World Health Organization Estimates of the Relative Contributions of Food to the Burden of Disease Due to Selected Foodborne Hazards: A Structured Expert Elicitation

Background
The Foodborne Disease Burden Epidemiology Reference Group (FERG) was established in 2007 by the World Health Organization (WHO) to estimate the global burden of foodborne diseases (FBDs). This estimation is complicated because most of the hazards causing FBD are not transmitted solely by food; most have several potential exposure routes consisting of transmission from animals, by humans, and via environmental routes including water. This paper describes an expert elicitation study conducted by the FERG Source Attribution Task Force to estimate the relative contribution of food to the global burden of diseases commonly transmitted through the consumption of food.

Methods and Findings
We applied structured expert judgment using Cooke's Classical Model to obtain estimates for 14 subregions for the relative contributions of different transmission pathways for eleven diarrheal diseases, seven other infectious diseases and one chemical (lead). Experts were identified through international networks followed by social network sampling. Final selection of experts was based on their experience including international working experience. Enrolled experts were scored on their ability to judge uncertainty accurately and informatively using a series of subject-matter specific 'seed' questions whose answers are unknown to the experts at the time they are interviewed. Trained facilitators elicited the 5th, and 50th and 95th percentile responses to seed questions through telephone interviews. Cooke's Classical Model uses responses to the seed questions to weigh and aggregate expert responses. After this interview, the experts were asked to provide 5th, 50th, and 95th percentile estimates for the 'target' questions regarding disease transmission routes. A total of 72 experts were enrolled in the study. Ten panels were global, meaning that the experts should provide estimates for all 14 subregions, whereas the nine panels were subregional, with experts providing estimates for one or more subregions, depending on their experience in the region. The size of the 19 hazard-specific panels ranged from 6 to 15 persons with several experts serving on more than one panel. Pathogens with animal reservoirs (e.g. non-typhoidal Salmonella spp. and Toxoplasma gondii) were in general assessed by the experts to have a higher proportion of illnesses attributable to food than pathogens with mainly a human reservoir, where human-to-human transmission (e.g. Shigella spp. and Norovirus) or waterborne transmission (e.g. Salmonella Typhi and Vibrio cholerae) were judged to dominate. For many pathogens, the foodborne route was assessed relatively more important in developed subregions than in developing subregions. The main exposure routes for lead varied across subregions, with the foodborne route being assessed most important only in two subregions of the European region.

Conclusions
For the first time, we present worldwide estimates of the proportion of specific diseases attributable to food and other major transmission routes. These findings are essential for global burden of FBD estimates. While gaps exist, we believe the estimates presented here are the best current source of guidance to support decision makers when allocating resources for control and intervention, and for future research initiatives.