The effect of vaccination coverage and climate on Japanese encephalitis in Sarawak, Malaysia.

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Source

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Abstract

BACKGROUND:

Japanese encephalitis (JE) is the leading cause of viral encephalitis across Asia with approximately 70,000 cases a year and 10,000 to 15,000 deaths. Because JE incidence varies widely over time, partly due to inter-annual climate variability effects on mosquito vector abundance, it becomes more complex to assess the effects of a vaccination programme since more or less climatically favourable years could also contribute to a change in incidence post-vaccination. Therefore, the objective of this study was to quantify vaccination effect on confirmed Japanese encephalitis (JE) cases in Sarawak, Malaysia after controlling for climate variability to better understand temporal dynamics of JE virus transmission and control.

METHODOLOGY/PRINCIPAL FINDINGS:

Monthly data on serologically confirmed JE cases were acquired from Sibu Hospital in Sarawak from 1997 to 2006. JE vaccine coverage (non-vaccine years vs. vaccine years) and meteorological predictor variables, including temperature, rainfall and the Southern Oscillation index (SOI) were tested for their association with JE cases using Poisson time series analysis and controlling for seasonality and long-term trend. Over the 10-years surveillance period, 133 confirmed JE cases were identified. There was an estimated 61% reduction in JE risk after the introduction of vaccination, when no account is taken of the effects of climate. This reduction is only approximately 45% when the effects of inter-annual variability in climate are controlled for in the model. The Poisson model indicated that rainfall (lag 1-month), minimum temperature (lag 6-months) and SOI (lag 6-months) were positively associated with JE cases.

CONCLUSIONS/SIGNIFICANCE:

This study provides the first improved estimate of JE reduction through vaccination by taking account of climate inter-annual variability. Our analysis confirms that vaccination has substantially reduced JE risk in Sarawak but this benefit may be overestimated if climate effects are ignored.