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Vaccines work: a reason for celebration and renewed commitment

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With policy makers around the world considering how to allocate limited health budgets and individuals considering whether to accept vaccinations for themselves and their children, understanding the impact of vaccination has never been more important to inform those decisions. A modelling study by Xiang Li and colleagues in *The Lancet* reports that vaccination against ten common vaccine-preventable diseases (VPDs) reduced deaths by nearly half in low-income and middle-income countries between 2000 and 2019.[1] Using demographic and vaccine coverage data, the authors compiled and analysed modelled VPD burden and vaccine impact estimates from 16 independent research groups. The main findings highlight the large impact of vaccination and how well the global immunisation community and caregivers have done in vaccinating children. Remarkably, this finding is likely to be an underestimate of the full impact of vaccination, and yet, at the same time, the global community is at risk of losing these gains.[2]

One reason why the study by Li and colleagues underestimates vaccination impact is because it includes only 98 countries globally; however, the low-income and middle-income countries included in the analysis account for most of the burden of childhood VPDs. More than 95% of the global mortality over the past 20 years from measles, *Haemophilus influenzae* type b, hepatitis B, *Neisseria meningitidis* serogroup A, *Streptococcus pneumoniae*, and yellow fever occurred in the countries included in this analysis, but almost a third (31%) of the world's population lives in countries not included in this study.[1] Countries in the Americas, Europe, northern Africa, and the Middle East are not well represented, and many of these excluded countries have pockets of low childhood vaccination and high VPD burden.[2]

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Another reason why this study underestimates vaccination impact is that it includes only ten of the vaccines commonly used in routine childhood immunisation programmes. Pertussis vaccination was not included and has the potential to impact paediatric mortality more than some of the other vaccines included in this analysis.[3] Seasonal influenza vaccine, although variably used in children around the globe, was not included and would reduce severe disease, and potentially mortality, if used more broadly.[4] The study also excluded most vaccines against epidemic-prone and pandemic-prone diseases, such as cholera, Ebola virus, and typhoid, which have the potential to save many lives. Other than cholera, these diseases primarily affect older children and adults, and these age groups are increasingly the target of new vaccinations and booster doses given across the life course.[2] Furthermore, the study does not consider reduction in mortality beyond direct protection, such as through non-specific effects[5] and reductions in secondary infections and antimicrobial resistance.[6]

The study by Li and colleagues[1] models the impact of vaccination because forecasting and direct measurement of deaths and disease through surveillance and vital registration records are challenging in many countries. Strong evidence of vaccine impact exists for many vaccines against laboratory-confirmed diseases, such as measles,[7] rubella,[8] rotavirus,[9] and *N meningitidis* serogroup A.[10] Even these direct measures of impact are limited by poor VPD surveillance, laboratory confirmation, and data analysis capacity in many parts of the world, especially in the countries included in the study by Li and colleagues.[11] Maintaining and strengthening VPD surveillance globally could facilitate validating this study's estimates and providing robust data to strengthen future models.[11]

Accurately estimating and forecasting vaccination coverage are difficult because of poor data quality and are especially challenging for vaccines that are given outside of infancy and in countries with a large private sector providing vaccines. One rare scenario in which Li and colleagues might have overestimated instead of underestimated impact is for rotavirus disease, because rotavirus vaccine coverage lags behind coverage for other vaccines,[12] and the authors assumed that new vaccines (such as rotavirus) would reach coverage of a reference vaccine (the third dose of diphtheria-tetanus-pertussis) within 2–3 years.

Despite the success of vaccination globally, people are still dying from VPDs.[13] The COVID-19 pandemic has interrupted immunisation services and compromised health systems in many countries.[14] Low vaccine coverage before the COVID-19 pandemic was leading to a resurgence in VPDs, such as measles.[7] This decline in coverage together with vaccine scepticism, which is being increasingly reported in low-income and middle-income countries, threatens to reverse the gains that have been achieved.[15] The Immunization Agenda 2030,[2] a strategy for immunisation developed by global partners, lays out a framework for sustaining the gains modelled in this study and continuing to save lives through vaccination, including with new vaccines such as those against COVID-19. Global leaders and the immunisation community can use the findings of Li and colleagues to inform renewed efforts to ensure everyone receives all their vaccines on time throughout their life. If this happens, the next run of these models will show that many more lives have been saved due to vaccination.

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