TABLE 4. Implications of different assumptions for theoretical estimates of the herd immunity threshold (*H*), with reference to simple global estimates as obtained by equation 8, 11, and 12

Variable + assumption	Implications for herd immunity	References
Maternal immunity	If vaccines not effective until maternal immunity wanes, crude *H* estimates will be too low; this may be corrected by considering that a child is not born until maternal immunity disappears (equation 13)	(23)
Variation in age at vaccination	Herd immunity effect greatest (*H* threshold lowest) when vaccination occurs at earliest possible age; delayed vaccination implies threshold coverage level will be *higher* than simple estimates	(8, 28)
Age differences in "contact" rates or infection risk	Implications vary with relation between age and contact rate; falling contact rate with age implies true *H* may be *lower* than simple global estimate	(7, 36)
Seasonal changes in contact rates	Seasonality may imply *lower* true herd immunity threshold if seasonal change is marked, and fade out can occur during low transmission period	(7, 63)
Geographic heterogeneity	In theory, geographic differences in contact rates may permit elimination with lower overall vaccine coverage than that implied by *H* based on total population by targeting high risk groups	(20)
Social structure (nonrandom mixing)	Social structure can have complicated implications as it implies group differences in vaccination uptake and/or infection risk; existence of vaccine-neglecting high contact groups means true *H* will be *higher* than simple estimates	(15)