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The public health burden of unsafe foods: a need for global commitment

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The WHO Foodborne Epidemiology Reference Group (FERG) published the first estimates of the global burden of foodborne disease (FBD) in 2015 (Havelaar et al., 2015). Key findings were that thirty-one foodborne hazards caused 600 (95% uncertainty interval [UI] 420–960) million foodborne illnesses and 420,000 (95% UI 310,000–600,000) deaths in 2010. The global burden of foodborne disease caused by the 31 hazards studied was 33 (95% UI 25–46) million Disability Adjusted Life Years (DALYs). In total, 40% of the FBD burden was among children under 5 years old. Overall, the African (AFR), South-East Asian (SEAR) and Eastern Mediterranean (EMR) D subregions had the highest FBD burden.

The most common causes of foodborne illness were diarrheal disease agents; particularly norovirus and *Campylobacter* spp. Foodborne diarrheal disease agents, particularly non-typhoidal *Salmonella enterica*, furthermore caused 230,000 (95% UI 160,000–320,000) deaths. Other major causes of FBD deaths were *Salmonella Typhi*, *Taenia solium*, hepatitis A virus and aflatoxin.

FERG estimates of the FBD burden are probably conservative, i.e., underestimates rather than overestimates. Limited resources and data obliged FERG to focus on only a subset of more than 100 hazards of potential relevance. Estimates of the burden of disease from chemicals and toxins was a particular challenge as there are thousands of chemicals potentially contaminating the food supply and many naturally occurring toxins. How many chemicals make it into the food supply is unknown for most low- and middle-income countries (LMIC). Of the 31 FBD hazards considered in the 2015 report, there were only three chemicals – aflatoxin, dioxin, and cyanide in cassava (the latter with data from only five African countries). The burden of peanut allergy was only documented for high income (A) sub-regions. As part of the FERG effort, manuscripts on the burden of disease from foodborne metals (methylmercury, lead, arsenic, and cadmium) have been recently been submitted for publication (Gibb et al., submitted for publication). Although these manuscripts will not become official WHO estimates due to methodological differences, they document an important FBD burden. These foodborne metals account for 9 million Disability Adjusted Life Years (DALYs). Lead is estimated to account for the most illnesses and DALYs globally (Gibb et al., 2018).

There is increasing evidence that chronic asymptomatic colonization with enteric pathogens may lead to stunting by causing so-called environmental enteric dysfunction (Rogawski et al., 2018). Foodborne pathogens associated with decreased linear growth include *Campylobacter* spp., enteropathogenic *Escherichia coli*, *Shigella* spp., *Cryptosporidium* spp., *Giardia* spp. and norovirus.

FERG has published attribution estimates for foodborne pathogens to food groups such as different types of meats, eggs, vegetables, fruits and nuts etc. (Hoffman et al., 2017). Using these data, it was estimated that 35% of the global burden of FBD was caused by animal source foods (ASF). The relative contribution of ASF to FBD burden differed widely between subregions, and between countries within the same subregion. The FBD burden of ASF was lowest in high-income subregions, where the proportion of ASF in the diet was highest. ASF consumption significantly increased with income, while ASF FBD burden significantly decreased. This suggests that as countries get richer, their food safety systems evolve and the greater effectiveness of these systems is able to not only keep up with the increasing consumption of ASF but even makes these foods safer to consume (Li et al., unpublished information).

DALYs comprehensively quantify the health-related disease burden of FBD, but the economic burden (cost-of-illness, losses in the agricultural and food sectors and trade impacts) is also an important factor to consider in national and international decision making. Limited data are currently available, but one study suggests that the FBD cost in India is about \$28 billion or around 0.5% of the country's gross domestic product (GDP) every year (Smeets et al., 2017).

Also, food production can cause human diseases by mechanisms other than direct transmission of pathogens through food consumption. For example, animal husbandry is an important source of zoonotic disease agents that spread from pigs, poultry, cattle, etc., by direct contact or through the environment, and may also affect livestock health.

The considerable difference in the burden of FBD between low- and high- income regions suggests that a major proportion of the current FBD burden is avoidable. A recent analysis by the World Bank, based on FERG data, suggests that the FBD burden of ASF in Sub-Saharan African countries with adequate levels of operational funding for veterinary services is 208 DALYs per 100,000 population, while it is 569 DALYs per 100,000 population in countries where such funding is inadequate (Jaffee et al., 2019). For a country like Nigeria, inadequate funding of veterinary services would translate to annual production losses of US\$ 1.3 billion. These authors conclude that “these results provide a compelling case that moderate levels of investment in enhancing food safety management capacity—and specifically for animal-based FBD—can have significant public health and economic benefits”. A key challenge is to adopt approaches that have been proven successful in high-income countries to LMIC in an economically and culturally acceptable way. Furthermore, interventions to improve the safety of ASF require multisector approaches, and may not be effective in isolation, underlining the need for One Health initiatives.

While FBDs are closely linked to poverty in developing countries, they are also a global public health issue. Growing international trade and longer and more complex food chains increase the risk of cross-border transportation of contaminated foods. Furthermore, migration and travel can expose people to new hazards. Achievement of the Sustainable Development Goals, in particular the overarching goals of poverty reduction, achieving food security and ensuring healthy lives, will depend in part on successful reduction of the burden of FBD.

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