Disparities in Invasive Pneumococcal Disease Rates Between Populations: Will the Extended Pneumococcal Conjugate Vaccines Be a Game-Changer?

David Greenberg1,2 and Shalom Ben-Shimol1,2
1Pediatric Infectious Disease Unit, Soroka University Medical Center, and 2Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel

(See the Major Article by Wortham et al on pages 1250–7.)

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The first 7-valent pneumococcal conjugated vaccine (PCV7) was developed on the basis of data demonstrating that within the United States and other developed countries, the 7 vaccine serotypes were responsible for >80% of invasive pneumococcal disease (IPD) in young children [1]. Indeed, shortly after the introduction of PCV7, a significant and dramatic reduction in IPD rates was observed in many countries that had introduced the vaccine [2–5]. However, several factors led to the development of extended, higher-valency pneumococcal conjugate vaccines (PCVs). These factors included epidemiological data from different parts of the world, mainly from developing countries, demonstrating increase in IPD caused by serotypes not covered by PCV7, such as 1, 5, and 7F, as well as worldwide increase in disease caused by the virulent, highly antibiotic-resistant serotype 19A [6].

Disparities in IPD rates among populations with different socioeconomic status have been previously reported, emphasizing overcrowding, poverty, malnutrition, low vaccine uptake, and underlying diseases as major factors contributing to high pneumococcal disease rates [4, 7, 8].

Wortham and colleagues, in this issue of Clinical Infectious Diseases, present the results of a multicenter study evaluating the secular trends in IPD rates, and have focused on racial disparities in invasive Streptococcus pneumoniae infections between 1998 and 2009, before and after the introduction of PCV7 to the national immunization program in the United States. The aim of their study was to compare IPD rates in different populations, and mainly to compare rates between black and white populations within the United States. These study results are noteworthy for several reasons.

First, the reduction in PCV7 serotype IPD is very impressive, especially given the large database, describing IPD incidences in different age groups and different racial populations in a population of >29 million people with >47 000 IPD cases over a 10-year period.

Second, the effect of total reduction in IPD rates was accompanied by closure of the disparity gaps in PCV7-type IPD rates between 2 different racial populations—blacks and whites. This effect of diminished disparity in IPD rates between the 2 populations was to be expected, as was described in several earlier reports, where PCV7 introduction resulted in decreased PCV7-type IPD rates (close to elimination in most cases) in various populations, including populations with different rates, residing in the same country [4]. This is yet another demonstration of the PCV7 impact, overcoming any other confounding factors contributing to IPD rates, such as poverty and ethnicity.

Third, the rates of non-PCV7 serotype IPD were higher in the black population than in the white population, in the pre-PCV7 era. As an increase in non-PCV7 serotypes disease was observed in both populations, it has led to a sustained gap in the nonvaccine-type disease between them. This can be partially attributed to other background factors differentiating between the 2 populations that remained unchanged.

Fourth, the majority of IPD in 2009 was attributed to additional 13-valent pneumococcal conjugated vaccine (PCV13) serotypes not included in PCV7 (1, 3, 5, 7F, and 19A). New data from countries that have introduced PCV13 suggest that PCV13 did significantly reduce
disease caused by the additional serotypes [9, 10]. Thus, it is plausible that PCV13 introduction in the United States will result in further closing of the gap between the 2 populations. Indeed, recent unpublished data from Israel demonstrate that differences in IPD rates between different populations were virtually eliminated in the post-PCV13 period, proving again PCVs’ ability to overcome all other disparity-contributing factors (in terms of impact).

Prior reports have emphasized the initial impact of the vaccine on reducing racial disparities by dramatically reducing serotype-specific rates in both the black and white populations [8]. This report adds to the literature by demonstrating persistence of racial disparities, largely due to the expansion of disease due to non-PCV7 serotypes. The report has important implications for our understanding of the potential impact of PCV13 on IPD rates, as well as other possible future public health strategies to eliminate IPD.

The current study also has several important limitations. The authors refer to all additional 5 serotypes of PCV13 as a group, without providing specific data regarding rate dynamics of specific serotypes (eg, 19A and non-PCV13 serotypes). It would be interesting to evaluate whether these specific dynamics differed between age groups and racial populations. This would allow a better appreciation of the disparity phenomena and could possibly affect future decisions regarding vaccine strategies.

In addition, the study does not offer data regarding the source of cultures in terms of obtainment in the community versus the hospital setting. In the United States, it is common to obtain blood culture in the community. It would be important to see whether this practice has not been changed during the study period. It would also be important to observe changes and differences in the serotypes’ isolation proportions and incidences in blood cultures obtained in the community versus blood cultures obtained in hospitals. This might hint at the disease severity changes due to these serotypes during the study period. It is possible that the distributions of “community serotypes” and “hospital serotypes” were different between blacks and whites.

Finally, the study described differences between blacks and white within the United States. It would be interesting to compare populations by their region of residence to investigate whether these differences are related to socioeconomic status and not ethnicity.

Disparities in IPD rates between populations derive from multiple factors, including genetic factors, comorbidities, overcrowding, hygiene conditions, nutrition, poverty, and vaccine uptake. As most of these factors are extremely difficult to change, and demand a substantial investment mainly on a governmental and global level, it seems that the future lies in a different approach to eliminate pneumococcal disease. New technologies such as wider-spectrum or protein-based vaccines are needed. Vaccines are the most cost-effective way to eradicate IPD, subsequently leading to the elimination of disparities between populations in IPD rates worldwide.

Note

Potential conflicts of interest. Both authors: No potential conflicts of interest.

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Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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