



Contextualizing the burden of disease in the Pacific Islands: the case of dengue

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Background on dengue

- Caused by the dengue virus (DENV).
- Several serotypes.
- Transmitted by several species of the *Aedes* genus mosquito.
- Often asymptomatic.



Burden of Disease

Systematic reviews



Modelling



YLLs



YLDs



DALYs



Estimation of burden of dengue

- Bhatt S et al. The global distribution and burden of dengue. Nature. 2013;496(7446):504-7.
- Literature review: PubMed, WoS, PROMED, HealthMap.
- Extracted 'occurrence' datapoints (Clinical or laboratory confirmation of dengue transmission in a 5km x 5km grid).
- Apparent dengue infection: 'any infection that results in visible symptoms, for example nausea or vomiting, rash, aches and pains, mucosal bleeding or restlessness, sufficient to disrupt the individual's daily routine'.
- Inapparent dengue infection: 'any infection that does not have any impact on the day-to-day life of the subject'.

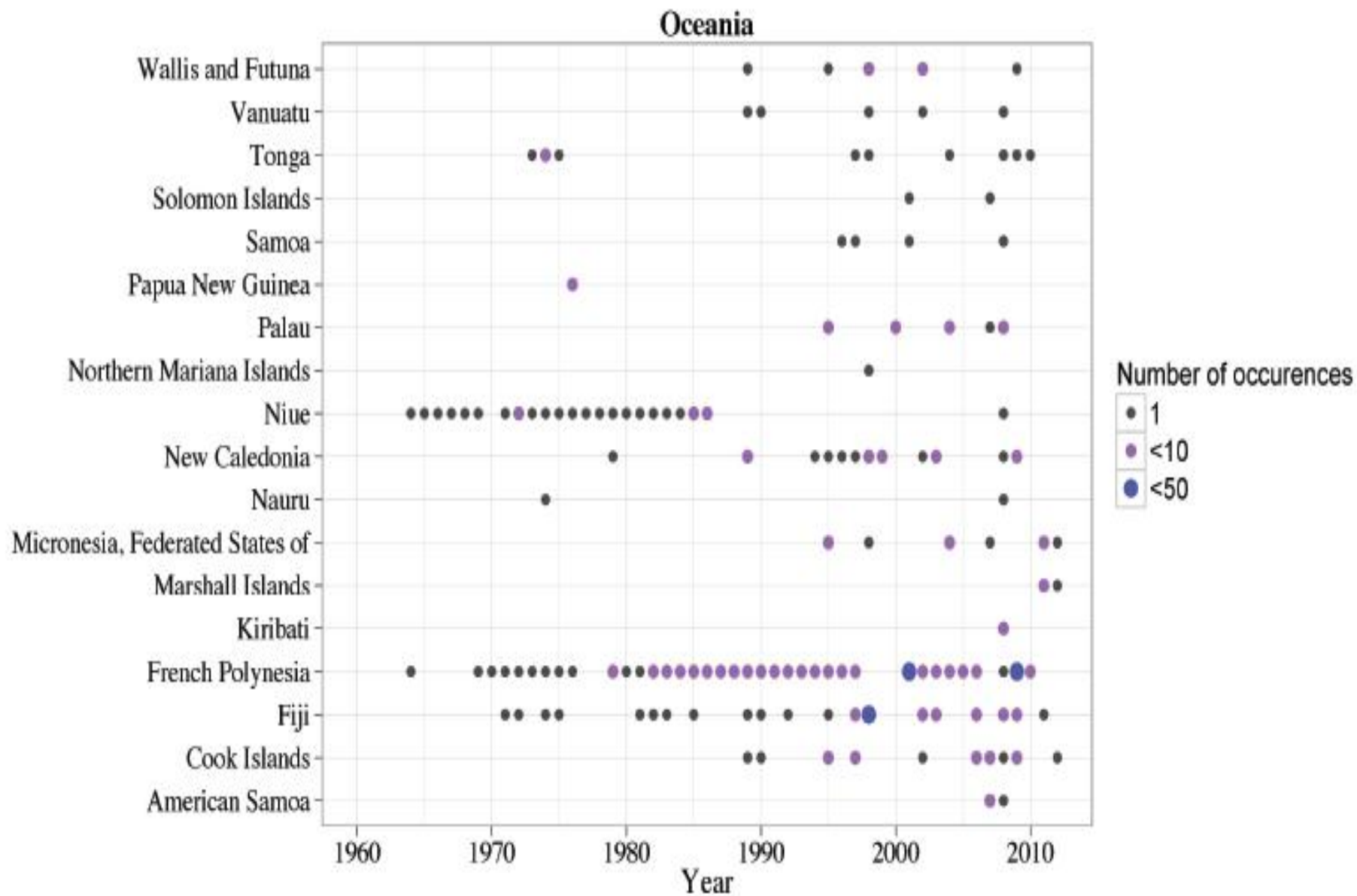


Figure SAll. Temporal breakdown of the number of occurrences per county in Oceania. Data point colour and size reflect the total number of occurrences at each time point.



Estimation of burden of dengue

- Geo-positions were then assigned to the data.
- Other covariate layers were added to explore predictive influence of certain environmental and socioeconomic characteristics.
- Most predictive of the number of dengue infections for specific geographical grids were: precipitation; temperature; and proximity to low-income urban centres.
- Using this information, maps were then translated into incidence maps.



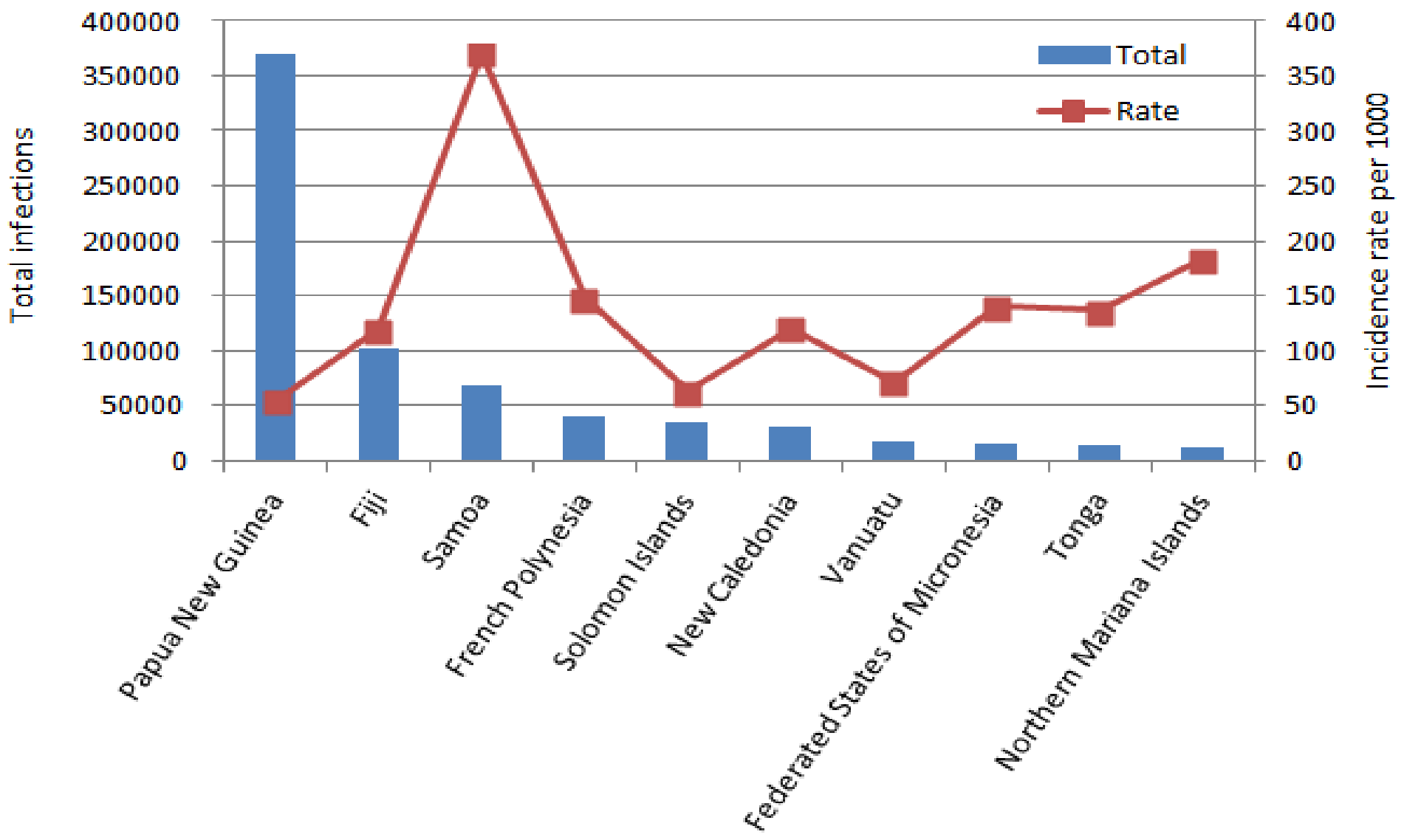
Estimation of burden of dengue

For Oceania in 2010, it was estimated:

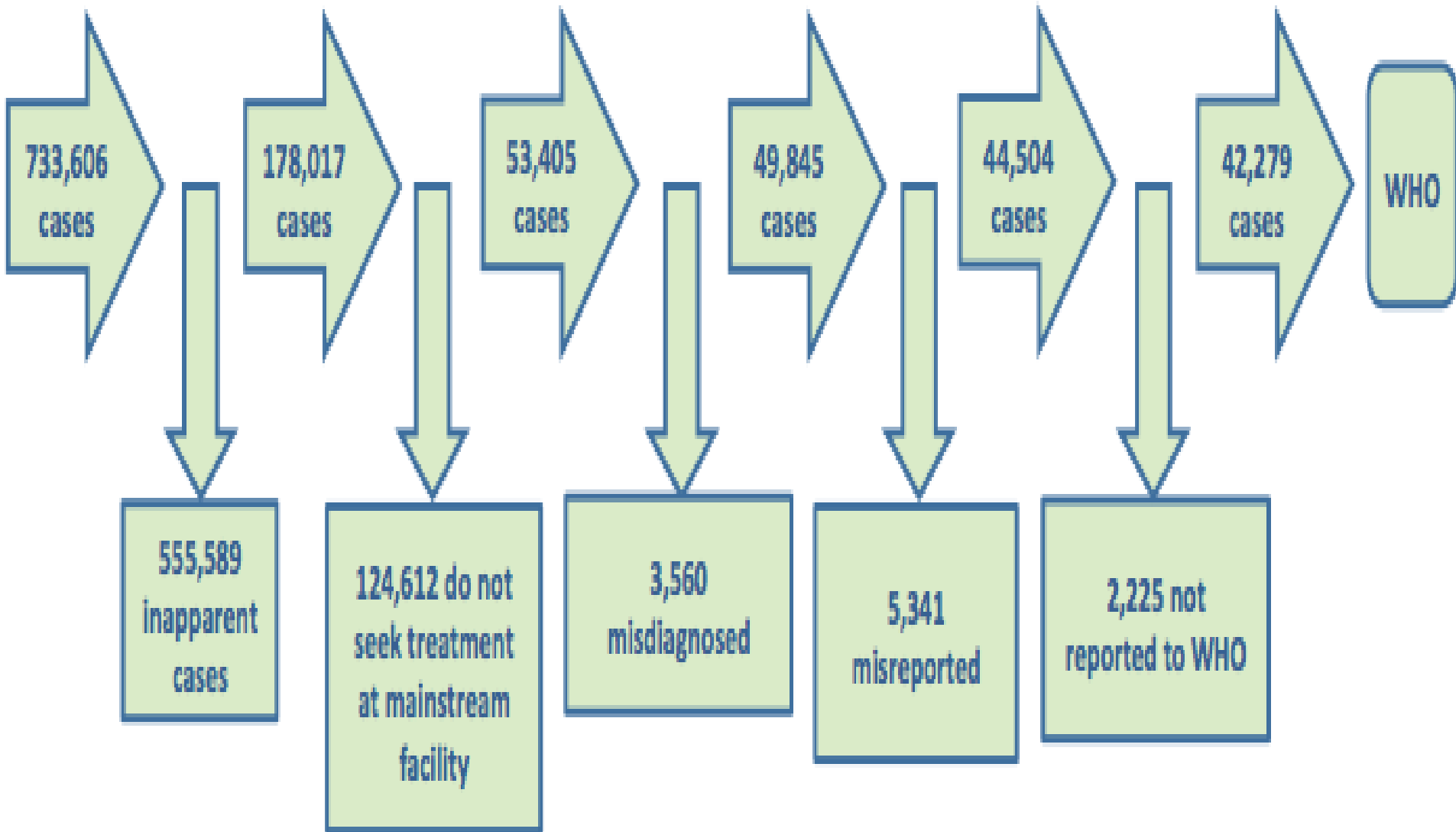
- There were 178,017 apparent infections and 555,589 inapparent infections.
- Thus an annual incidence of 76 infections/1,000 population.
- That just 3.5% of apparent cases were reported (given that only 6,355 cases were reported to WPRO).

Note, given the estimates are influenced by data from other regions, they may not be accurate in some instances.

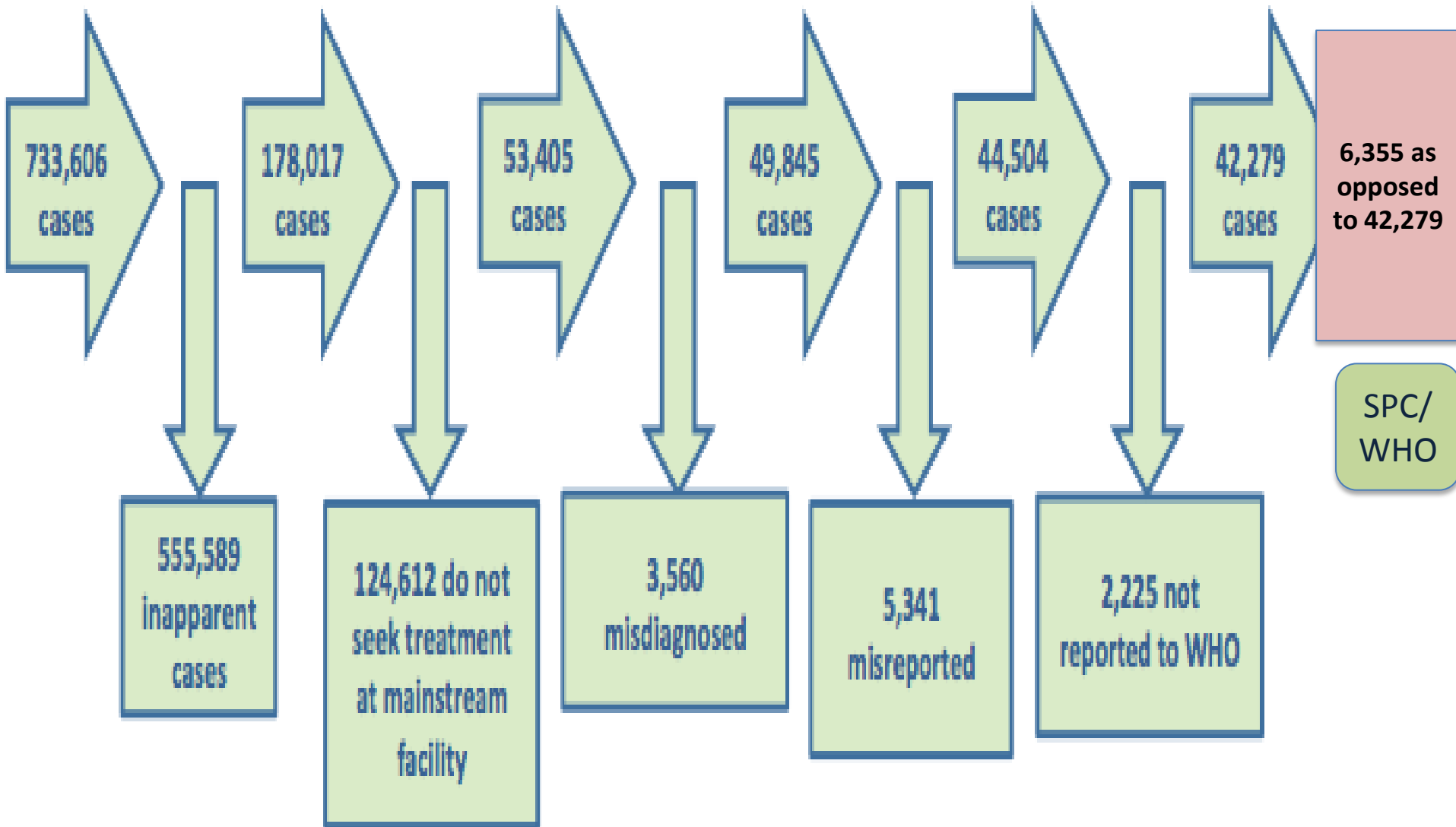
The top 10 Pacific Island countries and territories in terms of estimated number of dengue infections and incidence of dengue infections per 1000 population for 2010, GBD 2010



Hypothetical reporting chain of a dengue virus infection (adapted from Bhatt et al)



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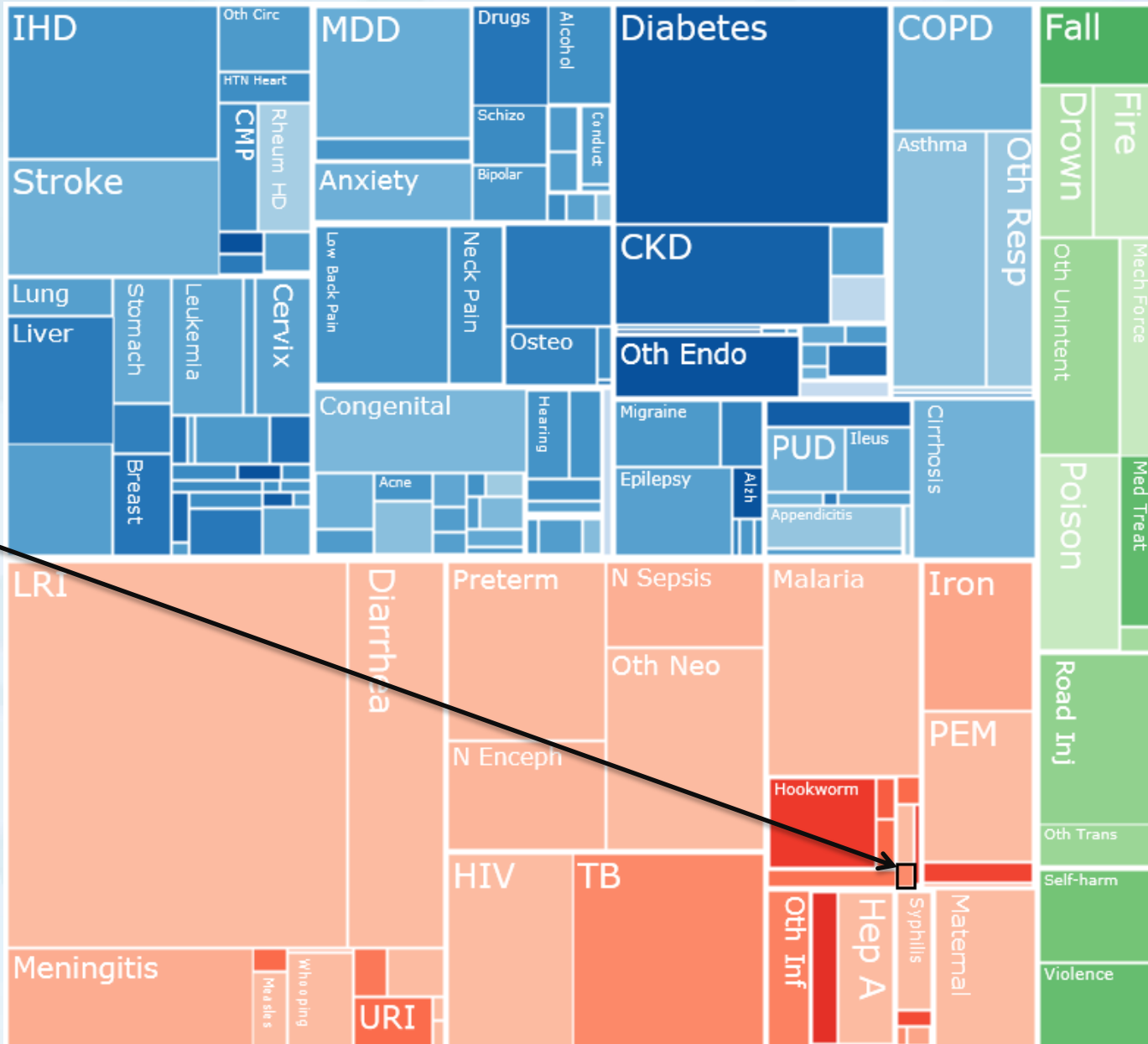


Estimation of burden of dengue

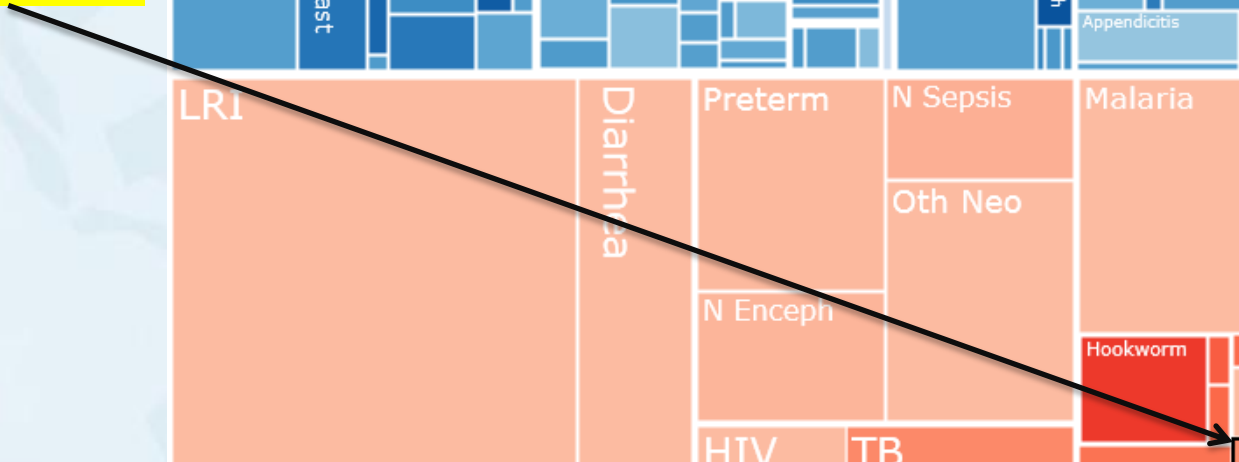
- In Oceania, the burden equated to 1,603 DALYs.
- The vast majority (99%) of burden from dengue in Oceania was estimated to be due to YLLs, as opposed to YLDs.
- DALY rates increased in Oceania from 1990 to 2000, then decreased. Once again, there is substantial uncertainty around these estimates.

Oceania, DALYs Both sexes, All ages, 2010

Annual % change
2005 to 2010
DALYs per 100,000



Dengue





The strengths of these estimates

- The most comprehensive effort to date to estimate the global burden of dengue.
- As complete surveillance data is not available as this is very costly and labour intensive, predictive modelling such as this can provide important information on the distribution of dengue for control policy and programs.
- In addition to environmental factors, this study also incorporated socioeconomic factors (e.g., vector and human movement, urban poverty and overcrowding, etc) into models.



The limitations of these estimates

- The definition of burden may not capture all elements of health important to Pacific Islanders. For instance, burden on health facilities, carers, economy, tourism, anxiety, etc.
- Estimates are heavily influenced by PNG (representing 70% of the population of Oceania).
- Estimates are influenced by data from other regions – these may not be accurate for the Pacific.
- Factors will also vary substantially by country and culture.



Opportunities for improving our understanding of dengue in the Pacific

These large-scale modelling efforts can be integrated with regional and national data. For example, adaptation to the Pacific could involve Pacific estimation of proportions of:

- Infections inapparent -> seroprevalence surveys.
- Apparent infections that seek treatment.
- Those misdiagnosed, and misreported.
- Those reported to the HIS unit but not reported to WHO.
- Pacific-based cohort research.



Merci beaucoup!

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- Bhatt S et al. The global distribution and burden of dengue. Nature. 2013;496(7446):504-7.
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