



CHAPTER 10

Why Food Safety Matters to Africa: Making the Case for Policy Action

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¹ The overall approach and findings in this chapter are based heavily on Jaffee et al. (2019).

Food safety is vital for achieving food and nutritional security in Africa. Unsafe food contains microbiological, chemical, or physical hazards that can make people sick, causing acute or chronic illness that, in extreme cases, can lead to death or permanent disability.² The presence of foodborne hazards can also reduce the bioavailability of nutrients in food, putting already food-insecure populations at greater risk of malnutrition. Food safety is closely linked to other food-related public health issues. For example, the inappropriate use of antimicrobials in livestock and aquaculture production is contributing to the emergence of antimicrobial-resistant pathogens.

The safety of food impacts not only public health in African countries but also the growth and modernization of these countries' domestic food markets. Food consumption and expenditure patterns are changing throughout the continent, driven by income growth, urbanization, and other factors. Overall, consumption is declining for starchy staples and increasing for animal products, fruits and vegetables, and processed foods. Out-of-home eating is also on the rise. But for farmers and food business operators to profitably and sustainably service this demand for higher-value foods, they must manage the food safety risks associated with such foods and maintain consumer trust (Ortega and Tschirley 2017). These developments may profoundly impact income and employment opportunities in the African food packing, manufacturing, and food service industries, as well as affecting the growth (or otherwise) of domestic and international tourism.

Unsafe food and its antidote, investments in food safety capacity, can have profound effects on the success of efforts to alleviate poverty and reduce inequalities in Africa. Because people with low incomes are both consumers of food and agents in agrifood value chains, food safety intersects with poverty in two critical ways. A growing body of literature identifies the extent of food safety hazards in informal food markets, which are the predominant source of food for poor people, especially in Africa's urban areas (Roesel and Grace 2014; Skinner 2016; Fellows and Hilmi 2011). Furthermore, food safety can affect the livelihoods of poor people within agrifood value chains, whether as small-scale

producers; marketplace, street, or cross-border food vendors; or operators (or employees) of micro and small food enterprises.

Food safety is an important contributor to the trade performance of some African countries. This is especially true for those countries that compete in markets for high-value foods, including fresh fruit and vegetables, fish and fishery products, meat, spices, and nuts. Countries, and sectors and firms therein, with limited food safety capacity tend to find themselves at a competitive disadvantage when trying to serve potentially lucrative export markets if they face periodic yet costly rejections of product consignments and uncertainty about sustained market access. For Africa, special attention has been given to addressing the potential constraints faced by organized smallholder farmers in meeting the evolving regulatory and private food safety and other standards in high-value external markets (Jaffee, Henson, and Diaz Rios 2012). Concerns about food safety have also strongly impacted intraregional trade, both of staple commodities and of higher-value foods.

For all of these reasons, **food safety is a vital issue for achieving many of the Sustainable Development Goals (SDGs).** Food safety is integral to achieving SDG 1 (end poverty), SDG 2 (end hunger), and SDG 3 (good health and well-being), and can also contribute to or detract from achieving SDG 5 (gender equality), SDG 8 (decent work and economic growth), and SDG 11 (sustainable cities and communities).³

In 2015, the African Union Commission (AUC) launched the Comprehensive Africa Agriculture Development Programme (CAADP) Biennial Review (BR) to monitor progress in agricultural development on the continent. The CAADP BR initially encompassed 43 indicators, with AU member states committing to mutual accountability for results and actions related to the core themes. Seven of the key indicators related to nutrition, but none tracked food safety, despite its relationship to many of the CAADP's technical and socioeconomic goals. Yet during the past few years there has been growing awareness of the importance of food safety. As a result, three new indicators on food safety (the food safety systems index, food safety health index, and food safety trade index) were added to the 2019 CAADP BR.

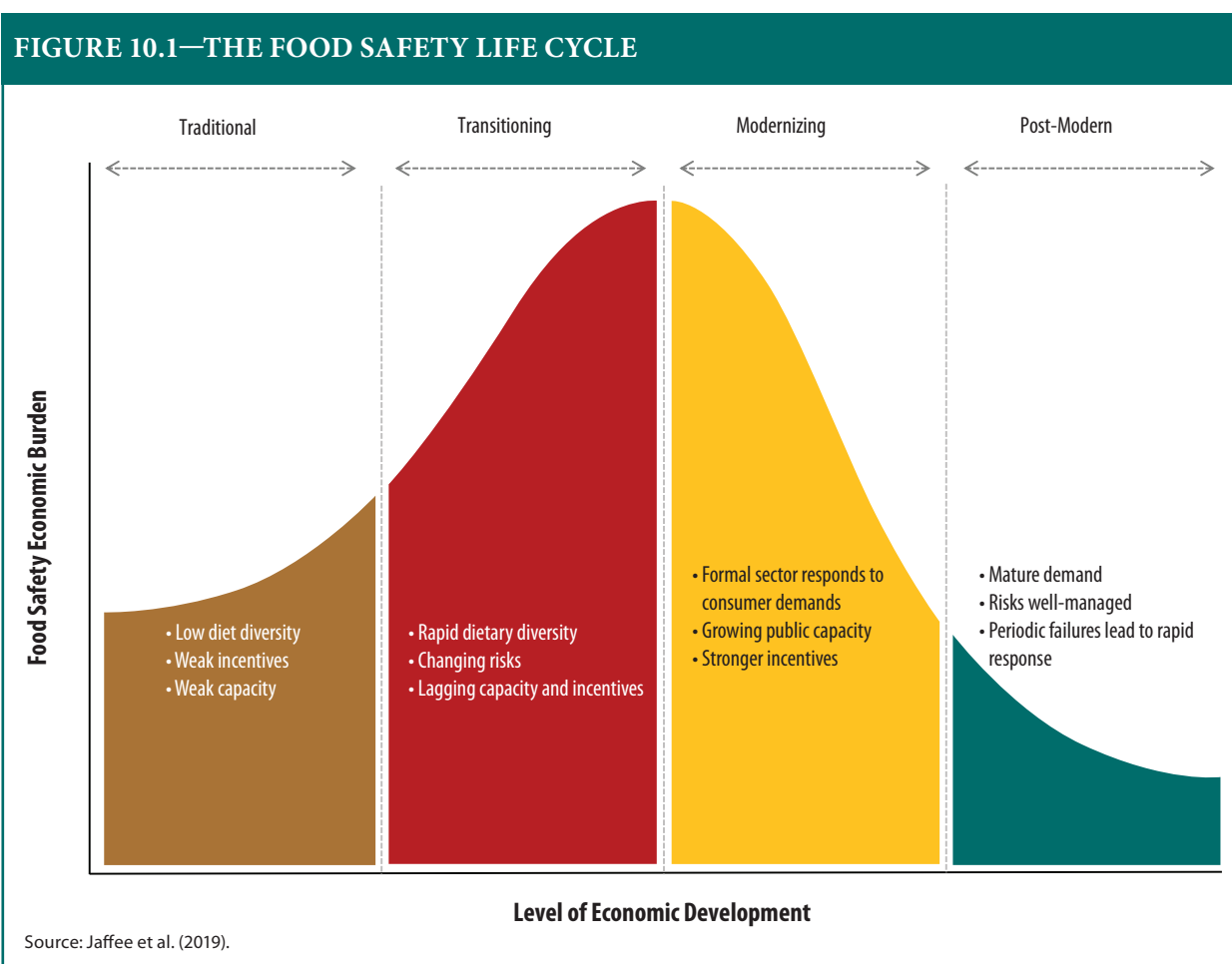
2 Hazards that have been addressed by public policies include microbial pathogens (such as Salmonella species), zoonotic disease agents (such as highly pathogenic avian influenza), parasites (such as intestinal worms), adulterants (such as melamine), naturally occurring toxins (such as aflatoxin), antibiotic drug residues, pesticide residues, and heavy metals (such as cadmium).

3 The full set of SDGs (and their indicators) can be found at <https://unstats.un.org/sdgs/indicators/indicators-list/>. See Grace (2017a) for an elaboration on the links between food safety and the SDGs.

Another sign that food safety has been moving up the development agenda in Africa was the convening of the first International Conference on Food Safety, sponsored by the Food and Agriculture Organization of the United Nations, the World Health Organization (WHO), and the AU in Addis Ababa in February 2019. This event generated a large number of background documents⁴ and resulted in a high-level political statement advocating for increased and better-coordinated collaboration and support to improve food safety in the region and around the globe.⁵

Positioning Africa in the Food Safety Life Cycle of Countries

The burden of unsafe food generally evolves in a systematic manner, in line with processes of economic development; this can be thought of as the food safety life cycle of a country (Figure 10.1). The economic costs of unsafe food, in both absolute and relative terms, vary across countries according to their level of economic development. This variation is linked to the complex interplay of a wide range of economic, demographic, dietary, and environmental health factors. These factors affect the incidence of and potential exposure of populations to food safety hazards, the strength of incentives for actors in agrifood value chains to prevent or manage these hazards, and the costs of food safety missteps. Although all African and other low- and middle-income countries are



experiencing changes in diet and agrifood value chains, their position in this process of food system transformation varies considerably. The food safety life cycle across countries and over time reflects evolving food safety challenges, as well as the degree of mismatch of food safety management capacity in and between the public and private sectors.

⁴ Available at <http://www.fao.org/about/meetings/future-food-safety/international-food-safety-conference/en/>.

⁵ The years 2019 and 2020 have seen major new dedicated food safety initiatives in Africa. These included four projects jointly funded by the Bill & Melinda Gates Foundation and the UK Department for International Development in their first-ever round of funding for food safety; a new Feed the Future Innovation Lab on Food Safety; a US Agency for International Development Broad Agency Announcement on food safety; and the launch of the One Health Research, Education and Outreach Centre in Nairobi, with food safety as one of its three thematic areas.

Low-income African countries face a very significant burden of food-related illness, with the supply of and demand for safe food remaining underdeveloped, as is typical of the *traditional stage*. Here, diets tend to be dominated by starchy staples (maize, cassava, and rice), and policy attention is focused on the availability and affordability of these foods and on other public health issues (for example, malaria and maternal and child mortality). Much food is produced close to the point of consumption and undergoes limited transformation. Traditional ways of processing food dominate and are often fairly effective at reducing risk. The predominant foodborne diseases (FBDs) come from microbiological pathogens and parasites linked to poor hygiene, close contact with animals, and low access to clean water and improved sanitation. Domestic market drivers or incentives for safer food are often weak. Food safety capacity tends to be rudimentary, with more-developed systems predominantly geographically concentrated and focused, for example, in capital cities for higher-income consumers and in niche high-value exports to high-income countries.

African countries reaching lower-middle-income status—the *transitioning stage* in Figure 10.1—face a broader range of food safety hazards, straining if not overwhelming food safety systems. These countries are experiencing rapid shifts in diet and agricultural production practices, as well as swift urbanization, all of which affect the exposure of consumers to food safety hazards. In these countries, most of the distribution of potentially hazardous fresh food products continues to occur through informal channels with multiple points of intermediation. For farms, intensification of production often involves greater use of agrochemicals and veterinary drugs. Animal-sourced foods are an important cause of FBD, and as animal production intensifies, epidemiological changes occur that can lead to the emergence of new diseases. More opportunities and incentives for food fraud also arise. Food imports, including perishable foods, often increase. As a result, domestic consumers are exposed to new foodborne hazards. A common situation is one in which the prevailing official regulatory apparatus is overwhelmed by the breadth and depth of emerging issues, while emerging private sector food safety governance measures still reach only a modest share of the overall food market, and are not exposed to many checks. At this stage, consumer food safety concerns are rising faster than the use of available tools to fix food safety problems. Empirical evidence points to the underdevelopment of regulatory oversight capabilities in lower-middle-income countries, especially for relatively high-risk animal products. Commonly,

national and subnational governments are playing catch-up and are sometimes being overwhelmed by the emerging challenges. Yet the politics of unsafe food presses governments to act, in real or symbolic ways.

For upper-middle-income countries in the *modernizing stage*, the gap between need and capacity begins to close. This results in a reduction in the absolute and relative public health and economic burdens of unsafe food. The modernizing stage is characterized by profound and often rapid restructuring of agrifood value chains. Formal sector enterprises come to dominate in both urban and rural areas, and the modern retail sector expands and extends into smaller urban centers and rural areas. As businesses become better organized, both as individual enterprises and collectively across sectors, they are able to exert greater pressure on government to enhance public food safety management systems. Because of administrative change and public investment, regulatory systems become more effective at establishing and enforcing minimum food safety standards, and at promoting and facilitating food safety management system upgrades in the private sector. More effective surveillance systems also highlight the burden of FBD, such that the problem gains recognition and the benefits of upgrading food safety management systems become more apparent. Simultaneously, public administration of food safety becomes more efficient, in turn enhancing authorities' ability to respond to the needs and demands of stakeholders. All of these changes foster greater trust within the population in the ability of the agrifood system to deliver safe food.

The burden of FBD eventually declines to much lower and relatively stable levels in the *post-modern stage*, at which point any further improvements in food safety happen in smaller increments. Although FBDs are generally at much lower levels in high-income countries, some FBDs persist and have proven difficult to eradicate. A new equilibrium reflects the facts that both market-based and political incentives for improved food safety management capacity remain high, but agrifood value chains are complex, with few easy wins in terms of improved capacity. Paradoxically, concern over FBD and novel food technologies is highest at this stage, reflecting the level of media attention and the nature of demand for food among consumers with a higher degree of discretionary food expenditure. For some consumers, there is a blurring of borders between food safety and other issues—for example, organic food, animal welfare, biotechnology, and industrial production systems.

The vast majority of African countries are presently situated in either the traditional or the transitioning stage of the food safety life cycle, meaning that their capacities to manage food safety risks, in both government and the private sector, lag considerably behind the need for such capacity. Furthermore, the gap between capacity and need is widening with the rapid urbanization and dietary changes that are occurring in an increasing number of African countries. Although time series data are not available, it is likely that African countries at these stages are experiencing rising public health burdens and rising economic costs from unsafe food. Very few African countries are at the modernizing stage of the food safety life cycle, at which capacity is quickly catching up with need, and there is a downward slope in the economic costs of unsafe food relative to the value of the domestic food market. The only African countries that are likely to have progressed into the modernizing stage are Algeria, Egypt, Mauritius, Morocco, Seychelles, South Africa, and Tunisia. These countries collectively account for only 21 percent of Africa's population.

For African countries, neither the widening gap between food safety capacity and need, nor the escalation of public health and economic costs due to FBDs is inevitable. Prevailing food safety capacity and the evolution of agrifood systems are not acts of nature outside of human influence, but largely the results of actions taken by governments, the private sector, and consumers. In referring to “actions” here, the focus is not on “firefighting” efforts, such as stepping up product testing or restricting certain types of commerce in the aftermath of FBD outbreaks or high-profile food-related scandals. Rather, the emphasis is on the incremental yet systematic building up of food safety management capacities and the mainstreaming of preventive practices in the food system “from farm to fork.”

The Public Health and Economic Costs of Unsafe Food in Africa

Research is shedding new light on the global burden of FBD. Until recently, data on the incidence of FBD and its associated costs were limited to high-income countries. To address this gap, the WHO's Foodborne Disease Burden Epidemiology Reference Group (FERG) spent nearly a decade gathering data

and employing statistical models to estimate the burden of some 31 important foodborne hazards in 14 regions of the world (WHO-FERG 2015). The estimates were expressed in terms of lost disability-adjusted life years (DALYs) associated with ill health and premature death.⁶ For 2010, the base year, the global burden of FBD was estimated at 600 million illnesses and 420,000 premature deaths. This aggregates to the equivalent of 33 million DALYs (Havelaar et al. 2015). For comparison, the estimated 2015 global burden of tuberculosis and that of malaria in 2010 were 40 million and 66 million DALYs, respectively. The same WHO study more recently presented estimates of the 2015 burden of FBD associated with four heavy metals, suggesting a global burden of some 1 million illnesses, 56,000 deaths, and 9 million DALYs (Gibb et al. 2019).

The global burden of FBD is unequally distributed, with Africa and emerging Asia having the highest incidence of (and death rates from) FBD.

The Africa region (including both northern Africa and the part of the continent south of the Sahara) accounted for more than 90 million foodborne illnesses and around 137,000 deaths in 2010, according to FERG estimates (WHO-FERG 2015). These represented around 15 percent and 33 percent of the global totals, respectively. Extrapolating to Africa's population in 2018 and including the more recent analysis related to heavy metals, we estimate that Africa's foodborne illnesses and FBD deaths currently number around 135 million and 180,000, respectively, per year. These estimates translate into a loss of some 15 million DALYs annually due to FBD.

Epidemiological studies show that the most vulnerable people to FBD are the young, old, malnourished, poor, pregnant, and immunocompromised (Grace 2015). A disproportionate share of the burden falls on children under the age of five. Children are more exposed to foodborne hazards because of their lack of control over food preparation and a propensity to behaviors that increase the risk of FBD. Furthermore, children are more vulnerable to the consequences of infection because of their developing immune systems, small body size, and lower levels of stomach acid, among other factors. Globally, children account for 9 percent of the total population, yet 38 percent of all cases of foodborne illness occur in children. The FERG study estimated that some 56.6 million African

⁶ One DALY can be thought of as one lost year of a “healthy” life. The sum of DALYs across a population is a measure of the burden of disease and can be thought of as a measurement of the gap between current health status and an ideal health situation, wherein the entire population lives to an advanced age, free of disease and disability.

children fell ill from FBDs in 2010, of whom nearly 48,000 eventually died (WHO-FERG 2015).

Much of Africa south of the Sahara (SSA) has the highest proportional FBD burden in the world, based on FERG estimates of DALYs per 100,000 people. Although these estimates tend to be many times greater than official national estimates, reflecting the weaknesses of surveillance systems in many countries, they are generally considered to be conservative.⁷ A

deeper review of the data furthermore highlights patterns that have potentially important implications. Due to data limitation and other concerns, the results of the WHO-FERG study were reported by geographic subregions, rather than for individual countries. Yet it is at the country level where especially interesting comparisons can be made. Without specifying individual country names, we can still provide some comparative data for several countries of SSA and of East and Southeast Asia (ESE). According to FERG, emerging Asia accounts for about half of the world’s foodborne illnesses and deaths. Table 10.1 allows a comparison between the public health burden of the “big three” diseases (tuberculosis, HIV/AIDS, and malaria) and that of foodborne illness by and between subregions. It also allows for a comparison of the estimated rates of foodborne illness and FBD-attributed death among groups of countries.

Whereas the global burden of FBD is now on par with one or more of the “big three” public health concerns at a global level, this is not yet the case in most countries of SSA, including those shown in Table 10.1. Nevertheless, the burden of FBD is quite high in these countries. For comparison, there are relatively few countries outside of SSA with an estimated FBD burden exceeding 650 DALYs per 100,000, a burden about twice that of the listed ESE countries. Yet

TABLE 10.1—COMPARATIVE PUBLIC HEALTH BURDEN: DISABILITY-ADJUSTED LIFE YEARS LOST PER 100,000 POPULATION; FOODBORNE ILLNESSES AND DEATHS PER 100,000 POPULATION

Disease	ESE1	ESE2	SSA1	SSA2	SSA3	SSA4
Tuberculosis (2016)	148	414	1,326	2,769	1,694	1,150
HIV/AIDS (2016)	67	440	3,138	5,131	11,928	1,171
Malaria (2016)	1	1	3,496	4,964	12	357
FBD (2010)	272	390	1,235	1,322	797	967
FBD Illness Rate	6,873	9,270	9,370	11,047	8,061	10,767
FBD Death Rate	2.8	3.9	15.9	17.8	10.8	12.6

Source: WHO-FERG unpublished statistics and WHO Global Health Observatory data (<https://apps.who.int/gho/data/view.main>).

Note: ESE = East and Southeast Asia; FBD = foodborne disease; SSA = Africa south of the Sahara. ESE1, ESE2, SSA1, SSA2, SSA3, and SSA4 signify individual countries whose burden of disease patterns are representative of those in these regions.

the burden from FBD in the African countries remains quite a bit lower than for one or more of the “big three.” This prevailing situation influences the political economy for food safety because public health resources and policy attention continue to remain focused squarely on tackling the current burden of the “big three.” This is one reason why domestic food safety fails to get onto the policy radar in much of SSA, except in the event of large-scale outbreaks of disease that garner media attention. It is also why food safety is largely seen as a trade issue. In parts of Asia, the situation is quite different. Given large gains in relation to legacy public health concerns, especially the “big three,” food safety is now recognized to be among the leading health concerns. Furthermore, there is political pressure for action, reflecting high and persistent pressure by consumers. This has translated into comparatively stronger policy and budgetary attention to domestic food safety in many parts of Asia.

Whereas the incidence of foodborne illness in SSA countries is generally very high, this is also commonly the case in much of emerging Asia. The exceptionally high loss of DALYs per 100,000 population in SSA seems to be significantly linked to a much higher estimated death rate from FBD in these countries.

⁷ Foodborne illness reporting itself tells us little because the majority of people falling ill do not seek medical attention and the symptoms are not always attributed to food sources.

Compare, for example, the situation of the ESE2 and SSA1 countries. They have a very similar estimated incidence of foodborne illness, yet the estimated death rate from such illness is nearly four times higher in the SSA countries. Likely contributing factors are higher rates of FBD among young children and serious health consequences when FBD is paired with preexisting ailments. Other important contributing factors are likely to include less timely diagnosis of FBD and problems accessing timely and effective treatment, especially among the poor and among children more generally. Thus, large numbers of Africans are dying from cases of FBD that would be effectively treated in parts of Asia and elsewhere. The implication is that a major part of the strategy for reducing the burden of FBD in Africa must involve improvements in access to effective health services.

African populations are exposed to a broad range of food safety hazards.

The analysis of FERG suggests that some 82 percent of the burden of FBD in Africa is associated with microbial pathogens, in particular *Salmonella* species, toxigenic *E. coli*, *Norovirus*, and *Campylobacter* species (WHO-FERG 2015). Next in importance are heavy metals, especially lead, accounting for 8 percent of the burden. Though estimated to account for a very small proportion of foodborne illnesses or deaths in Africa, aflatoxins are the food safety hazard that has attracted the most public attention, policy focus, and development assistance in recent times. Aflatoxins, naturally occurring toxins produced by fungus, can contaminate a wide variety of food crops including maize, sorghum, cassava, groundnuts, sesame, chili, and others. Furthermore, aflatoxin-contaminated feed can result in the contamination of the resultant animal products, such as milk. Children can also be affected through breast milk or from direct consumption of weaning foods. Acute exposure to aflatoxin has proven lethal in several instances in Africa, although chronic exposure is more pervasive. A large body of research in Africa and elsewhere has found causative links between aflatoxin levels in the diet and cancer. Aflatoxin has also been found to be a growth retardant in animals and is suspected of being a contributing factor to child stunting.

For risk management purposes, it is important to have detailed information on which foods are most involved in the transmission of FBD.

Unfortunately, very little information on the prevalence of foodborne hazards

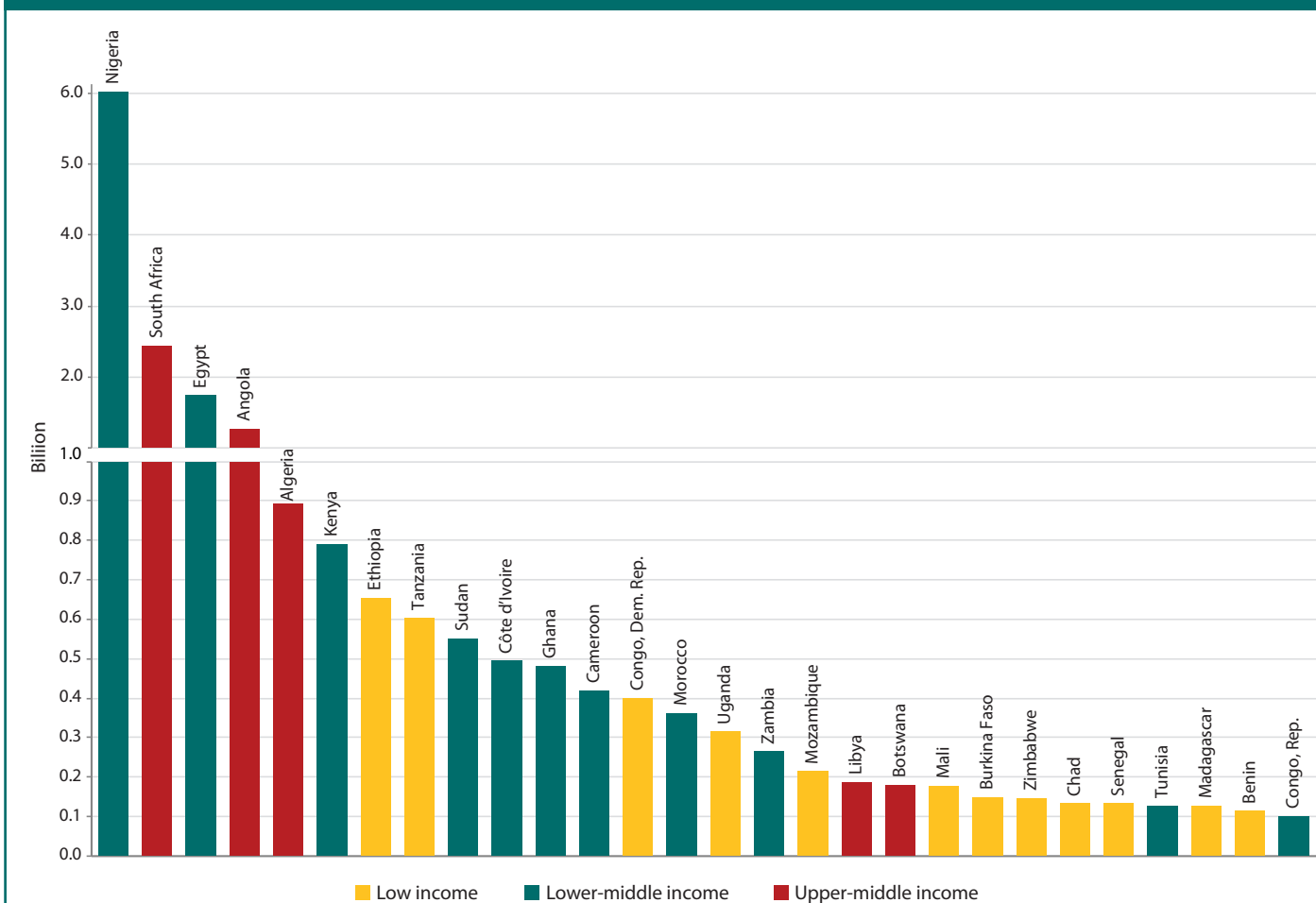
across foods is available for most countries in Africa. A FERG expert elicitation process reviewed the most likely source for 11 of the 31 hazards that were assessed (Hoffmann et al. 2017). It found fresh produce, in the form of fruits and vegetables, and multiple animal products to be the primary source of these hazards. Current estimates attribute very little of the global burden of FBD to cereals, although the newer research related to chemical and heavy metal hazards is beginning to change this picture somewhat. Despite the considerable attention given to aflatoxin in cereals, the bulk of FBD in Africa is likely attributable to animal products, especially meat, fish, and milk, and secondarily to fruits and vegetables. The results of a recent analysis of FBD attributable to animal-sourced foods (Li et al. 2019), when assessed against the earlier FERG analysis, suggests that, for most African countries, animal-sourced foods account for between 30 and 50 percent of the FBD burden. As discussed below, this has important implications given that most African countries are ill-prepared to manage food safety hazards related to animal products.

The economic costs of unsafe food take multiple forms and have both short- and long-term dimensions, although valuing these costs is challenging because of data and methodological limitations. The economic costs associated with FBD include the resources expended on public health and loss of productivity when disease occurs, disruptions to food markets when outbreaks of illness take place as consumers avoid implicated foods or shift to alternatives that are perceived to be safer, impediments to agrifood exports due to real or expected food safety problems, and the costs of complying with food safety regulations and standards in foreign markets. More indirect and harder to measure are costs including those of FBD prevention and those associated with wary consumers shifting their food consumption patterns, for example from nutrient-dense fresh produce to processed foods, as a result of concerns about food safety. For most African countries, reliable estimates of these costs and how they are distributed within society are lacking. This makes coherent policy planning and implementation difficult, especially in the face of acute resource limitations.

There have been very few studies of the burden of FBD in low- and middle-income countries. However, **a recent World Bank global study estimated the**

productivity losses that can be attributed to unsafe food within Africa at around US\$20 billion⁸ in 2016 alone (Jaffee et al. 2019).⁹ To these losses of productivity can be added the annual costs of treating foodborne illnesses, which are estimated at \$3.5 billion in 2016. Thus, even ignoring the costs of market disruptions, product recalls, and consumer product avoidance, which are difficult to estimate given available information, it is reasonable to expect that the annual costs of unsafe food in the domestic markets of Africa exceed \$24 billion. Of course, the costs of FBD vary significantly across the African continent based on country size, level of economic development, food consumption patterns, and so on. However, estimates from the aforementioned World Bank study (Jaffee et al. 2019) indicate that very significant productivity losses from FBD are currently being experienced by at least two dozen African countries. That being said, the majority of the aggregate loss due to unsafe food on the African continent is accounted for by a small number of countries based on their (large) population size, (higher) per capita income, or both,

FIGURE 10.2—ESTIMATED “PRODUCTIVITY LOSS” DUE TO FOODBORNE DISEASE, AFRICA, 2016 (US\$ BILLIONS)



Source: Jaffee et al. (2019), based on data from WHO-FERG (2015) and World Bank (2019).

Note: The estimated loss for the indicated countries totals US\$19.5 billion. The estimated loss for all other African countries totals US\$0.5 billion.

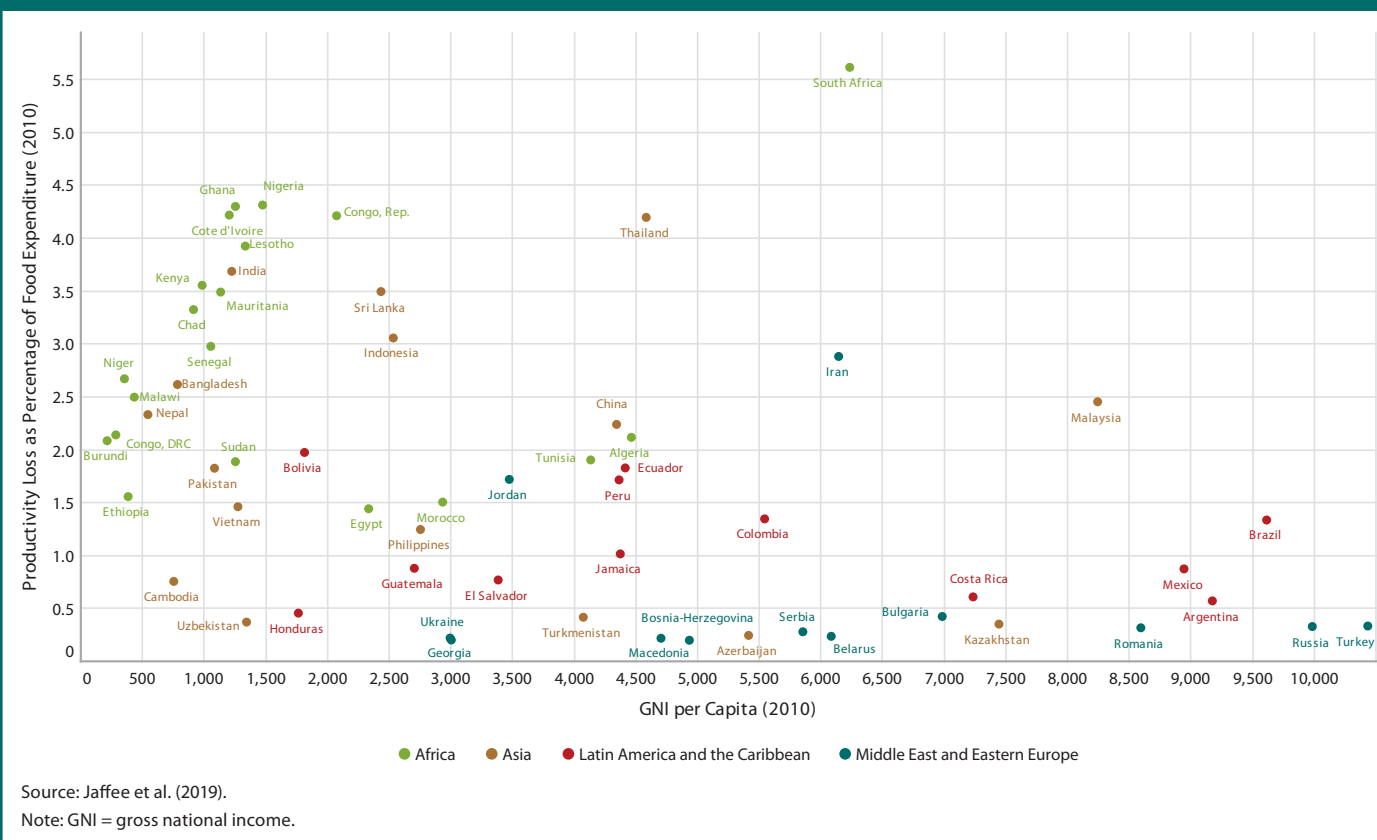
⁸ All dollar amounts are US dollars.

⁹ As estimated by national FBD DALYs multiplied by gross national income per capita. Jaffee and others (2019) reported the total for SSA to be \$16.7 billion, whereas that for North Africa totaled \$2.3 billion. The Africa total constitutes 21 percent of the global total for low- and middle- income countries. Given its much larger population and higher per capita income, emerging Asia accounts for a little less than two-thirds of the global total.

together with a very significant FBD incidence (Figure 10.2).

It is important to understand not only the absolute but also the relative magnitude of the costs associated with FBD. This is illustrated in Figure 10.3, in which the estimated productivity loss from FBD as a share of total national food expenditure in 2010 is reported for low- and middle-income countries in various regions.¹⁰ Whereas there is considerable diversity in the relative cost among African countries, the relative economic burden is generally higher for African countries than for countries in Asia, Latin America, and the eastern Europe–central Asia region that are at a similar level of economic development. This is especially the case for countries clustered at lower income levels. In contrast, the pattern is more ambiguous at the lower-middle-income level, where there has likely been a surge in the burden of FBD in rapidly urbanizing Asia. Unfortunately, more recent data on total food expenditures are not available for many African countries, making it difficult to discern whether the relative economic burden of FBD is rising for African countries that have transitioned into middle-income status as they too have experienced rapid urban growth and dietary change. The evidence that is available, however, is consistent with the food safety life cycle described above. Thus, among the five African countries for which 2016 food expenditure data are

FIGURE 10.3—THE RELATIVE ECONOMIC COST OF UNSAFE FOOD: FOODBORNE DISEASE-RELATED “PRODUCTIVITY LOSSES”/TOTAL FOOD EXPENDITURES (%), 2010



available (namely, Algeria, Egypt, Morocco, South Africa, and Tunisia), the ratio between the productivity loss from FBD and food expenditure is generally higher in 2016 than in 2010.¹¹

Beyond the domestic burden of FBD, food safety also impacts the agrifood trade performance of African countries, with potentially important consequences for the performance of formal-sector businesses, employment, and incomes. Effectively competing in international agrifood trade may entail

¹⁰ This is illustrated for 2010 because reliable data on total food expenditures are not available for more recent years for some of the comparator (and especially low-income) countries in other regions.

¹¹ Tunisia was the lone exception, and its ratio was minimally lower (from 2.28 to 2.19 percent). For most emerging Asian countries with available data on food expenditures, this ratio also increased between 2010 and 2016.

considerable costs for the public and private sectors to comply with food safety regulations or standards in a given export market. The magnitude of these costs is a critical issue for export competitiveness, especially with respect to Africa's external trade in fish, fruit, and vegetables.¹² International experience suggests that a multitude of factors influence compliance costs, including firm and industry size, the gap between prevailing food safety management capacity and that required for export markets, and levels of collective action between exporting firms. In many cases, the challenges faced in complying with food safety regulations and standards tend to reinforce or accentuate the broader set of competitive strengths and weaknesses of industries and firms (World Bank 2005; Beghin and Orden 2012). In some cases, "trade losses" attributed to (non)compliance with more stringent standards are more accurately attributable to more entrenched and longer-term competitiveness issues within businesses or sectors. And although more stringent food safety regulations and standards can certainly act as non-tariff barriers to trade, they may also act as powerful catalysts for investments in improved food safety management systems, especially when the incentives for such investments are lacking in domestic markets.

For Africa, food safety has been on the development agenda predominantly as a trade and market access issue. Many of the pertinent challenges, whether related to intraregional or extraregional food trade, have drawn considerable attention and resources from African governments, researchers, trade partners, and many development support agencies. Indeed, a recent survey pointed to literally hundreds of small and larger projects supported by trade partners or development agencies during the past decade and a half that have sought to address trade-related food safety problems or capacity constraints in Africa (GFSP 2018). In contrast, initiatives focused on domestic food safety matters have been comparatively few and poorly funded, until quite recently.

Though ongoing challenges remain, very notable progress has been made in addressing important trade-related food safety hazards and capacity limitations. This has contributed to gains in the region's trade, especially its trade in higher-value, food safety-sensitive foods such as fish, fresh fruit and vegetables, nuts, and spices. Between 2001 and 2017, the region's exports of these products increased more than fourfold, from \$3.8 billion to \$16.1 billion. By way of comparison, over that same period, the region's exports of its traditional core commodities—cotton, cocoa, coffee, and tea—rose from the same base of \$3.8 billion to reach only \$11.9 billion. Another illustration of the region's progress on trade-related matters has been its generally good and improving pattern of low rates of rejection by the European Union and other major trading partners on its export consignments of fish, fruit, and vegetables due to food safety problems.¹³

The available evidence suggests that, for Africa, the trade-related costs associated with food safety pale in magnitude compared with the public health and commercial costs, and the productivity losses experienced due to unsafe food domestically. For SSA, the ratio between domestic and trade-related costs is likely to be on the order of 40 to 1 today, and this would likely widen substantially in the future in a business-as-usual scenario, as suggested by the food safety life cycle.¹⁴ This gap suggests that the predominant attention of multilateral agencies and bilateral donors, in addition to national governments, on the trade impacts of food safety has been misguided. Largely, the reality reflects the greater visibility of the export losses associated with noncompliance with food safety requirements, and the pressure applied on governments and donors by well-organized export-oriented businesses and farmer groups. In contrast, the costs associated with domestic FBD are not only largely hidden, given that they are rarely monitored and measured, but predominantly imposed on segments of society that have

12 This has been much less of an issue in relation to Africa's large trade in beverage crops (cocoa, coffee, and tea). Although much has been claimed about the adverse impact of food safety standards on Africa's trade in groundnuts and groundnut products, many additional factors have also undermined the region's export competitiveness in those markets.

13 Rejection rates do vary by country. The region's four largest fish exporters—Mauritius, Morocco, Namibia, and South Africa—and its leading fruit exporters—Cameroon, Côte d'Ivoire, and South Africa—all have relatively low rejection rates compared with major developing-country suppliers elsewhere. Some smaller exporters, of both product groups, have higher rejection rates and have had to make considerable upgrades to remain competitive.

14 For SSA in 2016, Jaffee and colleagues (2019) estimated the productivity loss due to unsafe food to be \$16.7 billion and the costs for FBD treatment to be \$2.5 billion. This conservatively estimated domestic cost of \$19.2 billion does not take into account commercial losses incurred by domestic firms due to market disruptions or product recalls, nor does it count the costs incurred in making investments in facilities or food safety management systems. Regarding trade, the estimated value of rejected trade consignments is \$78 million per year. Some companies are simply deterred from engaging in trade due to the complexities of complying with strict food safety requirements. We assume the impact of this to be significant, perhaps leading to a "loss" of potential trade worth three times that of the rejected products (that is, \$234 million). We further add an estimate of the annualized capital investments needed by African exporters to ensure compliance with food safety standards—amounting to \$155 million. This puts the trade-related costs of food safety for SSA at \$467 million annually.

little or no influence over the policies and priorities of national governments and donors, most notably the poor, children, and micro- and small enterprises.

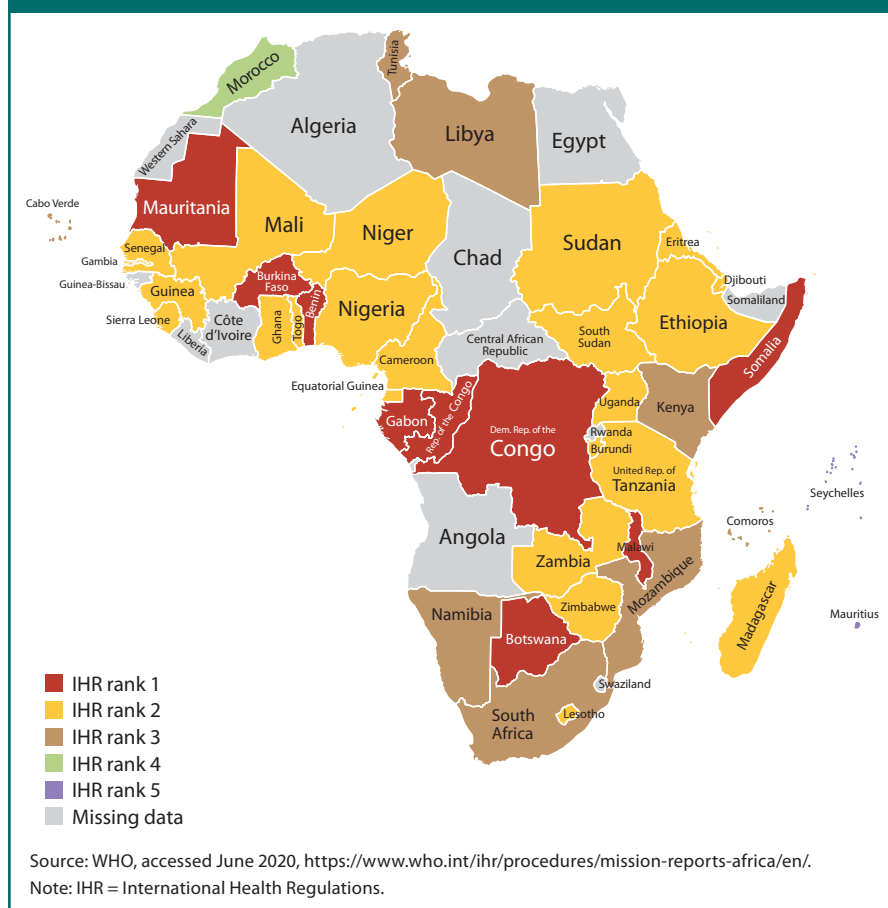
The Status of Food Safety Capacity in Africa

The safety of food is the result of the actions and inactions of many stakeholders, operating under diverse environmental, infrastructural, and socio-political conditions. These stakeholders include farmers, food handlers and distributors, food manufacturers, food service operators, consumers, regulators, scientists, educators, and the media. The behavior of these stakeholders can be shaped by their awareness of food safety hazards; their technical, financial, and other capabilities to apply effective mitigating practices; and prevailing rules, commercial incentives, and other motivators.

Food safety management capacity comes in many forms. First, it is a critical element of human capital across all those who are involved in the handling or oversight of food. It may involve very basic knowledge, more specialized technical expertise, or “soft” management, leadership, and communication skills. Second, capacity is embedded in the physical infrastructure that provides clean water and other basic services; supports food production, storage, and distribution functions; and allows for quality assurance services. A third type of capacity is embedded in management systems within enterprises, regulatory agencies, laboratories, and consuming households. Finally, food safety capacity relates to institutional norms, including social cues, brand reputation, professional ethics, and the depth and breadth of food safety culture. Motivations to invest in or otherwise strengthen food safety management capacities and put them to use can be influenced by laws, social pressure, market signals, or other factors. The mix and strength of these motivators tend to vary by a country’s stage of economic development and agrifood system transformation.

Systematic assessments of food safety management capacity have been completed for relatively few low- and middle-income countries. Where detailed assessments have been undertaken, the findings have often not been quantified, making comparisons across countries difficult. Furthermore, many of the pertinent capacity assessments are not in the public domain because of the sensitivity surrounding public food control systems and because of concerns

FIGURE 10.4—CAPACITY RATING OF AFRICAN COUNTRIES ACCORDING TO THE WORLD HEALTH ORGANIZATION JOINT EXTERNAL EVALUATION INDICATORS FOR FOOD SAFETY



about how the media or public might react to documented shortcomings in these systems. To get around these limitations, here we make use of a variety of data and other information sources.¹⁵

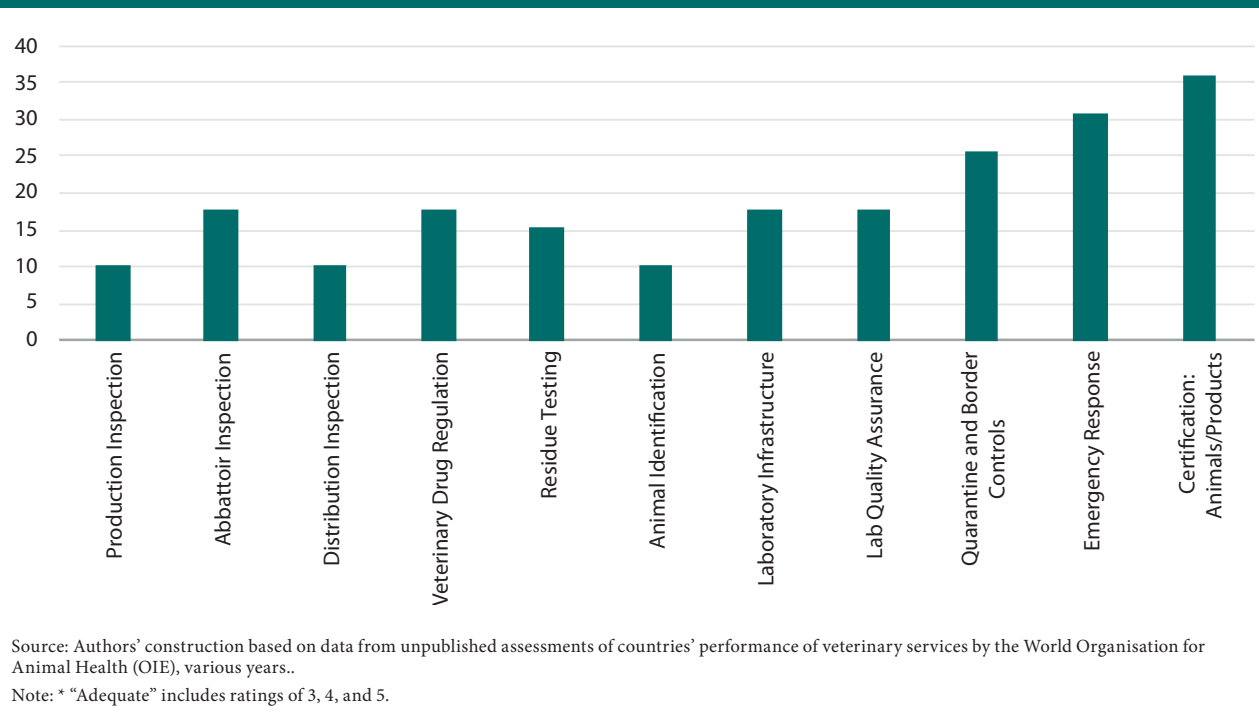
15 One promising step is the development of an African Food Safety Index to track the status of pertinent indicators across the region. In the near term, many of the indicators will likely relate to conditions that may impact food safety outcomes—for example, access to clean water and sanitation—rather than food safety outcomes themselves (such as the incidence of foodborne illness) or specific food safety management capacities (such as the quality of laboratory testing systems). Over time, however, the index can be refined as additional data are generated.

One source of information is the assessments undertaken by the WHO to evaluate the compliance of individual countries with the International Health Regulations.¹⁶ These regulations obligate signatory countries to develop capacities to prevent, detect, and rapidly respond to potential public health risks. Joint external evaluations (JEEs) have been completed for nearly all African countries during the past 3 years and cover 19 technical areas of public health capacity, with ratings of each capacity on a 5-point scale ranging from “no capacity” (1) to “sustainable capacity” (5). For food safety, the capacities that have been assessed relate only to FBD surveillance (indicator 5.1) and rapid response to food safety emergencies and FBD outbreaks (indicator 5.2). Although these are useful indicators, they provide an incomplete picture of the prevailing status of food safety management capacity. Figure 10.4 maps out the JEE food safety ratings for African countries. Of the 47 African countries assessed, only 1 country (Seychelles) received a 5 rating for food safety, and only 2 others (Mauritius and Morocco) received a rating of 4, defined as “demonstrated capacity.” A quarter of the assessed African countries received a rating of 1 and the vast majority were rated at 2, defined as “limited capacity.”

A second useful tool for gauging the capacity of national food safety management is the results of the assessments by the World Organisation for Animal Health (OIE) of the performance of veterinary services (PVS) in various countries. The fundamental components of the OIE’s PVS assessment pertain to (1) human, physical, and financial resources; (2) technical authority and capability; (3) interaction with interested parties; and (4) measures to ensure

¹⁶ See <https://www.who.int/ihr/procedures/mission-reports-africa/en/>.

FIGURE 10.5—PROPORTION OF AFRICAN COUNTRIES WITH ADEQUATE* CAPACITY FOR ANIMAL-SOURCED FOOD SAFETY



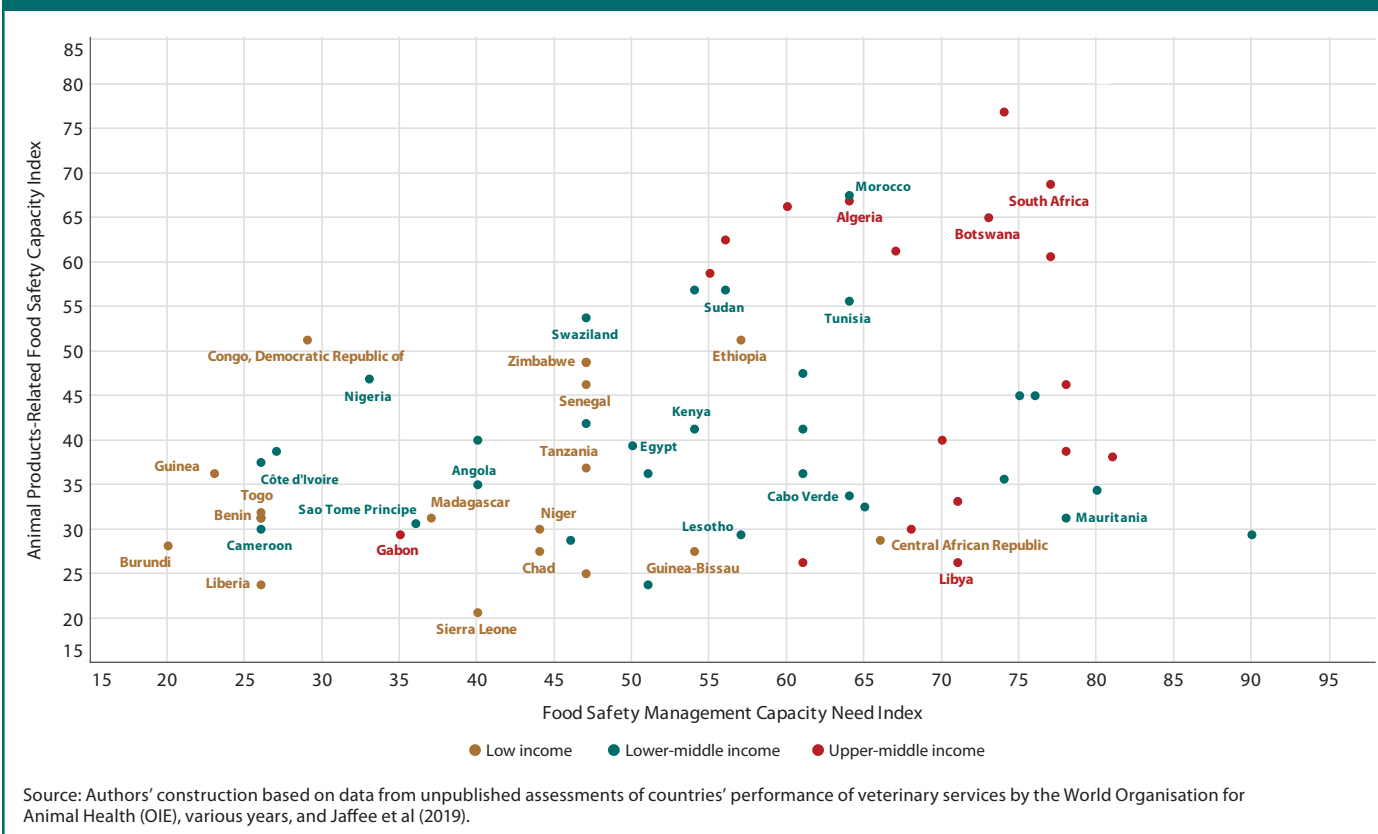
market access. The most recent version of the PVS assessment tool covers 38 critical competencies, with experts rating each capacity on a 5-point scale from “little or no capacity” (1) to “a high level of competence or application of best international practice” (5). A subset of these criteria is either directly associated with the safety of animal-based products or is likely to strongly influence how well food safety oversight is performed. Specifically, ratings for 18 such criteria can be used to gauge and compare the status of official control systems for animal-sourced food safety, including 2 associated with funding adequacy, 12 associated with technical capacities and regulatory functions, and 4 related to international market access. Jaffee and colleagues (2019) combined the technical capacities and market access measures from the PVS to construct an index

of animal-sourced food safety capacity.

The PVS assessments suggest that the vast majority of African countries have underinvested in their animal-sourced food safety systems and therefore have low capacities. Still, there are important variations in the status of these systems across the continent. Among the 39 African countries recently assessed for PVS, more than 30 percent were judged to have “adequate” capacity (ratings of 3, 4, or 5) with respect to emergency response and the certification of animals and products for export (Figure 10.5). In contrast, only 4 of the 39 countries were rated as having adequate capacities in relation to primary production inspection, animal identification, and animal product distribution inspection. Better ratings of capacity were generally found in North Africa and among the SSA countries that have been regular exporters of animals or meat. The African region as a whole is lagging behind other developing regions by a considerable margin.¹⁷

Such varying capacities to manage the food safety risks associated with animal products in Africa should be gauged in relation to current needs. Countries demonstrate considerable differences in terms of the prominence of animal products in the local diet and in trade, as well as in terms of the importance of livestock in their agricultural gross domestic product. These

FIGURE 10.6—CAPACITY AND NEED FOR CAPACITY FOR FOOD SAFETY SYSTEMS FOR ANIMAL-SOURCED FOOD, AFRICA



and other factors were considered in constructing a “capacity need index” in relation to the safety of animal-sourced foods. Figure 10.6 maps animal-sourced food safety capacity and current capacity need, both for African countries and for other low- and middle-income countries (which are not labeled). In the bottom left quadrant are multiple western and central African countries whose capacities are low, but so too are their prevailing needs. We would expect the need for animal-sourced food safety capacity in these countries to increase over time as urbanization and income growth result in higher consumption of

17 Among lower-middle-income countries globally, some 30 percent are rated as having adequate laboratory infrastructure and 40 percent as having adequate capacities for quarantine and for emergency response. Among upper-middle-income countries, 60 percent or more have adequate capacities in these three dimensions.

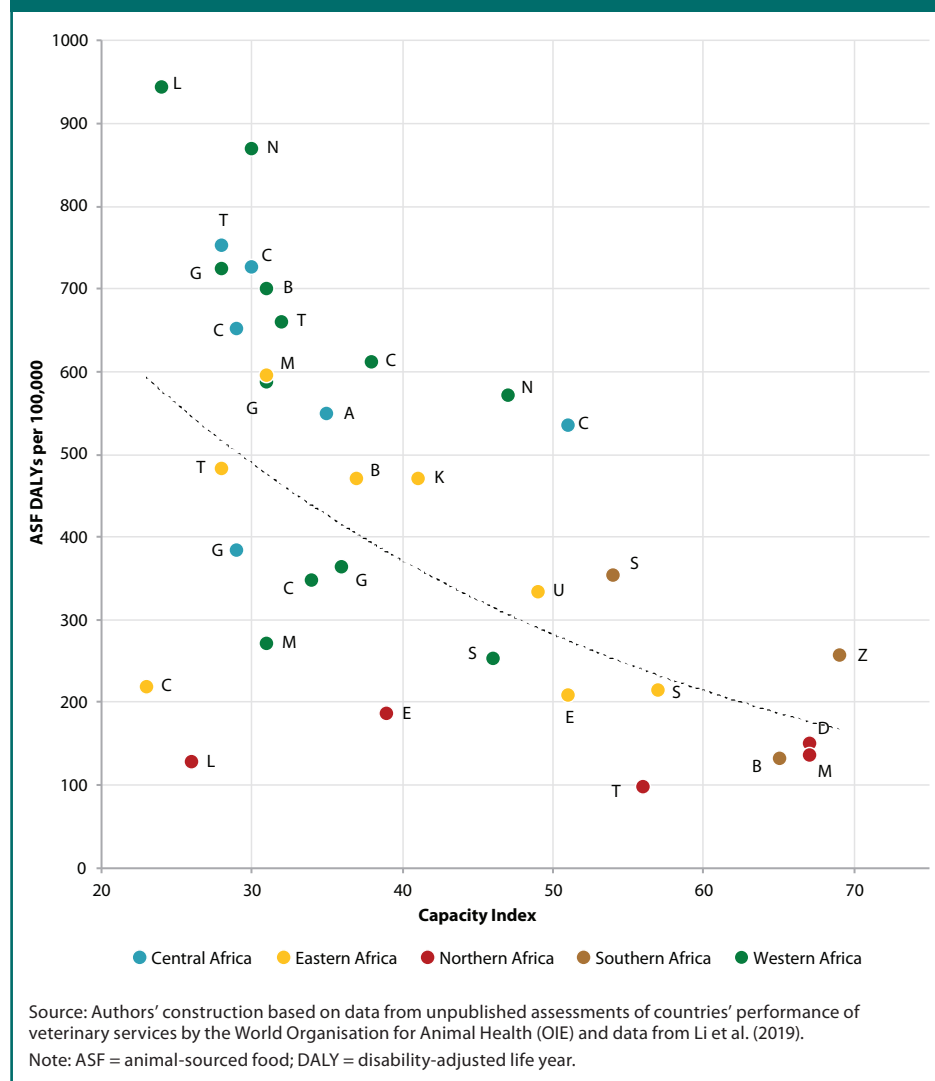
animal products. Countries in the bottom right quadrant feature a high need for animal-sourced food safety capacity yet major gaps in prevailing capacity. Central African Republic, Libya, and Mauritania are positioned here. The Africa region has few members in the top right quadrant, where high capacity need is being addressed by relatively strong underlying capacity. The notable exceptions are Botswana, South Africa, and several North African countries.

Although the development of more advanced food safety management capacities needs to be calibrated with underlying and evolving needs, which in turn are associated with prevailing demographics, dietary patterns, and commercial factors, a sustained pattern of underinvestment and the lack of even rudimentary capacities can put populations at significant risk. This appears to be the situation in relation to the consumption of animal products in many African countries. Figure 10.7 suggests a remarkably close association between animal-sourced food safety capacity, represented by our capacity index, and the burden of FBD attributable to animal-sourced foods, estimated by Li and colleagues (2019). Consistent with the “One Health” perspective (that is, the recognition that people, animals, and the environment influence one another’s health), investing in important animal health capacities appears to yield dividends in the form of improved food safety. And failing to do so has significant health consequences. Thus, every African country for which the estimated DALY burden from animal-sourced food exceeds 500 per 100,000 people was rated by the OIE PVS assessments to be devoting inadequate or highly inadequate budgetary resources to its veterinary services.

Prevailing capacities with respect to food safety regulation and official food safety institutions in most African countries exhibit the same patterns as in other developing regions, the most notable of which are the following:

- The absence of a comprehensive national policy on food safety, translating into a lack of prioritization of key problems and elements of food safety capacity
- The lack of reliable data to assess the scale and distribution of many food safety problems. Research tends not to link up with broader changes in the food system and therefore cannot inform forward-looking policymaking.
- Food law modernization that has generally not been matched by the same progress in developing regulations to enable enforcement of the law

FIGURE 10.7—RELATING THE ANIMAL-SOURCED FOOD BURDEN OF FOODBORNE DISEASE TO PREVAILING ANIMAL-SOURCED FOOD SAFETY CAPACITY



Source: Authors’ construction based on data from unpublished assessments of countries’ performance of veterinary services by the World Organisation for Animal Health (OIE) and data from Li et al. (2019). Note: ASF = animal-sourced food; DALY = disability-adjusted life year.

- The absence of effective mechanisms for the accreditation and certification of businesses
- The fragmentation of institutional responsibilities among lead agencies and ministries, and between central and decentralized units, with often weak coordination due to overlapping mandates or gaps. There is, therefore, a lack of coordination in monitoring hazards, risks, and human health outcomes, and in interpreting laboratory test results.
- Capacities for food safety regulatory oversight that tend to be stronger for exports than for the domestic market. This stems from a variety of factors, including the clarity of requirements for “competent authorities” coming from external (and especially Organisation for Economic Co-operation and Development country) trade partners, a more narrow or concentrated industry structure over which regulatory checks can be more readily made, the presence of better-organized industry associations in some export industries, and a legacy of earlier investments made to improve the competitiveness of export industries and resolve specific food safety-related problems.

Because public food safety management capacity is inadequate in much of Africa, there is growing interest in alternative approaches to regulation, envisaging a new relationship between the private sector as the “regulated” and the government as “regulator.” Thus, co-regulatory approaches and other forms of public-private partnerships are seen to provide opportunities to achieve greater efficiency in the management of food safety through the adoption of approaches that are practicable and more amenable to available resources, prevailing capacities, and prevailing incentives within agrifood value chains. For alternatives to direct regulation, the government can support the development and application of voluntary codes of practice or private standards, provide information to businesses and consumers about risk management, and facilitate market-based incentives for better risk management.¹⁸ Regulatory approaches can be made more flexible to allow businesses to comply in ways that are more

efficient and effective. Initiatives for such flexibility include industry inputs into the design of regulatory standards, flexibility in applying and enforcing process standards, and industry collaboration on enforcement.

With available data, it is not possible to make any strong generalizations or comparisons in terms of private sector food safety management capacity in Africa. Food industry structure varies enormously within the region, in terms of the size distribution and concentration levels in different segments of food manufacturing and the patterns of food distribution. Importantly, this variation includes the relative significance of different forms of “modern retail” (supermarkets, convenience stores, e-commerce operations, and so on) versus traditional community food markets. Levels of and formats for out-of-home eating, each with its own challenges for managing food safety risks, also vary significantly among the countries of Africa. Citing data or circumstances for one or even several African countries, therefore, does not provide a representative picture.

In the absence of reliable data, proxy indicators of private sector food safety management capacity can be employed, although these relate primarily to companies or value chains with a predominant export market orientation. For example, across the African continent, 387,204 hectares of the area under fruit and vegetable production was certified by GlobalGAP (a trademarked international farm assurance program) in 2017, a significant increase over the total of 99,337 hectares in 2010. In 2017, Africa accounted for 7.3 percent of the global total certified area and 21 percent of the total in low- and middle-income countries. Although 17 African countries had some GlobalGAP-certified area in 2017, 3 countries (namely Egypt, Morocco, and South Africa) accounted for 82 percent of the total for Africa. With respect to organic certification, 131,457 hectares of fruit and vegetable production was certified on the African continent in 2017, representing 15.6 percent of the total area in low- and middle-income countries certified for organic fruit and vegetable production. Egypt, Kenya, and Madagascar had the largest areas and collectively accounted for two-thirds of the African total. With respect to agrifood processing, one indicator of prevailing food safety management capacity is the number of businesses that are registered

¹⁸ Use of market-based incentives for compliance with voluntary food safety standards has the greatest utility in circumstances where there is a strong consumer demand for certified foods. Though there are certainly examples of such demand in middle-income African countries, it tends to occur in niche markets, and the majority of consumers are either unable or unwilling to pay for certified foods, with the latter often due to a lack of understanding of what certification represents or a lack of confidence in the credibility of the certifications.

to export to high-income countries. Outside of fish and fishery products, very few businesses are registered to export to the United States. The lone exception is South Africa, which ranked among the top 15 low- and middle-income countries in terms of the number of food manufacturing enterprises registered with the US Food and Drug Administration (FDA) in 2018. African countries as a whole accounted for only 7.2 percent of the total food processing enterprises in low- and middle-income countries registered with the FDA in that year, with 5 countries accounting for two-thirds of all African registrations.

Comparable data on the food safety capacities or regulatory compliance of small and medium-size enterprises are not available. Depending upon the objectives and perceived impacts of data disclosure, regulatory agencies seem to waiver between statistics pointing to (implausibly) high rates of compliance and those communicating information about the (significant) number of companies that have been fined or closed down during regular or seasonal regulatory inspection campaigns. It is clear, however, that large numbers of small and medium-size enterprises, and also microenterprises, that cater to the poor in Africa will need to upgrade their facilities and their food safety and supply chain management capacities to meet rising consumer demands and regulatory requirements in the coming years.

Very significant challenges remain in improving hygienic conditions and vendor practices in community markets and in relation to street foods. Survey and other evidence from many African cities points to low levels of food safety awareness and high-risk behaviors among food handlers in the informal sector, which services a large proportion of urban populations and the majority of the urban poor. Furthermore, evidence from small-scale studies of street food and other informal vendors suggests worryingly high contamination levels. Among the common risk factors are these:

- Inappropriate and unhygienic locations and surroundings, as vendors target high-human-traffic areas that may be exposed to airborne chemicals in dust and vehicle exhaust fumes
- Poor personal hygiene practices, either due to a lack of knowledge or poor environmental conditions and poor access to potable water, waste disposal, or both

- Unsuitable methods of transportation of food and ingredients, especially with respect to within-city movements of meat and animal carcasses by carts and motorbikes, and on bus rooftops
- Unclean places of preparation, including surfaces, equipment, and utensils, whether at the vending site or in the home, where condiments may be prepared ahead of time
- Use of contaminated water and ice when potable sources are not available; also, use of nondisposable plates, cups, and cutlery

Intervening in informal food channels is especially challenging given the large numbers of vendors involved, their frequent mobility and periodicity of business, their low levels of literacy and numeracy, and the hesitancy of regulators to unduly disrupt the livelihoods of relatively poor market actors. Yet these distribution channels often service a significant proportion of rural and urban consumers across the African continent. Even with the emergence of “modern retail” outlets, the small shops, community markets, and street vendors will remain major players in African food markets for the foreseeable future. This is especially the case with respect to the distribution of fresh foods that are critical to efforts to enhance the nutrient intake of the poor. It is important, therefore, to experiment with different types of intervention that are aimed at inducing behavioral changes on the part of traditional market and street food vendors and among their clientele. Some African experiences with such interventions are summarized in Roesel and Grace (2014) and in Jaffee and others (2019), and the sources cited therein.

The Way Forward

A significant share of Africa’s food safety problems and associated costs are avoidable if a concerted set of preventive measures are put in place. Some countries have invested little in food safety in the public or private sector. Foundational investments will be needed in people, infrastructure, and institutions, together with interventions in priority agrifood value chains. Importantly, the priority here must be value chains directed at domestic markets, and especially those that serve the poor, and not to exports. For other countries, the

challenges are to improve the functionality of public regulatory delivery and technical services while mainstreaming safer food practices among farmers and food business operators of various sizes.

There are no simple solutions or quick fixes to the myriad of food safety challenges faced in Africa. On the contrary, a comprehensive approach is required that simultaneously focuses on improving food safety awareness, practices, and governance. It should include (1) addressing fragmented and often weakly coordinated institutional responsibilities; (2) building up capacities for risk analysis and risk communications; (3) enhancing systems for surveillance and food product traceability and recall; (4) moving from an end product testing focus to one that emphasizes supporting GAP among farmers and upgrading private sector management systems; (5) increasing consumer awareness of the safety of food; and (6) improving consumer food storage, handling, and preparation practices.

Food safety should be seen as a *shared responsibility* between food business operators, consumers, and government. However, the effective operationalization of this concept, which has been actively promoted by the WHO, is a significant challenge in many African countries. Governments need to play effective vision-setting and convening roles, provide reliable information to the entire spectrum of stakeholders, and employ a diverse set of policy instruments that involve, incentivize, and leverage the actions of key value chain actors. Whereas practitioners once emphasized effective “official food control” systems, the most critical roles for government are now recognized to be facilitative ones that induce investments and behavior change by actors who share with government the goal and responsibility for safer food.¹⁹

This inclusive concept of food safety management will require a paradigm shift in how African countries approach food safety regulation. The traditional regulatory model centers on enforcement through the inspection of food facilities and product testing, accompanied by systems of legal and financial penalties for infractions. Though this strict authoritative model is seemingly appealing to the public and media, and therefore to political decisionmakers, in many contexts its efficacy is questionable. This is especially the case where smallholder farmers, micro- and small enterprises, and informal food channels predominate, and both

surveillance and inspection capacities are limited. A shared responsibility model instead implies a move from a regulator–regulated relationship toward efforts by government to better incentivize and facilitate the delivery of safe production, processing, and distribution of food. In this context the role of regulation becomes one in which the absolute minimum food safety standard is legally defined but food business operators are given a degree of flexibility in how they attain this standard. And governments can offer information and other resources and support to motivate and assist compliance.

Governments in Africa need not only to invest more in food safety but also to invest more smartly. This means (1) investing with clear purpose and tracking the impacts of interventions; (2) investing in the foundational knowledge, human resources, and infrastructure for food safety systems; (3) balancing attention to “hardware” (laboratories, physical market infrastructure, processing facilities, and so on) and “software” (management systems, human capital, awareness raising for behavioral change, and so on); (4) realizing synergies among investments and in the pursuit of goals, for example initiatives addressing both animal and human health, or both food safety and environmental health; and (5) ensuring the sustainability of investments and wider outcomes.

Not all investments that can reduce the burden of FBD are typically regarded as falling within the scope of “food safety” interventions. Thus, critical investments may address environmental health issues, such as those that increase access to potable water and improve sanitation, or those that lessen environmental contaminants in soil, water, and air. Measures such as these reduce the propensity for cross-contamination in food supply chains. Also important are investments in public health systems, including those that improve the quality of and access to medical treatment, which can reduce significantly both the morbidity and mortality outcomes of FBD.

In advancing the food safety agenda in Africa, making informed planning and other decisions will require fundamental improvements in the scientific and statistical dimensions of food safety, but also the active involvement of finance and other central economic ministries. It is recommended that such entities (1) calibrate public expenditure for food safety to the economic costs of unsafe food and the benefits of investing in its prevention and management; (2)

¹⁹ The private sector, both as individual companies and through industry associations, can play a major role in advancing food safety science, applying emerging technologies, developing food safety human capital, providing quality assurance services, and promoting safer practices in primary production and food value chains.

emphasize forward-looking preventive measures to minimize future costs (in the form of avoidable losses) for, among other things, public health and market development; (3) balance public expenditure and investment between “hardware” and “software”; and (4) ensure that proposals for significant public investments or programs are justified through cost-benefit or cost-effectiveness analysis, and that alternative approaches, including regulatory measures and facilitating private investment, have been considered.

Lead food safety agencies and pertinent technical ministries (that is, agriculture, health, trade, and environment) should develop a unified food safety strategy that defines priorities and responsibilities, guides the coordination of measures by government and private entities, and establishes funding needs.

These lead agencies and ministries are also advised to (1) adjust key performance indicators to be less about noncompliant outcomes (for example, number of legal infringements, value of fines collected, number of businesses closed, and so on) and more about food safety outcomes (for example, magnitude of food safety risks, incidence of FBD, levels of border rejections in focal export markets, and the like); (2) take measures that aim to minimize the entry of food safety hazards into the food supply from farms, especially approaches that offer co-benefits for public health and environmental protection; (3) direct attention to small and informal actors in the food system with an emphasis on raising awareness, promoting safer food handling practices, and improving physical operating conditions (for example, access to clean water and waste management facilities); (4) remove policy, regulatory, and other barriers to private investments in and services for food safety; (5) apply risk-based approaches to govern food trade, together with improved trade facilitation capabilities; (6) provide consumers with the tools to become partners in food safety through their own actions and through incentivizing and motivating food suppliers; and (7) incorporate the science of behavior change by redesigning training programs, information campaigns, and other interventions.

Clearly, however, the countries within Africa face distinct circumstances in relation to the current mix of food safety challenges, the structure of their food markets, and their prevailing strengths and weaknesses in food safety management capacity. Thus, specific priorities and the appropriate sequencing

of investments and initiatives need to be determined at the individual country level, and in the case of very large countries, at the subnational level. Guidance to countries at different positions in the food safety life cycle regarding ways to effectively position food safety in the national development dialogue as well as likely priorities in relation to food safety risk assessment, risk management, and risk communications is provided in the executive summary of *The Safe Food Imperative* (Jaffee et al. 2019). Most African countries have food systems that fall into either the “traditional” or “transitioning” stages, although the region’s upper-middle-income countries will likely find the strategic guidelines for “modernizing” food systems more appropriate.

Importantly, individual African countries need not, and should not, act on their own to develop a full range of food safety management capacities and understand the efficacy of different types of interventions. There is enormous scope for collaboration at the subregional and regional levels. For example, at either of those levels there is scope, among other things, to (1) develop a food science agency to provide independent scientific opinions and advice based upon risk assessment work on emerging topics; (2) develop centers of excellence to provide training in food safety regulatory delivery and to document good practice; (3) develop centers of excellence to support food safety education programs, consumer communications, and wider engagement programs; and (4) develop and apply capacities that combine networks of national laboratories and regional reference laboratories to support laboratory leadership, proficiency testing, and multicountry surveillance and testing programs.

Finally, **building food safety capacity in Africa needs to be seen as a continuous process of development, upgrading, learning, adjustment, and refinement.** It needs to be linked to the broader processes and evolving goals of economic development, and to be addressed in tandem with broader interventions and investments including measures to improve access to quality public health services, clean water and sanitation, and improved agricultural productivity and sustainability. Whereas a subset of investments and institutions will need to be dedicated to food safety, the complex challenges of food safety cannot be addressed through professional silos.