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Sustained food safety action for improved nutrition and health of Africans

Background paper

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Introduction

Food safety concerns leading to foodborne diseases are important because they directly impose health and economic burdens and indirectly affect the development and flourishment of domestic and export food sectors in Africa. Because these impacts are large, it will be difficult to attain the Sustainable Development Goals or meet the commitments of the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods unless foodborne diseases in Africa are brought under control. Food safety concerns will become of even greater importance as developments advance towards a free trade zone for the continent and promoting these developments becomes necessary.

This paper was developed for the 2018 Africa Day for Food and Nutrition Security and addresses the theme 'Sustained food safety action for improved nutrition and health of Africans'. The paper starts by describing the current status of food safety in Africa, covering the health and economic burden, the most risky foods and the people most at risk. It then briefly summarises current and previous food safety initiatives in Africa. Subsequent sections focus on strengthening the nexus between food quality, nutrition and health and strategic directions for improving food safety policy and regulatory frameworks in Africa.

Status and trend of food safety in Africa

What are foodborne diseases?

Foodborne diseases are illnesses caused by contaminated or naturally harmful food or beverages. A food safety hazard is anything in food that can harm the consumer's health both through short-term and long-term exposure.

There are three major types of hazards:

- Biological hazards: these are living organisms—including viruses, bacteria, protozoa, moulds and parasites—that have the ability to infect people or produce toxins injurious to health. For example, *Salmonella*, which causes gastrointestinal disease, and *Vibrio cholerae*, which causes cholera, are biological hazards.
- Chemical hazards: these can be artificial chemicals produced by industry, or natural chemicals such as toxic metals or those produced by heating food. Aflatoxins and pesticides are examples of chemical hazards that can be found in food and are injurious to health.
- Physical hazards: these include stones and fragments of metal or glass, as well as sub-microscopic nanomaterials and radionuclides. Items that erroneously enter food production lines or are deliberately added to increase food volumes and increase revenues are categorized under physical hazards.

The health burden of foodborne diseases globally and in Africa

The health impacts of foodborne diseases can be measured in different ways, including annual cases of sickness and death. There is also a standard metric for measuring disease burden called the disability-adjusted life year (DALY). One DALY is equivalent to one lost year of healthy life. Measuring health impact in DALYs for all health conditions helps comparisons between different diseases and aids prioritization of interventions.

Systematic and comprehensive evidence on the health burden of foodborne diseases in developing countries started to become available only recently. The landmark first assessment of the global burden of foodborne diseases, conducted by the World Health Organization (WHO), was published in 2015 (Havelaar et al. 2015). The assessment considered 31 hazards for which there was enough information to allow global burden estimates. This showed that foodborne diseases have a global health burden comparable to malaria, HIV/AIDS or tuberculosis and revealed how the negative health impact of foodborne diseases has been grossly overlooked in the past. The global burden of foodborne diseases caused by the 31 known hazards considered in 2010 was 33 million DALYs. Most of this burden (98%) falls on developing countries and on children under five years of age (40%). The results are broadly consistent with other estimates of the health burden of human disease, such as the ones produced by the Institute for Health Metrics and other estimates by WHO.

The WHO estimates foodborne diseases by world regions. There are two regions relevant to Africa named *Africa D*, which comprises mainly countries in west Africa, and *Africa E*, which comprises countries in eastern and southern Africa. The report shows that Africa has the highest incidence of foodborne diseases and the highest death rates and DALYs among all ages, including children under five years of age.

The economic burden of foodborne diseases

Foodborne diseases are associated with a wide range of economic costs. These can be divided into the following categories:
a) the harm caused by the disease (e.g. lost productivity from illness);
b) the cost of response (e.g. treatment and food recalls); and
c) the cost of prevention (e.g. food safety governance and risk-reducing practices)

Alternatively, cost can be presented in relation to the actor along the value chain (consumer, healthcare, agro-food industry, government) who is most affected by them (McLinden et al. 2014). Food-related zoonotic diseases—diseases shared between animals and humans—often exert additional burdens on the livestock sector. Therefore, it is important for cost estimates to cover multiple sectors.

A recent study by the World Bank gives the first global estimate of the economic burden of foodborne diseases (Jaffee et al. 2019). The study measured the productivity cost of foodborne diseases in terms of lost human capital from sickness and death (17 billion United States dollars [USD]), treating foodborne illnesses (USD 2.5 billion) and rejection of exported food because of failure to comply with trading regulations (approximately USD 1 billion). This suggests that the public health and domestic economic costs of unsafe food may be 50 times the trade related costs for sub-Saharan Africa. Figure 1 shows loss of productivity associated with foodborne diseases in African countries; a small number of countries are responsible for a large proportion of loss.

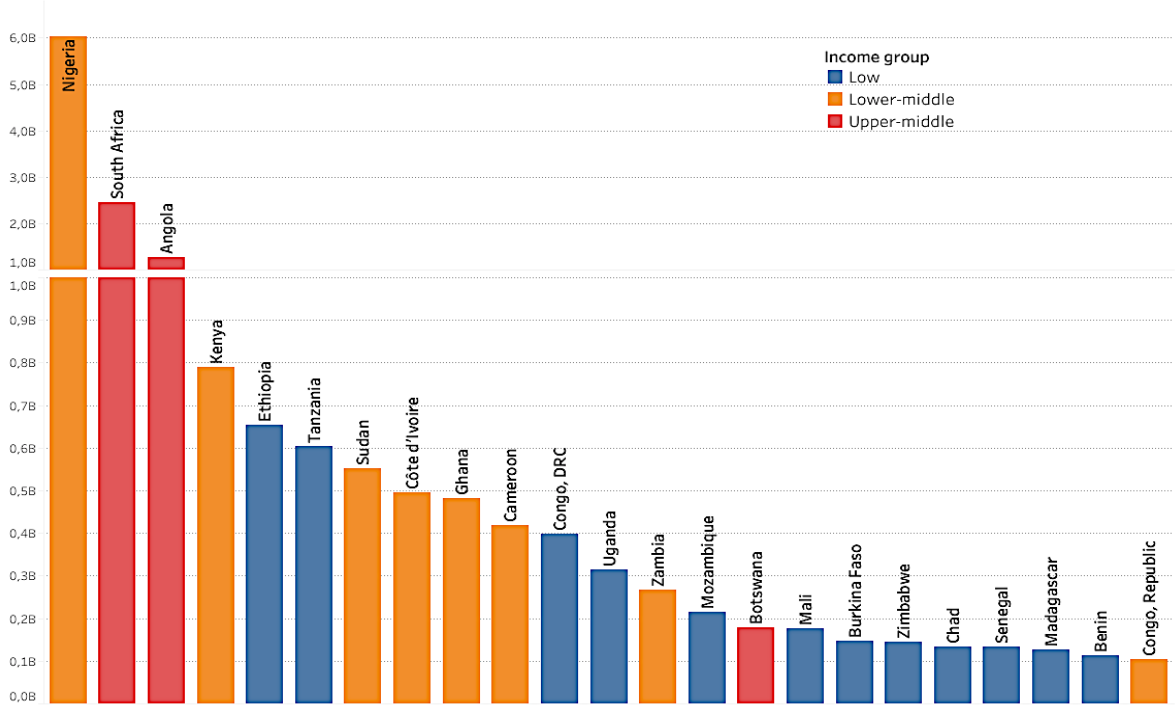

Figure 1. Loss of productivity (million USD) associated with food safety in Africa.

Beyond the economic costs associated with foodborne illnesses, food safety has direct costs associated with market access and trade. Setting up legislation and enforcement of food safety practices and standards requires economic investments by the public sector. Compliance with food safety requirements, both in national and international markets,

represents a direct cost for private industries. These costs are normally higher for small enterprises than for middle and large companies. Accessing international markets poses additional economic costs for businesses to address and manage food safety and comply with highly stringent international standards.

Major food safety incidents can raise alarms in trade partner countries, affect export markets and result in large economic impacts for the country. Similarly, consumer response to food safety scares can have enormous economic impacts on domestic markets and erode trust in government and food safety authorities if not appropriately managed.

Most risky foods

For risk management purposes, it is important to have adequate information on foods highly involved in transmission of foodborne diseases. In most areas of the world, there is very little information on these relationships. This is partly due to difficulties in obtaining food attribution estimates and, in low- and middle-income countries, due to challenges in setting up and maintaining reliable monitoring and surveillance systems for foodborne diseases.

In the absence of such data, a recent WHO study used expert elicitation to attribute foodborne transmission of a selected number of hazards to different food categories (Hoffmann et al. 2017). The study included 11 out of the 31 hazards that were included in the global burden estimates of foodborne diseases. The selected hazards accounted for 43% of the total DALYs (Figure 2). Aggregating across food categories gives an approximation of the burden attributable to broader food categories and accordingly, livestock products were responsible for 67% of the burden, followed by fish, vegetables and fruit in that order (Hoffmann et al. 2017). This is important given the rise in consumption of animal-source foods, fruits and vegetables to address micronutrient deficiencies in low- and middle-income countries. It is also an area that has been neglected in terms of value chain development compared to cereal staples across the continent but expected to develop over the next decades. Addressing and managing food safety will be crucial in that process.

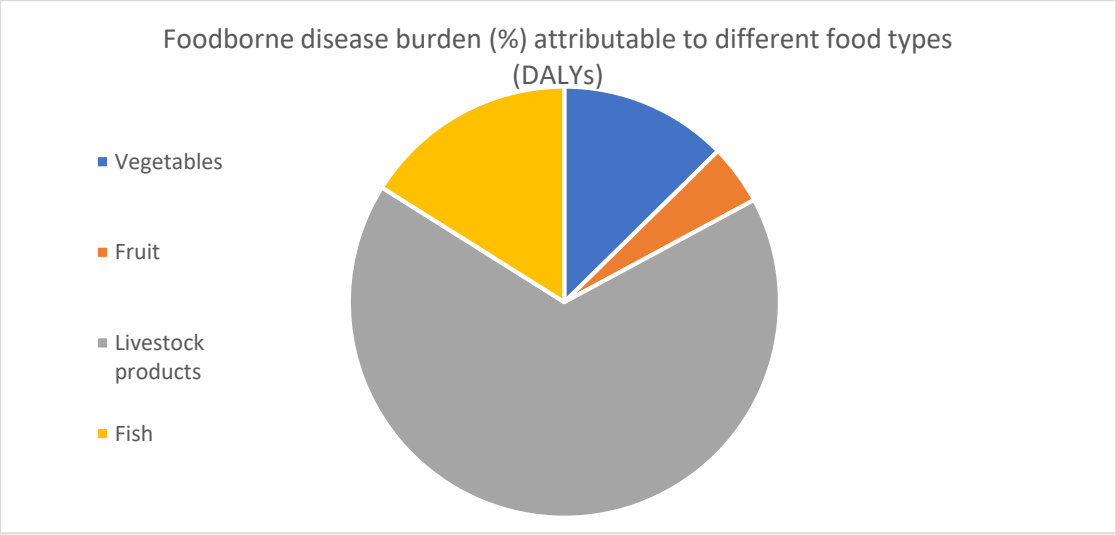

Figure 2. Food disease burden attributable to different food types, not all hazards considered (Hoffmann et al. 2017).

People most at risk of foodborne illnesses

The WHO study found children under five years of age are disproportionately affected by foodborne diseases. This is because of their lack of control over food preparation and tendency to behaviours that increase risk, such as eating soil and animal faeces. Children are also more vulnerable to the consequences of infection because of their developing immune system, small body size, lower levels of stomach acid and other factors (Grace et al. 2018). Elderly people are also at increased risk. Age-related deterioration of the immune system, chronic conditions and longer gut transit time result in increased susceptibility to infections.

Women generally have stronger immunity than men (Berghella et al. 2012) but pregnancy can result in weakening of the immune system, which can alter susceptibility and disease outcomes (Silasi et al. 2015). In addition, some foodborne diseases can pass to the foetus, potentially causing severe abnormalities. Of special concern are listeriosis and toxoplasmosis, both of which can be transmitted via food and can cause serious damage to the brain and other organs of an unborn baby. Campylobacteriosis and, more rarely, salmonellosis during pregnancy can also cause infection and death of unborn babies.

People with primary immunodeficiencies, such as low production of antibodies, are prone to foodborne infections. Similarly, those with acquired immunodeficiencies, such as HIV/AIDS, are at higher risk of diarrhoea caused by foodborne organisms including nontyphoidal *Salmonella* and *Giardia* and, less commonly, *Shigella*, *Campylobacter*, *Microsporidium*, *Cryptosporidium*, *Isospora* and *Cyclospora* (Sax 2001). Patients treated with radiation or immunosuppressive drugs for cancer, diseases of the immune system or as transplant recipients also have lower immunity and higher vulnerability to foodborne diseases. This increased vulnerability to foodborne diseases exacerbates the already compromised nutritional status of individuals with these conditions and results in loss of appetite, reduced food intake and vomit- and diarrhoea-related loss of nutrients and malabsorption.

Aflatoxin: a problem especially in Africa

Aflatoxin belongs to a class of naturally occurring poisons called mycotoxins produced by moulds that are commonly found on maize, groundnuts and other staple crops produced in Africa. Aflatoxins may also be present in milk and other animal-source foods if animals consumed contaminated feed. Aflatoxin can cause liver cancer, has been associated with stunting in children and is correlated with immunosuppression. At high doses, it can cause acute and fatal poisoning, as recently occurred in Tanzania[1].

Aflatoxin is a hazard in other regions of the world but is closely managed and generally well-controlled in advanced food systems through regulation and industry practices. In Africa, aflatoxin is one of many significant hazards and can be used to illustrate the complex nature of the food safety problems that arise on the continent in terms of its causes and multiple impacts.

Cause of the problem

- Climate and other natural conditions conducive to aflatoxin production

[1] Food poisoning linked to 14 deaths in two regions. *The Citizen*, 29 July 2016. https://www.thecitizen.co.tz/News/1840340-3320994-k7rbqoz/index.html

- Low awareness among smallholder farmers of the conditions that contribute to high levels of aflatoxin
- Insufficient extension capacity to educate and train farmers on prevention methods
- Scarce drying and storage infrastructure that can reduce aflatoxin levels
- Few reliable laboratories to test for aflatoxin and lack of affordable, on-farm diagnostic testing
- Weak regulatory enforcement of aflatoxin standards
- Generally weak market incentives for farmers and processors to reduce aflatoxin
- Low awareness among consumers about the dangers of eating contaminated food
- Frequent lack of dietary abundance to permit consumers to dispose of potentially contaminated food

Impact of the problem

- Affects the health of all African consumers but disproportionately affects the rural poor
- Directly causes illness and death from both acute and long-term exposure
- Interferes with nutrition and, thus, food security
- Disrupts regional trade within Africa due to lack of harmonized standards and verification practices
- Causes reduced access to export markets due to inability to meet European and United States of America standards
- Undermines Africa's agriculture-led growth and development strategies
- Imposes another barrier to reducing rural poverty in Africa

Aflatoxin is being addressed in Africa at national, regional and continental levels through initiatives such as the African Union Commission's Partnership for Aflatoxin Control in Africa, which provides a model for integrated and systems-oriented approaches to reducing food safety risks.

Current and previous food safety initiatives in Africa

Many countries in Africa have been undergoing modernization of their food safety systems in the last decades. This has often included developing coordination mechanisms across ministries and departments with mandates for food safety, establishing standards bureaus, upgrading laboratory facilities, updating and harmonizing standards and strengthening export capacity. Although many African countries subscribe to Codex Alimentarius standards, resource challenges have limited their enforcement. Progress has been slow in adopting risk-based approaches, effective governance in the informal sector and traceability and foodborne disease surveillance.

According to a recent analysis by the Global Food Safety Partnership, a public–private initiative for supporting food safety capacity building hosted by the World Bank, the level of activity and investment in food safety capacity building in Africa has grown since 2010. Donor funding for capacity building projects, for which food safety resources are available, exceeded USD 383 million from 2010 to 2017. The European Commission, United States of America, the Food and Agriculture Organization of the United Nations and WHO have been the most pervasively present public funders of capacity building projects for food safety in sub-Saharan Africa from 2010 to 2017, accounting for 78% of 360 food safety focus projects and activities and 70% of all projects. Over half of all projects (56%) focus on

national food safety control systems, including regulatory legislations and standards, capacity building of government laboratories and training of government staff (report forthcoming).

As part of the Comprehensive Africa Agriculture Development Programme biennial review process, there has been strong recognition of the need for a food safety index to promote a development that is conducive to the desired improvements in the food safety environment in the continent. This development should be encouraged and supported by research to test the usefulness of the index developed so that improvements can be taken where needed. This is important for the use of the food safety index on the Malabo mutual accountability mechanism to which countries have committed.

Strengthening the nexus between food quality, nutrition and health

Stunting affects 155 million children under five years of age globally and is preventable but largely irreversible when it occurs within the first 1000 days of a child's life, which is a critical period for brain development. Infectious diseases such as diarrhoea and upper respiratory and helminth infections are considered to contribute to malnutrition. Many studies have shown that the burden of stunting can be partly prevented by improved nutrition.

Undernutrition and foodborne diseases are related. Infectious foodborne diseases commonly manifest as diarrhoea, which is strongly associated with stunting (Checkley et al. 2008; Guerrant et al. 2013; Richard et al. 2014). Around half the burden of infectious diseases results from non-gastrointestinal manifestations that can also cause undernutrition through reduced appetite and increased nutrient requirements resulting from inflammation, infection or other catabolic conditions (Tappenden et al. 2013).

More recently, environmental enteric dysfunction (EED) has been estimated to significantly contribute to stunting (Grace et al. 2018). Foodborne and zoonotic pathogens such as *Campylobacter* spp., different types of enteropathogenic *E. coli*, *Shigella* spp., norovirus and *Giardia* spp. are important agents implicated in causing EED. There is increasing evidence that the cycle of enteric disease and malnutrition may also predispose individuals to chronic diseases such as obesity and its associated co-morbidities, leading to a 'triple burden of the impoverished gut'—diarrhoea, malnutrition and co-morbidities (Guerrant et al. 2013).

Certain foodborne hazards have been found to have a direct effect on nutrition. This is the case of aflatoxins, where evidence of an association between aflatoxin exposure and stunting has been reported in a cross-sectional study in Togo and Benin, both countries located in sub-Saharan Africa (Gong et al. 2002). However, this was not reproduced in a cohort study in Nepal, where exposure was approximately 10 times lower than in Africa (Mitchell et al. 2017).

Strategic directions for improving food safety policy and regulatory frameworks in Africa

Past and current food safety efforts in Africa have substantially focused on access to regional and overseas export markets, with emphasis on oversight by national control systems to facilitate trade. Relatively little is being done to reduce foodborne illnesses and upscale food safety in national markets. The current focus reflects the economic importance of food exports to African governments, the role of African governments in overseeing exports and the focus of European and other donors on the safety of food they import from sub-Saharan Africa. These efforts should continue as exports are important for vibrant and diversified economies.

At the same time, recent analysis from WHO and the World Bank underscores the importance of focusing on food safety as an African health challenge, especially in the subsistence and informal market sectors where millions of Africans get most of their food. This new evidence implies a new strategic direction for food safety efforts in Africa is warranted.

The following recommendations on future food safety capacity development investments in Africa are drawn from recent studies by the World Bank and the Global Food Safety Partnership.

- *Elevate food safety in sub-Saharan Africa on the international health agenda*. Governments and donors should increase investment in food safety and prioritize the development of knowledge and intervention strategies to effectively address hazards and reduce risk in both informal and formal markets.

- *Establish goals, priorities and strategies that consider the health and development impacts of foodborne illnesses*. Africa's national governments and regional institutions, in dialogue with the donor community, should establish evidence-based goals, priorities and implement strategies that consider the public health burden and development impacts of foodborne illnesses in sub-Saharan Africa, especially among consumers who are dependent on informal markets.

- *Apply Codex food safety principles as appropriate*. In planning capacity investments, the donor community and national governments should apply Codex principles of science- and risk-based prevention as appropriate to local conditions and ensure that every proposed project has an opportunity to make a sustainable contribution to improvement in food safety.

- *Harness today's marketplace drivers of progress on food safety*. Donors and national governments should use their position and resources to recognize, catalyse and support consumer and marketplace drivers of progress on food safety.

Recommendations

The issues outlined in this background paper show that there are clear areas in the food safety domain that need attention to address not only health but also nutrition challenges in the continent. It is important that research provides the evidence on the gaps and the possible solutions that are locally relevant to help mitigate some of these challenges and direct progress in the continent.

We make the following recommendations:

- *Address key research gaps*: More evidence is needed on biological and chemical contamination of supplementary foods, the nature and origin of the pathogens involved and the fractional contribution to health outcomes arising from contamination outside and inside the household. Links between livestock keeping, gut microbiomes, diarrhoeal disease and health and nutrition outcomes are complex and poorly understood.

- *Focus on holistic research*: Research with strong linkages between nutrition and food safety is needed. Food safety considerations should be included in nutrition projects and nutrition considerations in food safety initiatives. There are both trade-offs and synergies between food safety and nutrition that if not considered will undermine the desired progress on nutrition outcomes in Africa.

- *Conduct food safety research on informal food sectors*: This is an increasingly important sector that feeds African consumers. Ways of addressing food safety concerns in these markets must be found within the characteristics and constraints of different settings on the continent.

- *Strengthen food safety systems*: We need research and policies that offer nationally relevant initiatives for the development of national and intra-African food safety systems. This is important to support recent developments toward a continental free trade area.

- *Develop a continental food safety index*: Current efforts to develop an African food safety index should be supported by research to ensure maximum utilization to promote food safety systems that can improve the needed food safety standards in the continent.

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