**Refining the characterization of the Sanofi Pasteur dengue vaccine’s efficacy profile using machine learning**

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**Abstract**

**Background**

CYD-TDV is the first licensed dengue vaccine for individuals 9 – 45 (or 60) years of age. Based on a subset of subjects for which baseline serostatus was measured with PRNT50 (12% of trial subjects) in the phase-2b and phase-3 trials, the vaccine was found to confer good protection against virologically-confirmed dengue in subjects pre-exposed to dengue but lower protection in individuals seronegative to dengue at baseline. A complete characterization of how efficacy varies by pre-vaccination dengue serostatus is lacking and can be informed by machine learning.

**Methods**

We applied Boosted Regression Tree to impute the baseline serostatus for a subset of the subjects with missing information (i.e. those with post-dose 3 PRNT50 titres) in the phase-2b and phase-3 trials of CYD-TDV. By merging individual-level imputations with group-level predictions of baseline serostatus, we provide more precise estimates of how efficacy varies with serostatus, age and serotype during active surveillance.

**Findings**

Over all ages and in the 9-16 age-group, we found that CYD-TDV is protective against dengue serotypes 1, 3 and 4 regardless of baseline serostatus, while efficacy against dengue serotype 2 is positive for dengue pre-exposed subjects. Most notably, we find support for age variation in efficacy independent of serostatus.