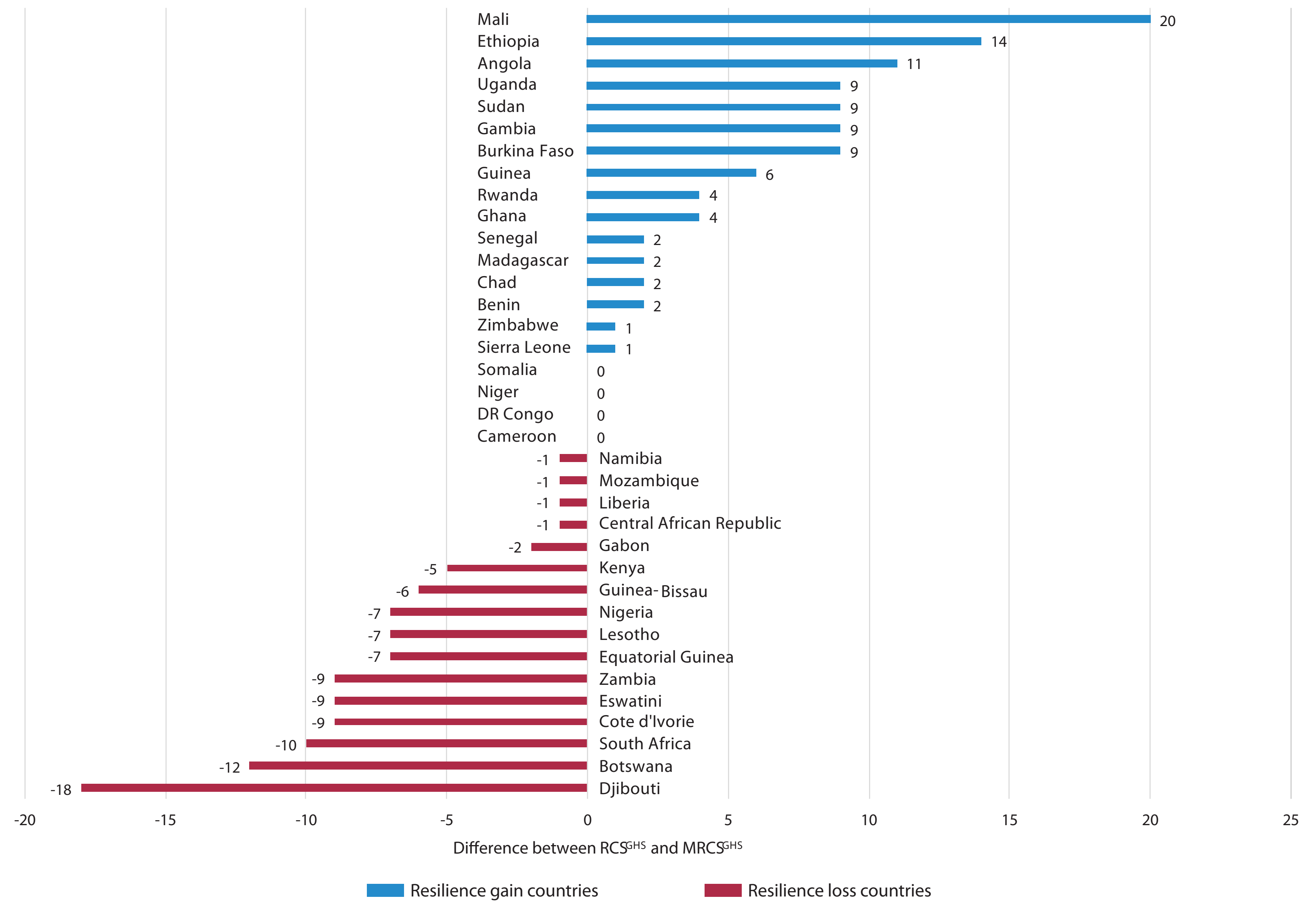
7 For a more complete discussion of the AATS see Benin, Ulimwengu, and Tefera (2018).

**FIGURE 10.9—MALABO REFERENCED RESILIENCE CAPACITIES SCORE TO GLOBAL HEALTH SHOCKS ($MRCS^{GHS}$)**




Source: Authors.

## FIGURE 10.10—RESILIENCE CONVERGENCE SCORE: RANK-ORDER DIFFERENCE BETWEEN $RCS^{GHS}$ AND $MRCS^{GHS}$




Source: Authors.

to climate variability and other related risks" (AUC 2019, 4). A corresponding indicator (indicator 6.2) used for the 2019 Biennial Review provided a measure of commitment to resilience by assessing the investment levels that a given country made toward climate change by searching for the "existence of government budget-lines to respond to spending needs on resilience building initiatives" (AUC 2017, 5). Indicator 6.2 is measured by three associated budgetary components: (1) disaster preparedness policy and strategy, (2) early warning and response systems and social safety nets, and (3) "number (proportion) of households covered by [weather-based] index insurance" (AUC 2017, 46).

To demonstrate how findings from the $RCS^{GHS}$ may be integrated with the resilience component of the AATS, we follow two steps. In the first step, a simple multiplicative score was used to represent the combination of the results of the $RCS^{GHS}$ with the multidimensional AATS resilience indicator. This score, which we refer to as the Malabo Referenced Resilience Capacities Score for Global Health Shocks ($MRCS^{GHS}$), integrates the health systems and macro-level resilience capacities of the $RCS^{GHS}$ with the budgetary commitments to climate-focused resilience building. Organized into quartiles, the results of the $MRCS^{GHS}$ are shown in Figure 10.9. Countries in the fourth quartile had the nine highest scores resulting from their combined performance on the AATS resilience components and the $RCS^{GHS}$. What is interesting to note here is that the top scoring countries for $MRCS^{GHS}$ represent a markedly different set of countries compared to those countries that were top performers in the $MRCS^{GHS}$. Slightly less than half of the countries in the fourth quartile of $RCS^{GHS}$ (Ghana, Gabon, Rwanda, and Namibia) appear as top-ranking countries for the $MRCS^{GHS}$.

In the second step of the analysis, $MRCS^{GHS}$ was subtracted from $RCS^{GHS}$ to illustrate the changes in ordinal ranking. As shown in Figure 10.10, this simple scaling produces a range of values that reflects gains (positive value) and losses (negative values) associated with a version of resilience capacity sensitive to both global health shocks and climate change. Countries with a positive value are labelled "resilience gain" and those with a negative value are labelled "resilience loss."

Other than Somalia, Niger, Democratic Republic of Congo, and Cameroon—which are the only countries that had no change in rank order position (36th, 31st, 32nd, and 25th, respectively)—countries are widely distributed in their change from $RCS^{GHS}$ to $MRCS^{GHS}$. Changing 18 and 20 places respectively, Djibouti decreased considerably in its resilience capacity score while Mali increased considerably. Although the scores shown in Figure 10.9 could have resulted from a variety of combinations of scores from the $RCS^{GHS}$ and $MRCS^{GHS}$, the array of positive and negative values may be viewed as a kind of resilience convergence score where the higher the score, the higher the convergence between $RCS^{GHS}$ and $MRCS^{GHS}$. It is worth noting that the three countries (Rwanda, Mali, and Ghana) with overall Malabo commitment scores higher than the benchmark displayed positive resilience convergence scores.

## Conclusion

The present chapter was motivated by the need to provide basic empirical evidence of some of the factors that may explain varied levels of resilience across Africa[8] in a world where a global health shock such as COVID-19 needs to be considered. There is no question that the most worrisome effects of COVID-19 are health related. It is also clear, however, that COVID-19 has created serious disruptions in supply chains that support the basic functioning of economies. The fact that COVID-19 occupies so much attention and dominates news cycles does not diminish other threats to meeting welfare targets for development, such as those specified in the Malabo Declaration. Most notable among threats that cannot be discounted are those emanating from climate change. For this reason, the measurement model presented here demonstrates how a limited number of indicators related to health system capacities and the macroeconomic effects of a global health shock can be combined to provide useful information to measure progress on the Malabo commitments. This was accomplished by integrating the findings from the $RCS^{GHS}$ with a multidimensional climate-change focused resilience indicator from the AATS. The findings presented here, which categorize countries in terms of resilience capacity, suggest a distribution of resilience capacities to global health across the 36 countries included in the study sample.

The combination of health system indicators and selected macrolevel indicators provide insights about a country's ability to respond to global health shocks. In this way, the measurement approach presented here may

8 While Africa is referenced in several sections of the chapter, the analysis did not include northern Africa. As noted in the introduction, this was a function of data availability.

be viewed as a kind of early warning systems for global health shocks. The early identification of countries with the lowest capacity to respond to global health shocks may help formulate policies and direct investments to avert humanitarian disasters. Conversely, understanding the ability of countries with higher resilience capacities to respond to COVID-19 may provide models that can be replicated in other countries in the continent. It is also important to understand how the resilience capacity in response to COVID-19 interacts with resilience capacities in response to other threats, such as climate change. This is a topic for future research.

The protracted nature of the global pandemic highlights the importance of including indicators that are sensitive to global health shocks as part of the Malabo Declaration's monitoring and evaluation system. In Africa, the impacts of COVID-19 further exacerbate a situation of ongoing shocks, such as desert locust outbreaks, fall armyworm infestations, droughts, conflicts, and insecurity. With respect to food security, disruptions to input markets and reduced labor mobility may result in the delay of planting and harvesting activities, and movement restrictions could cause reduced transactions among food traders, processers, and distributors. The rising incidence of shocks occurring simultaneously because of climate change and other dynamics presents a more complex landscape of risks that threaten development. The simultaneity and propagation of shocks over time also present a new set of challenges for measurement. The development of measurement protocols and analytic tools that are sensitive to interactions should be a priority. Although the findings presented here are based on static measures (without a panel structure), the enduring and lagged effects of shocks and the temporal features of recovery highlight the need for measurement protocols that give careful consideration of time.

With significant dependence on world trade cycles, limited health system capacity, and far more limited access to the internet, African countries are expected to be heavily affected by the direct and indirect global impacts of COVID-19. Given the high proportion of people across Africa who are dependent on agriculture for their livelihoods (Schlenker and Lobell 2010), climate and health shocks must be considered. The model offered here would be strengthened by including metrics that assess the effects of climate shocks that regularly undermine agriculture and threaten the welfare of those who depend on agriculture for their livelihoods. The same is true of any model that aims to measure the resilience of agriculture-based economies in a comprehensive manner.

In closing, we would like to emphasize that we regard our work as an initial, exploratory effort. Clearly, much more research needs to be carried out to develop metrics for health systems resilience capacities and to settle on the macrolevel factors important for measuring resilience capacities in the face of global health shocks. We hope the basic empirical findings offered in this chapter will provide impetus for a focused program of research that examines how the impacts of global health shocks may be incorporated into reporting on the Malabo Declaration goals. It is expected that achieving the Malabo Declaration commitments will pave the way for Africa to achieve the Sustainable Development Goals. However, such progress will require persistent investment in both the commitments themselves and countries' capacities to correctly measure and report on those commitments. In the face of COVID-19, investment strategies and measurement approaches need to be reconceptualized. To this end, the results presented in this chapter are intended as one of many empirical demonstrations on which future work on resilience measurements sensitive to global heath shocks may be based.