Effectiveness of Immunization Programs in Public Health Outcomes; Systematic Review

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Abstract

Background: By assisting in the development of a person's immunity to specific infectious agents, vaccines can lower a person's risk of infection and the severity of related disorders. This study synthesizes previous research and secondary data to examine the effects of vaccination programs on public health.

Method: A thorough search method was used to locate pertinent research to look at how vaccination campaigns affect public health. We made use of electronic resources including Web of Science, Google Scholar, PubMed, and Scopus. Only English-language publications released between 2013 and 2018 were included in the search.

Results: Immunization programs have significantly improved public health by lowering the prevalence of illnesses like influenza, polio, and measles that may be prevented by immunization. Immunization has been demonstrated to lower rates of illness and death, mostly in vulnerable populations such young children, the elderly, and those with weakened immune systems.

Conclusion: Overall, the findings show that immunization campaigns are a crucial public health measure that have significant advantages for both local communities and society at large.

Keywords: immunization, public health, outcome, effect, herd immunity

Introduction

Immunization campaigns have been essential in halting the development of infectious diseases and improving general health. Vaccines can reduce a person's risk of infection and the severity of associated diseases by helping them develop an immunity to certain viruses (Younger, 2016). Globally, the introduction of immunization programs has resulted in notable declines in rates of morbidity and death, indicating its efficacy in managing and eliminating illness.

Examining how immunization programs affect public health outcomes is the goal of this review (1). This study attempts to provide a comprehensive overview of the advantages and difficulties of vaccination programs by synthesizing recent research on the subject. It also seeks to highlight gaps in the literature that call for more research.

Vaccination efforts have played a major role in the control and eradication of measles, smallpox, and other diseases. Smallpox has all but vanished as a result of these efforts, and incidences of polio and measles have sharply declined (2). Public health officials have protected vulnerable people that cannot obtain vaccinations by creating herd immunity through high vaccination coverage rates.

Programs for immunization have clear advantages, yet there are issues and disagreements around their execution. There has been a reduction in vaccination rates in certain areas due to vaccine hesitancy stemming from concerns expressed by some persons regarding the safety and efficacy of vaccinations (3). This has led to vaccine-preventable illnesses reappearing in certain areas and preventable disease outbreaks in other others.

Vaccination strategies must deal with logistical challenges in addition to vaccine reluctance, such as restricted access to vaccinations in environments with low resources and the requirement for long-term infrastructure to support immunization programs. Moreover, the advent of novel infectious illnesses has emphasized how important it is to quickly implement efficacious vaccinations in order to stop the spread of novel infections and safeguard public health (4–6).

The goal of this research is to provide a comprehensive evaluation of the impact of immunization programs on public health.

Method

In order to find relevant studies to investigate the effects of vaccination programs on public health, a comprehensive search strategy was employed. Electronic databases such as PubMed, Scopus, Google Scholar and Web of Science, were used, and search terms such as "vaccination programs," "public health," "vaccination impact," "vaccine effectiveness," and "immunization" were employed. The search was limited to English-language publications published in the period from 2013 to 2018.

The studies that met the inclusion criteria were: primary research studies that examined how vaccination programs affected public health outcomes; studies that presented quantitative data on how well vaccination programs prevented diseases; studies carried out in human populations; and studies that evaluated the vaccination programs' overall impact on public health.

Four authors assessed the titles and abstracts in order to determine whether or not they should be included. After that, the pertinent information was taken out of the full-text publications of the selected studies. This information included the research design, demographic characteristics, specifics of the vaccination program, outcome measures, and key results. By analysis and consensus, any disagreements regarding the data extraction procedure were resolved. A narrative technique was used for data synthesis in order to define important themes related to the influence of vaccination programs on public health and to present study findings.

Notwithstanding these limitations, this systematic review offers a useful understanding of the impact of vaccination programs on public health and emphasizes the significance of ongoing investment in immunization efforts to improve population health outcomes. The search process, study selection, data extraction, and quality assessment were carried out in accordance with established guidelines for systematic reviews.

Result and discussion

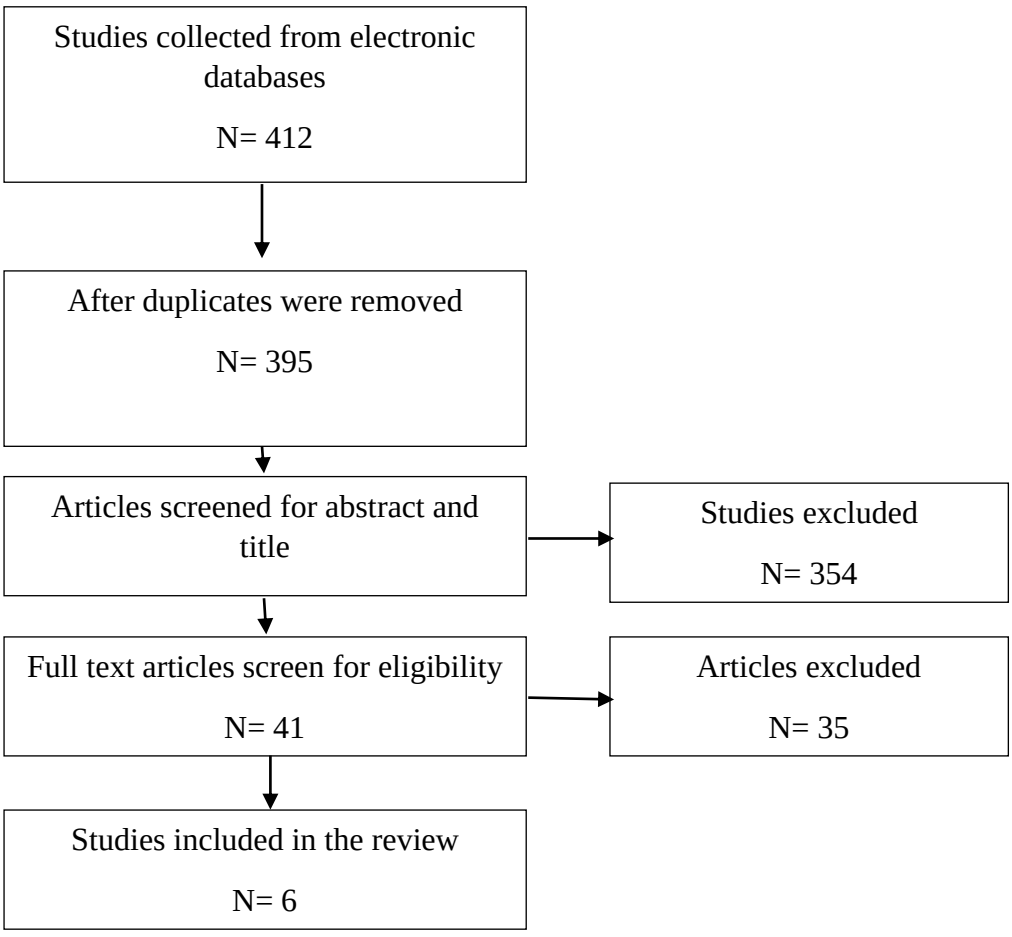
The vaccination importance in public health and their impact in preventing diseases

In this systematic review study we included 6 quantitative studies(1,2,7–10)(Fig 1) evaluated the impact of vaccinations programs on public health. Vaccination is crucial to halting the spread of infectious diseases as well as reducing the rate of illness and mortality in communities. Vaccines give immunity against diseases in the future by inducing the body to produce antibodies that can recognize and neutralize certain pathogens (10). By adopting vaccination programs, public health officials may protect not just vaccinated persons but also vulnerable populations who may be more prone to significant illness or consequences from infectious illnesses.Childhood vaccination campaigns, for instance, have likely reduced the incidence of diseases like rubella, which has lowered childhood death rates and stopped outbreaks of these infectious diseases.

Immunization programs save healthcare expenses related to treating illnesses that can be prevented by immunization, improving societal economic well-being. According to an Audisio et al. (9) study, between 1994 and 2018, children immunization programs in the US are predicted to have saved $295 billion in direct medical expenditures and $1.38 trillion in communal costs. It has been demonstrated that immunizations efficiently prevent a wide range of infectious illnesses. As an illustration, it is clear that the measles-mumps-rubella (MMR) vaccination is over 95% successful in preventing measles, greatly lowering the number of cases and outbreaks of this extremely dangerous illness. Similar to this, the influenza vaccination has been effective in lessening the intensity and spread of seasonal flu each year by providing protection against particular strains of the virus (8).

Since the start of the polio vaccine program in 1988, the number of cases has decreased by 99%, according to the Global Polio Eradication Initiative. Campaigns to vaccinate everyone against diphtheria have greatly decreased the number of cases and deaths from the disease. According to the WHO, the incidence of diphtheria has decreased globally by almost 90% since the vaccine's introduction (8).

Fig 1: Chart for studies selection



Effect of vaccine on herd immunity

One of the primary benefits of vaccination programs is the concept of herd immunity, often known as community immunity. A barrier that prevents the illness from spreading and protects individuals who cannot get vaccinated, such as small children, the elderly, and those with compromised immune systems, is created when a sizable portion of the population gets immunized against a particular disease (2). This concept is particularly important for diseases with high rates of transmission, such as the measles and pertussis.For example, in order to generate herd immunity and stop outbreaks, the measles vaccination needs a high coverage rate of about 95%. As seen in recent years in nations where anti-vaccine sentiments have caused a decline in vaccination rates, outbreaks can happen when vaccination rates fall below this threshold (7). In order to safeguard vulnerable populations and stop the recurrence of illnesses that may be prevented by vaccination, high vaccination rates must be maintained.

Lehtinen et al.'s recent work on human papillomavirus vaccination provides evidence that herd immunity may be estimated using data from clinical trials (11). The 2015 study by Ragonnet et al. sheds light on the actual effects of vaccination programs under different circumstances and identifies several quite typical scenarios where these effects could be understated. It also shows that assessments of a vaccination program's actual efficacy derived from clinical studies that gauge direct effectiveness may not be accurate. The design of vaccine clinical trials and public health initiatives may both be improved and estimations of vaccination efficacy can be more accurately estimated with the use of mathematical modeling.

It is appropriate to see this herd immunity as a "public good." (12,13)It delivers a huge benefitto the entire society, but building andmaintaining it needs communal work. Due to its reliance on group work, the public good is delicate, challenging to create, and labor-intensive to maintain. When it comes to herd immunity, the populace as a whole must be willing to make short-term sacrifices (such as paying for and maybe experiencing negative side effects from vaccines) in order to reap longer-lasting and less obvious advantages. Individually, people will be incentivized to "free ride" on the labors of others by allowing others to get vaccinated at risk of negative side effects and then benefiting from their efforts (13).

Establishing these public goods and managing the intricate social processes that go into maintaining them when they are in place are two of public policy's primary duties (14). Long-term success requires taking justice, unity, trust, and goodwill into account. There are aspects of vaccination programs that have the potential to influence these values and, in turn, the public benefit of herd immunity.

The financial implications of immunization campaigns

Vaccination programs have been shown to be an extremely cost-effective means of preventing sickness and reducing total healthcare costs. The initial cost of vaccinations is sometimes substantially cheaper than that of treating illnesses that can be avoided. According to research, every dollar spent on childhood immunizations saves $10 in net medical costs. For example, Hanquet's(15)research found that the regular childhood vaccination programs in the United States saved $295 billion in direct expenses and a net total of $1.38 trillion in societal expenditures.

By delaying the beginning of infectious illnesses, vaccination programs result in significant cost savings for healthcare (16). In addition to protecting recipients, vaccines also promote herd immunity, which lowers the overall incidence of illness in the community. As a result, hospital stays, ER visits, and doctor appointments for illnesses that may be prevented by vaccination reduce the load on healthcare systems (17).

Vaccination program barriers

The spread of false information and misunderstandings on social media and other platforms is one of the main causes of vaccination reluctance. Misinformation frequently contributes to vaccination skepticism and anxiety, which lowers public confidence in immunization efforts. For example, despite being shown untrue

by several scientific studies, parents' decisions about immunizations are still influenced by the myth that vaccinations cause autism (9).

Public health authorities and healthcare professionals need to emphasize effective communication methods that promote correct information about vaccinations in order to overcome vaccine hesitancy and misinformation (10). Better public health messaging may help fight misconceptions and raise vaccination acceptability through community involvement, education initiatives, and partnerships with reliable sources. Furthermore, establishing trust and raising vaccination rates may be achieved by having a conversation with reluctant people to learn about their worries and by giving them evidence-based information that is catered to their particular requirements and worldview.

Ensuring equal vaccination coverage across communities is still significantly hampered by the lack of access to vaccinations. Lower vaccination rates and heightened vulnerability to vaccine-preventable illnesses might arise from disparities in access to healthcare services, especially in marginalized groups (3). Inequalities in immunization coverage can result from challenges to vaccination services like geographic location, socioeconomic position, and linguistic difficulties.

Strategies like outreach programs and collaborations with community groups can assist in reaching underprivileged communities in order to address concerns of equality and access in vaccination programs (1). Improving vaccine accessibility and cost, especially for disadvantaged populations, can help facilitate vaccination by lowering obstacles to the shot. Furthermore, addressing socioeconomic determinants of health including transportation and poverty might aid in lowering obstacles to access and advancing fair vaccination distribution.

Conclusion

Immunization has resulted in herd immunity, shielding people who cannot be vaccinated due to medical reasons. The study also emphasizes the financial advantages of immunization campaigns, such as the savings from lower healthcare use and disease preventive costs. Overall, the findings show that immunization campaigns are a crucial public health measure that have significant advantages for both local communities and society at large.

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