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The paradox of endemic stability

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Endemic stability describes a dynamic epidemiological state in which clinical disease is rare in spite of a high incidence of infection within a population. Such a situation arises if the force of infection is high enough that acquisition of functional immunity occurs in the majority of the population at a relatively young age, when the disease is often mild compared with disease in older individuals. The prevalence of disease in older age classes is therefore reduced by these high levels of protective immunity. The phenomenon is most comprehensively described in the veterinary literature for tick-borne diseases, such as theileriosis, and the paradox is that reducing the force of infection in such situations can counterintuitively result in an increase in clinical disease. Where such conditions exist in the veterinary context, partial control measures are often not recommended.

Coleman *et al.*¹ have developed a generic mathematical model for endemic stability and have hypothesized about its wider occurrence in human public health. The model requires only that: (1) the probability or severity of clinical disease resulting from infection increases with age; and that (2) after first infection, the chance that subsequent infections result in clinical disease is reduced. When these two criteria are satisfied, endemic stability can result, regardless of disease aetiology, and measures that partially reduce the force of infection, such as vector control or mass vaccination, can lead to an increase in clinical disease incidence.

Coleman *et al.*¹ go on to consider the importance of these findings to the debate over the potential impacts of insecticide-treated bed nets (ITBNs) in areas of highly endemic *Plasmodium falciparum* malaria transmission. The partial reduction in force of infection, and hence morbidity and immunity, could in theory at least, result in an increased incidence of severe disease and mortality. Although the reality of endemic stability for *P. falciparum* malaria is still vigorously debated, it has never been suggested that withholding of interventions would be desirable in a human public health setting². These modelling observations, however, do have implications for the design of interventions, and lend further support to calls for the effects of control measures on mortality in areas of endemic malaria to be monitored carefully.

References

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