Studies show vaccines have unexpected benefits — better cognition, school grades and child growth

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The use of vaccination for preventing diseases has had the most profound effect on human health and quality of life. For instance, the polio vaccine has saved an estimated 16 million people from paralysis worldwide as of 2017, according to the World Health Organization (WHO). Despite this, anti-vaccination movements are gaining popularity in recent years, especially in high income countries with historically near universal vaccine coverage, like the USA. Consequently, cases of diseases like measles have seen a 30% rise globally. Vaccine hesitancy has been declared one of the top ten threats to global health by the WHO in 2019. In times like these, what if science showed some added benefits of vaccination besides the obvious?

A recent set of studies by a team of international researchers, led by those at the Center for Disease Dynamics, Economics & Policy (CDDEP), Washington DC and New Delhi, have shown that vaccines can have other unintentional positive effects. They show that measles and *Haemophilus influenzae* type B (Hib) vaccine can have long term cognitive, health and schooling benefits in children from countries like India, Vietnam and Ethiopia. The Bill and Melinda Gates Foundation funded the studies.

"The motivation for these studies comes from a small but growing body of evidence on the potential long-term benefits of vaccines," says Dr Arindam Nandi, Senior Fellow at CDDEP and the lead author of the studies. "Infectious diseases in early childhood can have negative effects on physical growth and cognitive capability in later life. Vaccinating against such diseases may, therefore, improve health, cognitive, schooling, and economic outcomes in the future, subject to vaccine effectiveness and the underlying environment," he argues.

The researchers have used data from the publicly available dataset 'Young Lives', which has surveyed causes and consequences of childhood poverty. Young Lives followed the lives of ~12,000 children from four low to middle-income countries: India, Ethiopia, Vietnam and Peru. The researchers used the data collected for the same set of children over the years at different ages, starting from 6-18 months, then at 4–6 years, 7-8 years, 11-12 years and 14-15 years for the studies. They used percentage scores from cognitive tests, school grades and Z-scores, a statistical measure of the deviation from the mean value of a group, to find differences in cognition and physical development between children who were either reported as vaccinated or unvaccinated at the baseline.

The studies compared scores for optimal values of height, body mass index (BMI) and weight among vaccinated and unvaccinated children. Besides, the performance of kids in cognitive tests like picture vocabulary test, reading, language

and mathematics, and school grades were compared. The available data contained details of children coming from different backgrounds, with differences in metrics like the age of the child, standard of living, access to healthcare, social or ethnic group and religion. Hence, the researchers used statistical tools to eliminate any bias stemming from these factors, so that the differences observed could be attributed to the vaccine under study.

The first study compares the effect of measles vaccination on children from India, Vietnam and Ethiopia. It found that vaccinated children had better results in education, schooling and physical developmental parameters. In India, they also had the improved height for their age at 7-8 years and better vocabulary and English proficiency at 11-12 years. In Vietnam, the vaccinated kids had higher body mass index and weight and scored better in vocabulary, mathematics and reading tests at 7-8 years. They also had a higher vocabulary score at 11-12 years. Vaccinated children in Ethiopia also showed similar trends; they scored high in vocabulary, mathematics and reading tests at 7-8 years. All vaccinated children obtained higher schooling grades across ages and countries.

The second study looks at the effects of Hib vaccination among children in India. It found that Hib-vaccinated children had better scores for height, scored higher points in English and mathematics tests, and attained higher schooling grades at 11-12 years. These trends stay unchanged at age 14-15.

India ranks fourth in the world in the number of cases registered for measles in 2019, according to the WHO. However, the number of cases registered in 2019 have seen a decline to around 53,000 cases till August 2019 from around 1,20,000 for the same period in 2018. The measles vaccine has been responsible for avoiding an estimated 21.1

million child deaths globally between 2000 and 2017. Hib affected an estimated 33,270 children annually, until as recently as 2015. The Hib burden in India has decreased by almost 84% after the Hib vaccination was introduced in the national immunization program. These studies indicate that in addition to saving lives, these vaccines can also have a host of non-health benefits. In today's world, where anti-vaccination movements are gaining popularity, studies like these have more significance.

"Lack of information and misinformation contributes to low vaccination coverage rates in many countries. The recent outbreaks of measles in high-income countries have brought vaccine hesitancy to the forefront of the public domain. It is important to realize that vaccine hesitancy may exist equally in poorly-educated as well as highly-educated populations. Public policies must be designed to counter both," remarks Dr Nandi on the trend.

Low and middle-income countries like India cannot afford to miss out on the critical policy implications thrown open by these studies, as they have the largest burden of vaccine-preventable diseases in the world. These positive cognitive, health and social outcomes show that vaccines have social and economic benefits.

This article has been run past the researchers, whose work is covered, to ensure accuracy.