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The Future of Stunting: Potential Scenarios under Climate Change

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Stunting affects up to 155 million children aged 5 or younger worldwide,[1] making it an all-too-common threat to global health. Some investigators have suggested that climate change may impair progress on stunting reduction. That's because higher temperatures and altered rainfall patterns are projected to reduce crop yield, decreasing the amount of food that is available,[2] as well as potentially altering some food's nutritional content.[3] A recent study in *Environmental Health Perspectives* broadens that line of inquiry by modeling the complex interactions between climate change and the socioeconomic factors that govern stunting rates.[4]

The term "stunting" refers to the impaired physical growth and development that results from inadequate nutrition and repeated infections with, for example, diarrheal diseases that reduce nutrient uptake. Stunted children are short for their age. They also may have impaired cognitive development, which can interfere with schooling and, thus, their ability to earn a living later.[1]

According to the authors of the new paper, increased income from rising food prices could potentially mitigate the effects of climate on stunting, but only if it is combined with adequate work with decent pay for rural farmworkers.[4] "In other words, reducing poverty and inequality among rural communities would be expected to reduce both undernutrition and the vulnerability of nutritional status to climate change," explains lead author Simon Lloyd, a research fellow at the London School of Hygiene & Tropical Medicine. "No previous work has considered that possibility."

In conducting the research, Lloyd and his colleagues developed a statistical model to estimate how stunting rates might change in response to two interacting drivers: food prices and incomes among those in poverty. That model depended, in turn, on output from two upstream models. One of these, developed by the World Bank, projects incomes for the bottom 20% wage earners in the global population until 2030.[5] The other, developed by the International Institute for Applied Systems Analysis (IIASA), assesses competition for land use between agriculture, bioenergy, and forestry.[6]

Both the World Bank and IIASA models were run under varying climate and socioeconomic scenarios. The climate scenarios were based on projections known as Representative Concentration Pathways (RCPs), including a best-case scenario under which greenhouse gas emissions peak by midcentury and then decline

Modeling suggests that rates of stunting in developing countries may increase as climate change progresses, with a greater proportion of the burden falling on rural areas. However, modest increases in food prices relative to rural incomes may reduce overall stunting, especially among farm children. Image: © Milton Rodriguez/Shutterstock.

(RCP 2.6) and a worst-case scenario under which they continue to rise unabated (RCP 8.5).

The socioeconomic scenarios, meanwhile, included a "prosperity future," wherein rural incomes among the poor rise proportionately with food prices, and a "poverty future," which assumes that economic benefits from rising food prices go primarily to wealthy landowners. The stunting model was limited to 44 countries in the developing world.

Taking all these factors into consideration, model results estimated that while stunting rates would rise in aggregate as climate change progresses, the increases would be more pronounced under poverty than under prosperity. More specifically, increasing prosperity among those with the lowest incomes would mitigate stunting to a greater degree among the rural poor, compared with the urban poor.

Samuel Myers, a principal research scientist at the Harvard T.H. Chan School of Public Health, who was not involved in the study, says the interplay between climate change, food prices, and health outcomes is one that warrants more attention. "This work makes a valuable contribution as an early step taking us in that direction," he says.

The major caveat, Myers adds, is that the results were projected only to 2030, when the "kinds of impacts we really worry about are in the 2050 to 2100 range. At that point, climate change impacts on crop yield and quality may be the dominant drivers of stunting. We just do not know."

Lloyd agrees that longer-term modeling is needed. But he says data limitations in the World Bank model restricted the study's projections and that without more data, long-term projections would be too uncertain. Still, while climate change impacts by 2030 were estimated to be relatively small, he says, they were not unimportant.

"In the absence of successful poverty and climate change reductions, climate change by 2030 resulted in over one million more stunted children, while more successful efforts to address poverty limited the increase to five hundred thousand," Lloyd says. Beyond 2030, the differences between modeled climate futures grows ever larger, he concedes, and by then climate change will likely have greater impacts on other factors, such as labor productivity, disasters, and infectious diseases, "each of which could affect incomes, food prices, and, in turn, stunting."

Charles W. Schmidt, MS, an award-winning science writer from Portland, Maine, writes for *Scientific American*, *Science*, various *Nature* publications, and many other magazines, research journals, and websites.

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