Title Reducing the risks of aflatoxin through public health interventions

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Abstract

Aflatoxin, produced by the fungi *Aspergillus flavus* and *A. parasiticus,* is the most potent naturally occurring human hepatocarcinogen. Food crops colonized by these fungi, especially maize and groundnut, are the major sources of dietary aflatoxin exposure. Aflatoxin and chronic hepatitis B virus (HBV) infection, two liver cancer risk factors that synergize with each other, are prominent in sub-Saharan Africa and certain parts of Asia. Furthermore, increasing evidence from epidemiological studies suggests that aflatoxin may cause child growth impairment, which can increase risks of premature deaths. A broad range of aflatoxin control strategies, developed to reduce aflatoxin exposure or its toxicity, include preharvest, postharvest, and dietary interventions; as well as the HBV vaccine, which does not reduce aflatoxin exposure but reduces the risk of aflatoxin-induced liver cancer.

We compared the efficacy and the cost-effectiveness of four aflatoxin risk-reduction strategies: HBV vaccine, biocontrol (preharvest), a postharvest intervention package, and NovaSil clay (dietary) in preventing liver cancer and stunting in Nigeria. Aflatoxin and chronic HBV infection are attributable for 8-27%, and 59-62%, respectively, of total liver cancers in Nigeria. We found that the HBV vaccine provides the greatest health-based efficacy and the lowest cost to avert one disability-adjusted life year (DALY) in Nigeria, compared with the selected aflatoxin control interventions. The prospective burden of aflatoxin-related stunting in Nigeria varies depending on aflatoxin exposure levels, which can vary substantially by year and location. At higher levels of aflatoxin exposure, the burden of aflatoxin-associated stunting is significant. Preventing stunting by any of these interventions would greatly reduce the cost per DALY and turn these interventions from non-cost-effective to very cost-effective. Our technical feasibility assessments of these four interventions suggest some advantages and disadvantages of each intervention over the others. These data are crucial components in a decision making process to effectively allocate public health resources, and to position interventions for further development of public health interventions to prevent some aflatoxin-related public health problems, especially in high risk populations.