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What do pollinator declines mean for human health?

Human activity is transforming natural systems and endangering the ecosystem services they provide, which has consequences for human health. This study quantified the human health impact of losses to pollination, providing the first global analysis of its kind. The researchers say pollinator declines could increase the global disease burden and recommend increased monitoring of pollinators in at-risk regions, including Eastern and Central Europe.

Human activity is accelerating the loss of biodiversity. Pollinators are experiencing particular declines, including insects like bees as well as birds (e.g. hummingbirds) and mammals (e.g. fruit bats). In the past 10 years, the number and species diversity of both managed and wild pollinators has decreased.

These declines are of direct concern for human health. This is because the work of pollinators is critical for growing crops — pollinators contribute to yield for an estimated 35% of global food production. They are also directly responsible for up to 40% of the global supply of certain nutrients, including vitamin A, which is important for growth and development, and folic acid, which is essential for bodily function and cannot be synthesised by humans. Pollinator loss could therefore not only reduce energy intake, but also threaten population health.

This study estimated the effect pollinator declines might have on human health by modelling impact on food and nutrient intake across the globe. The researchers assembled a database of supplies of 224 different food types in 156 countries, based on 2009 FAO data. To estimate the reductions in nutrient and food intakes caused by pollinator declines, they quantified the nutrient composition and pollinator dependence of the foods. Calorie intake was kept constant by assuming replacement with staple foods, such as cereals. This is supported by evidence of increased intake of cheap staple foods as a coping strategy during food shortages.

If all pollinators were eliminated, global fruit supplies would decline by 23%, vegetables by 16% and nuts and seeds by 22%. Seventy-one million people in low-income countries could become deficient in vitamin A and a further 2.2 billion already consuming below the average would experience further declines in supply. For folic acid, 173 million people may become newly deficient in the vitamin and a further 1.23 billion already deficient would experience further declines.

Changes in food and nutrient intake were linked to risk of three groups of disease: non-communicable (non-infectious, chronic diseases such as cancer, diabetes and heart disease), communicable (transmissible diseases such as TB and influenza) and malnutrition-related (e.g. vitamin deficiencies like rickets), using the Global Burden of Disease 2010 risk assessment framework.

Global deaths from non-communicable and malnutrition-related diseases were estimated to increase by 1.42 million (2.7%) every year, and 'disability-adjusted life years' (DALYs: years lost due to poor health, disability or early death) would increase by 27 million (1.1%) each year. The researchers published a table of the DALY burden of disease impacts for each of the 156 different countries, split between in-country and imported sources, to show how much of the burden is due to local pollinator declines.

Continued on next page.

Source: Smith, M., Singh, G., Mozaffarian, D. & Myers, S. (2015) Effects of decreases of animal pollinators on human nutrition and global health: a modelling analysis. *The Lancet*, 386(10007), pp.1964-1972. DOI: 10.1016/S0140-6736(15)61085-6.

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1.See Web Table S5, found in Supplementary appendix in original article, for details.

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The researchers also modelled two less severe scenarios. A 50% loss of pollination services would be associated with 700 000 extra deaths every year and 13.2 million DALYs, while a 75% loss would increase deaths to 1.05 million and DALYs to 19.5 million.

Almost the entire health burden was due to increases in non-communicable diseases, associated with low fruit, vegetable and nut and seed intake. The effect was also largely due to pollinator-dependent foods grown locally, rather than imported. The authors therefore say local resource management (e.g. active stewardship of pollinator populations) could generate significant health benefits.

Regions identified as at risk — central and eastern Europe, south and southeast Asia, and sub-Saharan Africa — may particularly benefit from increased monitoring of local pollinators to protect public health, as well as economic wellbeing.

By estimating per-person intakes of nutrients and foods under full and partial pollinator decline scenarios, and then quantifying the health effect, this study provides the first worldwide analysis of the contribution of pollination services to human health.

Overall, the authors say policymakers (especially in vulnerable nations) should mitigate the risk by implementing management strategies. They cite the EU, which has restricted use of neonicotinoid pesticides and promoted natural beekeeping practices, as an example. By revealing the potential impact of and national vulnerabilities to pollinator decline, this study will help policymakers to make decisions about which strategies to use and where.

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