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Effect of a vaccine to prevent serogroup A *N meningitidis* epidemics in Africa

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Before the introduction of a meningococcal serogroup A conjugate vaccine (MenAfriVac), which began in December, 2010, countries in the so-called meningitis belt of sub-Saharan Africa experienced annual outbreaks and periodic large-scale epidemics of serogroup A *Neisseria meningitidis*.¹ The devastating effects of these epidemics were seen not only on an individual level, with death or disabling sequelae occurring in 20–35% of cases,² but also on the societal level. During the 2007 *N meningitidis* A epidemic in Burkina Faso, for instance, households spent a third of their gross annual income per meningitis case and the public health system spent 2% of the national health budget responding to the epidemic.^{3,4} Thus, the success of MenAfriVac hinges not only on prevention of individual *N meningitidis* A cases, but epidemics as well.

In the years since MenAfriVac introduction, remarkable short-term success of this vaccine in the prevention of *N meningitidis* A carriage and disease has consistently been shown, with surveillance data showing few *N meningitidis* A cases in vaccinated areas.^{5–8} However, the medium-term and long-term regional effects of the vaccine have not been previously described. In *The Lancet Infectious Diseases*, Caroline Trotter and colleagues⁹ show a 99% reduction in *N meningitidis* A incidence and a 57% reduction in overall incidence of suspected meningitis in vaccinated areas of nine countries in the meningitis belt. Additionally, district-level risk of reaching epidemic criteria (>ten cases of suspected meningitis per 100 000 population per week) decreased by 59%. This analysis shows that the first phase of vaccine introduction, consisting of mass campaigns of 1–29-year-olds with a single dose of MenAfriVac, was effective in the near-elimination of *N meningitidis* A disease in vaccinated areas for up to 5 years post-vaccine introduction. With the first countries now initiating the second phase of vaccine introduction, with catch-up campaigns of subsequent birth cohorts and introduction of the vaccine into the Expanded Programme on Immunization, efforts to ensure high routine vaccination coverage and continued assessments of the effect of this vaccination strategy will be crucial to ensure that these gains are maintained.

Though the reduction in *N meningitidis* A incidence observed in vaccinated populations is extraordinarily high, improved surveillance and laboratory confirmation of meningitis cases

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in the post-MenAfriVac years might have resulted in an underestimation of vaccine effect. Likewise, improved laboratory confirmation rates might be a factor in the increased incidence of non-A serogroups after MenAfriVac introduction, with an incidence rate ratio of 2.76 (95% CI 1.21–6.30) in fully vaccinated populations. However, since serogroup replacement—or expansion of non-vaccine serogroups in the ecological niche following MenAfriVac-induced reductions in *N meningitidis* A nasopharyngeal carriage—is an important theoretical risk after introduction of a monovalent vaccine, this finding merits further assessment. The recent re-emergence of serogroup C epidemics in the region, notably the annual epidemics in Nigeria since 2013 and the 2015 epidemic in Niger, in which nearly 10 000 cases were reported, is worrying.^{10,11} However, the dynamic nature of *N meningitidis* epidemiology should be taken into account, because several epidemics due to serogroups C, W, and X were reported before MenAfriVac introduction.^{12–14} Although it is too early to determine whether serogroup replacement will become established, continued monitoring, including surveillance of *N meningitidis* lineages from both carried and disease-causing strains, is needed to fully appreciate the long-term effects of MenAfriVac.

The analysis by Trotter and colleagues underscores the importance of investments in high-quality meningitis surveillance, including strong laboratory capacity. Complementary initiatives, such as the MenAfriNet network,¹⁵ a consortium to strengthen case-based surveillance in five countries of the meningitis belt, can provide further evidence to assess long-term MenAfriVac effect, as well as to inform decision-making for use of a pentavalent (A, C, W, X, and Y) meningococcal conjugate vaccine for Africa that is currently under development. The success of MenAfriVac in the prevention of *N meningitidis* A cases and epidemics on a regional level in the 5 years since vaccine introduction shows the potential for similar achievements in the prevention of meningococcal disease and epidemics due to other serogroups in sub-Saharan Africa.

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Figure 1.

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