

Analyzing a decade of childhood vaccination and timeliness by deprivation in NHS Lothian

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Abstract

To protect children and other vulnerable groups from vaccine-preventable diseases, population-level immunity must be attained and individuals must have timely vaccinations to minimize their risk of infection. This project assesses the relationship between deprivation, vaccination uptake, and timeliness in NHS Lothian, the secondlargest health board in Scotland, to understand inequities in immunization and to see how the relationship has changed over the past decade. This retrospective cohort study uses immunization data from the Scottish immunization recall system (SIRS) for four routine childhood vaccines: the third dose of the primary vaccine (TPV), both doses of measles, mumps, rubella (MMR), and the preschool booster (PSB). The data include ten years of immunizations administered between 2008 and 2017. This study finds strong evidence for an association between deprivation and uptake and timeliness. Though uptake is high (>96%), immunization rates differ by deprivation decile with reduced risks of non-vaccination in the most deprived groups and increased risk in the least deprived deciles. Vaccines were not administered in a timely manner with more than half of the population experiencing delay. This was especially pronounced for the 40% most deprived populations and for immunizations scheduled at later ages (PSB and MMR 2). The deprivation gradient of uptake over the last decade has been decreasing from 2006 onwards. Timeliness has improved since 2008 but stratifying by deprivation shows a downward trend across all deciles. There is definitive evidence for an association between deprivation, uptake, and timeliness and time-trends show that uptake has been worsening since 2006. In 2018, there was a record incidence of measles and other vaccine-preventable diseases across developed countries. Declining childhood immunization uptake in southeast Scotland—an area with a large, highly mobile, and socioeconomically diverse population—threatens regional herd immunity and warrants investigation of suboptimal coverage. As deprivation of social and material resources increases risk of non-vaccination, we examined here the relationship between deprivation, uptake, and timeliness for four routine childhood vaccines and identified trends

over the past decade. Methods: This retrospective cohort study analyzed immunization data from the Scottish Immunization Recall System (SIRS) for four routine childhood vaccines in the UK: the third dose of the primary vaccine (TPV), both doses of measles, mumps, rubella (MMR 1 and MMR 2), and the preschool booster (PSB). Immunisations (N = 329,897) were administered between 2008 and 2018. Deprivation was measured via the Scottish Index of Multiple Deprivation (SIMD), ranking postcodes by deprivation decile. Chisquared tests and cox proportional hazards models assessed the relationship between uptake, timeliness, and deprivation. Results: There is strong evidence for an association between deprivation, uptake, and timeliness. Uptake for all childhood immunisations are very high, especially for TPV and MMR 1 (>98.0%), though certain deprivation deciles exhibit increased risks of non-vaccination for all vaccines. Delay was pronounced for the 40% most deprived population and for immunisations scheduled at later ages. Absolute PSB and MMR 2 uptake has improved since 2008; however, disparities in uptake have increased for all vaccines since the 2006 birth cohort. Conclusion: Both timeliness and uptake are strongly associated with deprivation. While absolute uptake was high for all vaccines, relative uptake and timeliness has been worsening for most groups; the reason for this decline is unclear. Here we identified subgroups that may require targeted interventions to facilitate uptake and timeliness for essential childhood vaccines. Children in Scotland are protected through immunization against many serious infectious diseases. Vaccination programs aim both to protect the individual and to prevent the spread of these diseases within the wider population. As a public health measure, immunizations are very effective in reducing the burden of disease. This publication provides a yearly and quarterly update of immunization uptake rates for children in Scotland at 12 months, 24 months, five years and six years of age. The release includes data to 31 December 2018. Data are presented by NHS Board, local authority and deprivation category. This annual report, which focuses on calendar year uptake rates, is published in March each year. In addition, each quarter ISD publish updated tables presenting the latest

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quarterly uptake rates for children at 12 months, 24 months, five years and six years, by NHS Board and local authority. Vaccines have resulted in a steady decline in child morbidity and mortality and subsequent improvements in global health . The World Health Organisation (WHO) recommends that 95% of vaccine-eligible people are immunized against diphtheria, tetanus, pertussis (whooping cough), polio, Hib, measles, mumps, and rubella to effectively control these deadly infectious diseases. However, unvaccinated and under-vaccinated children (those with incomplete or delayed vaccinations) are susceptible to these diseases if exposed . Delay in immunisations may play a role in outbreaks of infectious disease since vaccines delivered outside the immunisation schedule leave temporal gaps in immunity in which children are vulnerable to infection . Table 1 outlines the UK schedule for the immunisations included in this analysis, with recommended ages for each dose. These diseases are the most serious vaccine-preventable illnesses for young children and the schedule is designed with age-specific risk of each disease in mind

Biography:

Eram Ali Haider has completed her BA in Biology in 2017 from Bryn Mawr College, where Immunology and Virology quickly became her favorite biological subjects. She received her MPH from University of Edinburgh's School of Medicine and Veterinary Sciences this year. She aspires to improve immunization programmes around the world and has received her PhD in Vaccinology.

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