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Estimation of distribution of childhood diarrhoea, measles, and pneumonia morbidity and mortality by socio-economic group in low-income and middle-income countries



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Abstract

Background Vaccines are one of the most successful interventions in improving population health in low-income and middle-income countries (LMICs). In addition to the direct improvements in health outcomes, we are interested in their distributional effects—that is, whether vaccines promote or reduce health equity across socioeconomic groups. Empirical data on incidence and mortality of vaccine-preventable diseases across socioeconomic groups is not available. Therefore, we developed a method to estimate the distribution of childhood diseases and deaths across income groups and the benefits of three vaccines—for diarrhoea, measles, and pneumonia—in 41 LMICs.

Methods For every country and disease (diarrhoea, measles, pneumonia), we estimated the distribution of cases and deaths that would occur in each income quintile had there been no immunisation or treatment programme, using both the prevalence and relative risk of a set of risk and prognostic factors. Building on these baseline estimates, we assessed the effect of three vaccines (first dose of measles vaccine, pneumococcal conjugate vaccine, and rotavirus vaccine) under five scenarios based on sets of quintile-specific immunisation coverage and uptake of disease treatment.

Findings Because the prevalence of risk factors is higher in the poorest two quintiles than in the rest of the population, more disease cases and deaths would occur in the poorest two quintiles for all three diseases when vaccines or treatment are unavailable. However, we noted that current immunisation coverage and treatment utilisation rates have resulted in greater inequity in the distribution of cases and deaths. Even if in absolute terms the poorest quintiles benefit more from vaccines, the wealthier two quintiles see a higher percentage decrease in cases and deaths. Thus, in terms of overall distribution of remaining cases and deaths with vaccine coverage, the poorest quintiles would see a higher comparative burden of disease than they would without vaccine coverage. Country-specific context, including how the baseline risks, immunisation coverage, and treatment utilisation are currently distributed across quintiles, affects how different policies translate to improvements in the distribution of cases and deaths.

Interpretation Our analysis highlights several factors, including risk and prognostic factors, and vaccine and treatment coverage that would substantially contribute to the unequal distribution of childhood diseases, and we found that merely ensuring equal access to vaccines will not reduce the health outcomes gap between income quintiles. Such information can inform policies and planning of programmes that aim to improve equitable delivery of healthcare services.

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Declaration of interests

We declare no competing interests.

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