Determining the pneumococcal conjugate vaccine coverage required for indirect protection within Asia and the Pacific: a prospective observational study

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Abstract

Background **Pneumococcal disease is an important cause of childhood morbidity and mortality worldwide. Evidence is required to support the introduction of pneumococcal conjugate vaccines (PCVs) in low-income and middle-income countries (LMICs). PCVs prevent disease through both direct protection of vaccinated individuals, and indirect protection of unvaccinated people via reduction of nasopharyngeal carriage and transmission of vaccine-type (VT) pneumococci. We aimed to determine the degree of this indirect effect after introduction of 13-valent PCV (PCV13) at three sites in Asia-Pacific, and describe the relationship between PCV coverage and indirect protection.**

Methods **We are recruiting and swabbing children aged 2–59 months, admitted to participating hospitals with acute respiratory tract infections in Laos, Mongolia, and Papua New Guinea. Pneumococci are detected using *lytA* qPCR and serotyped by microarray. We are comparing risk of VT carriage in undervaccinated cases by village/subdistrict-level PCV13 coverage in children younger than 5 years. Individual PCV status is determined using written records and village PCV coverage is determined by administrative data or survey. Recruitment is due to finish in March, 2019.**

Findings **As of June, 2018, we have recruited 1208, 1056, and 897 cases, and tested 1099, 624, and 405 samples, from Laos, Mongolia, and Papua New Guinea, respectively. Overall, pneumococcal carriage varied from 37% in Laos to 88% in Papua New Guinea. In Laos, VT carriage decreased from 18% to 6% from the first to the third year post-PCV. In Papua New Guinea, VT carriage decreased from 54% to 37% from the first to the third year after PCV introduction. In Mongolia, VT carriage decreased from 31% pre-PCV to 24% in the first year after PCV. Undervaccinated children from villages with less than 50% coverage are 1·08 (95% CI 0·69–1·79) and 1·44 (95% CI 0·99–2·10) times more likely to be carrying VT than those from villages with 50% or more coverage, among the 336 in Laos and 83 children in Papua New Guinea, respectively, for whom we have both PCV and carriage data. This difference does not reach statistical significance.**

Interpretation **In the absence of feasible methods for pneumococcal disease surveillance in LMICs, studies of nasopharyngeal carriage of VT pneumococci, which is a prerequisite for disease, provide useful information to guide vaccine policy. The inclusion of three sites, which have contrasting vaccine schedules and pneumococcal epidemiology, enable us to explore factors that could maximise indirect protection from PCVs.**

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Declaration of interests
We declare no competing interests.

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