

# Think tank on infectious diseases in the Pacific

## Epidemiology of infectious diseases of public health concern for the Pacific

*Axelle Ronsse, MD MSc PHD*

*Emerging Disease Surveillance and Response*

*World Health Organization*

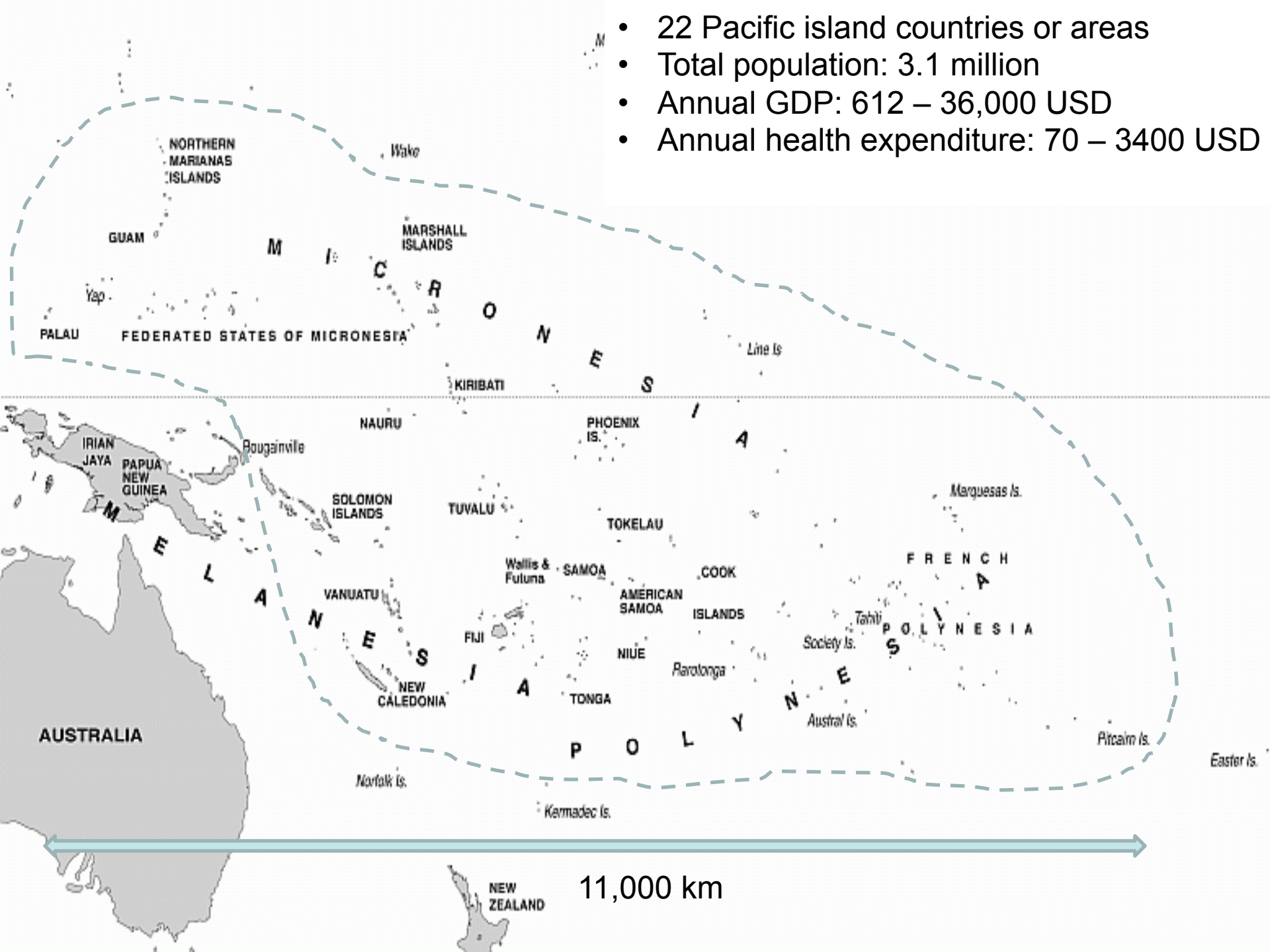


# Outline

- 1. Dengue and arboviruses in Pacific*
- 2. Post-disaster epidemics*
- 3. Pacific Syndromic Surveillance System*



- 22 Pacific island countries or areas
- Total population: 3.1 million
- Annual GDP: 612 – 36,000 USD
- Annual health expenditure: 70 – 3400 USD



# Dengue in the Pacific

- Serotype 2: re-emerged after ~15 years
- Serotype 3: re-emerged after ~20 years

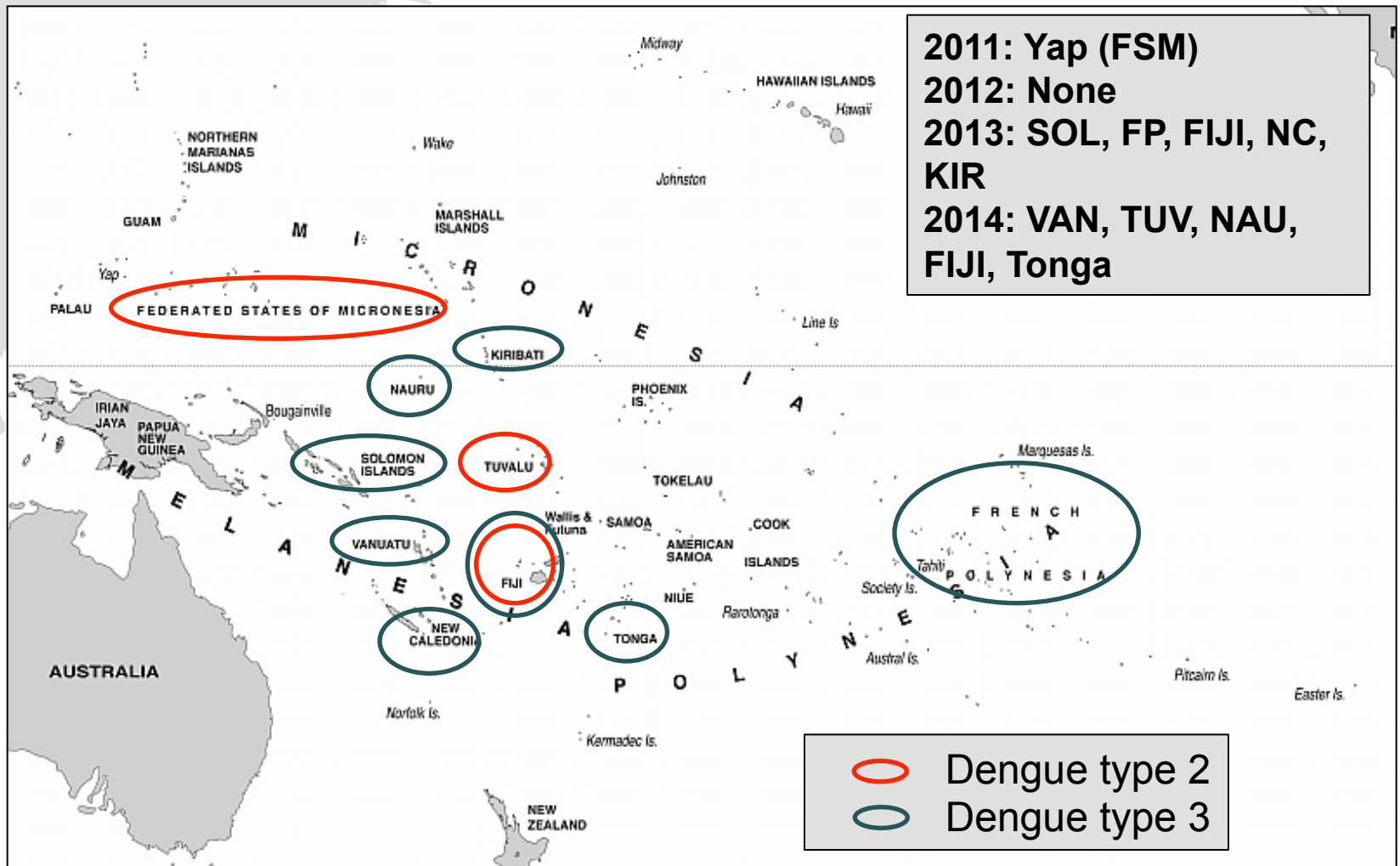
## **Dengue Virus Type 3, South Pacific Islands, 2013**

Van-Mai Cao-Lormeau, Claudine Roche,  
Didier Musso, Henri-Pierre Mallet,  
Tenneth Dalipanda, Alfred Dofai,  
Francisco Nogareda, Eric J. Nilles,  
and John Aaskov

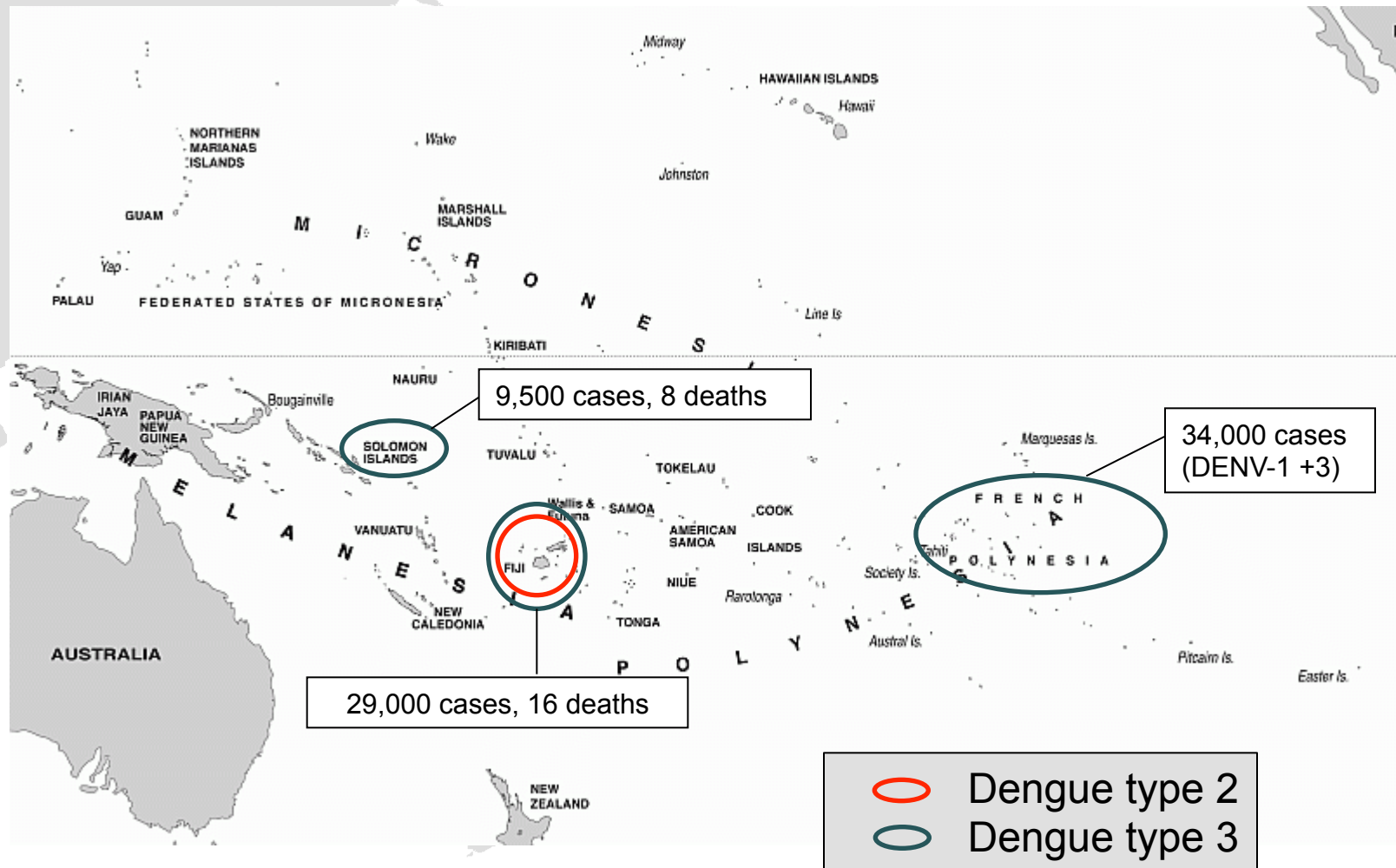
Emerging Infectious Diseases Vol. 20, No. 6, June 2014



# Re-emergence of dengue types 2 and 3 in the Pacific



# Re-emergence of dengue types 2 and 3 in the Pacific

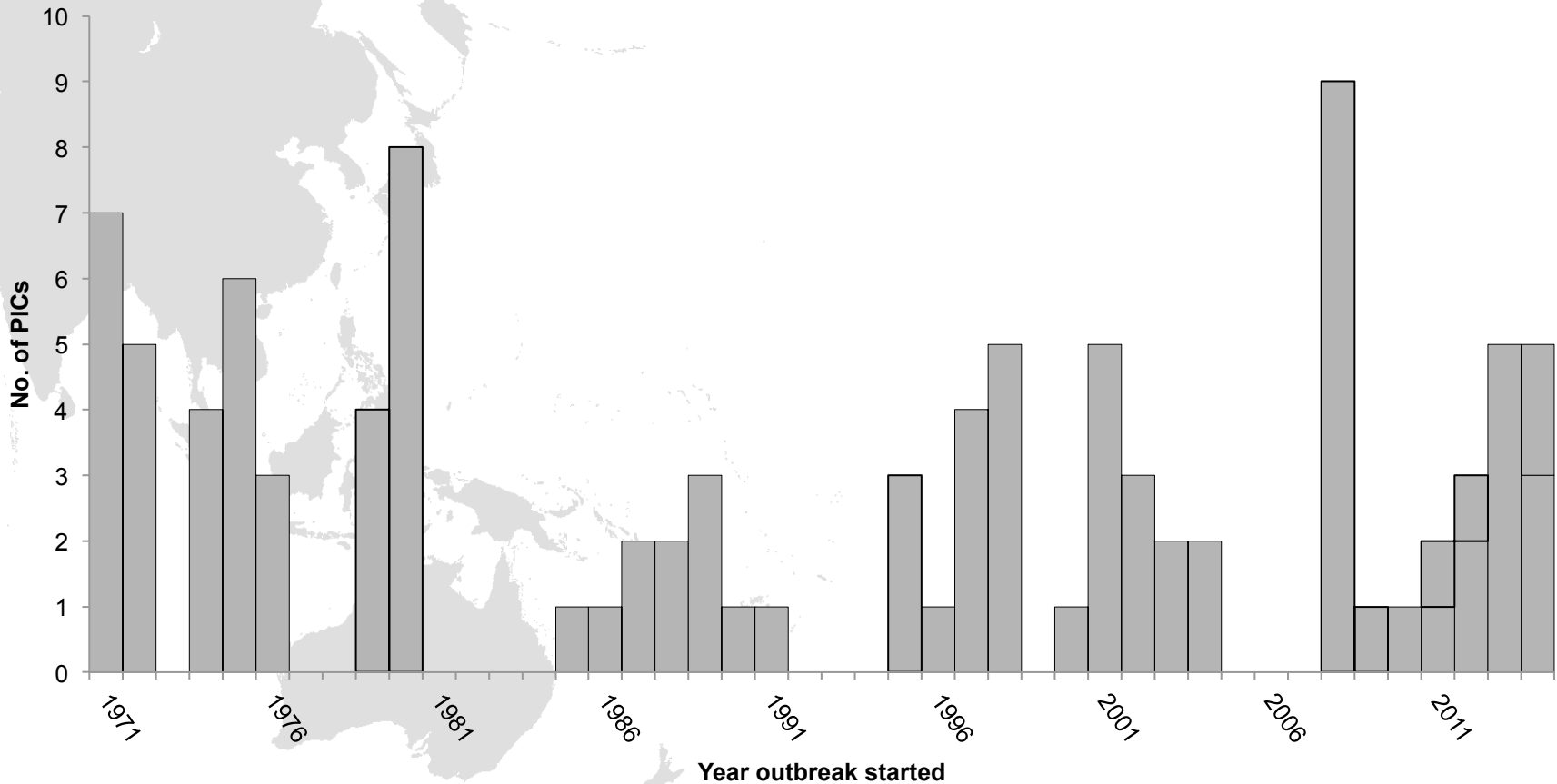


# Dengue in the Pacific

*Current surge in Pacific dengue unusual or unexpected?*

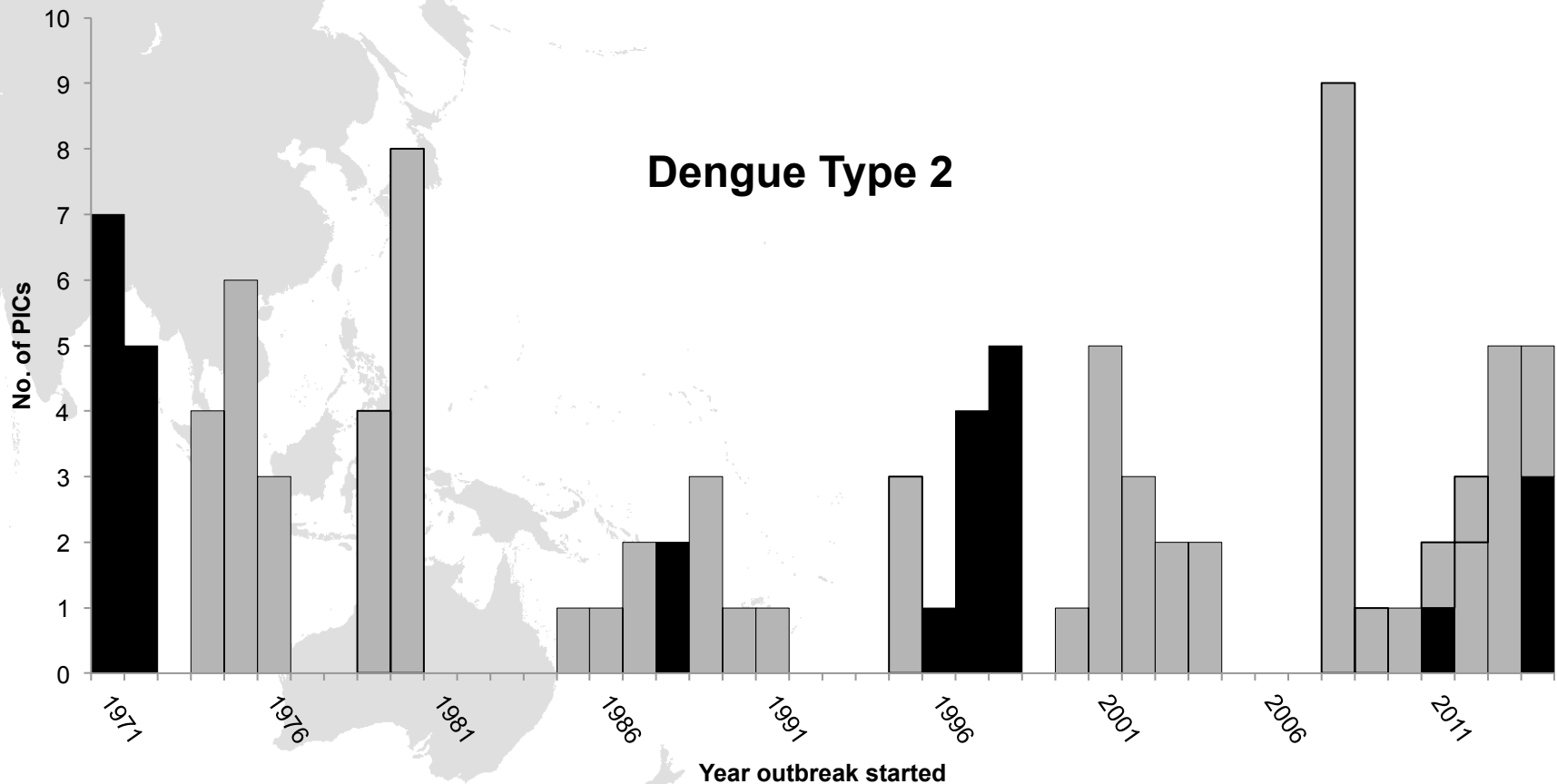


# Pacific island dengue outbreaks 1971 to 2014

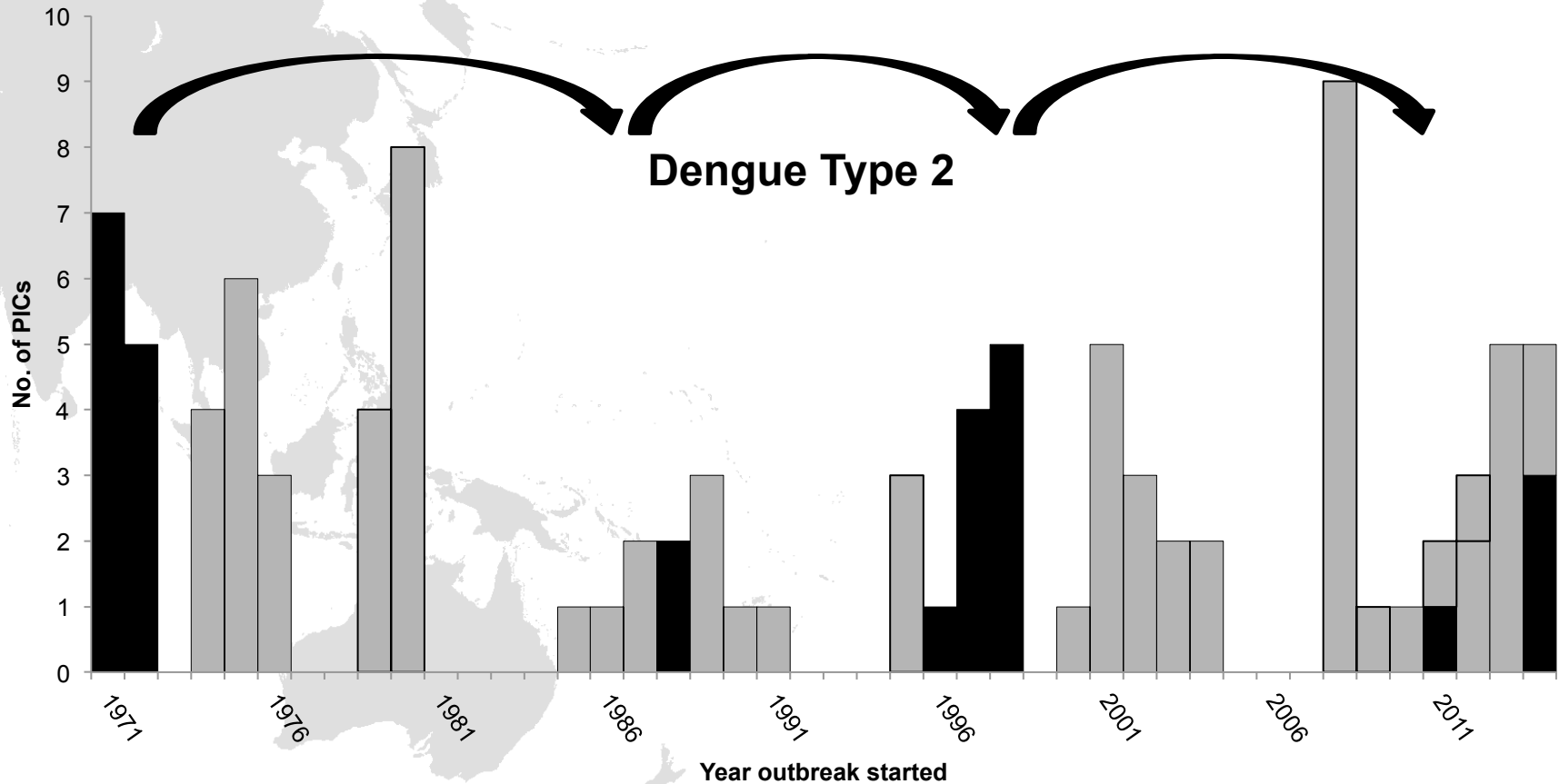




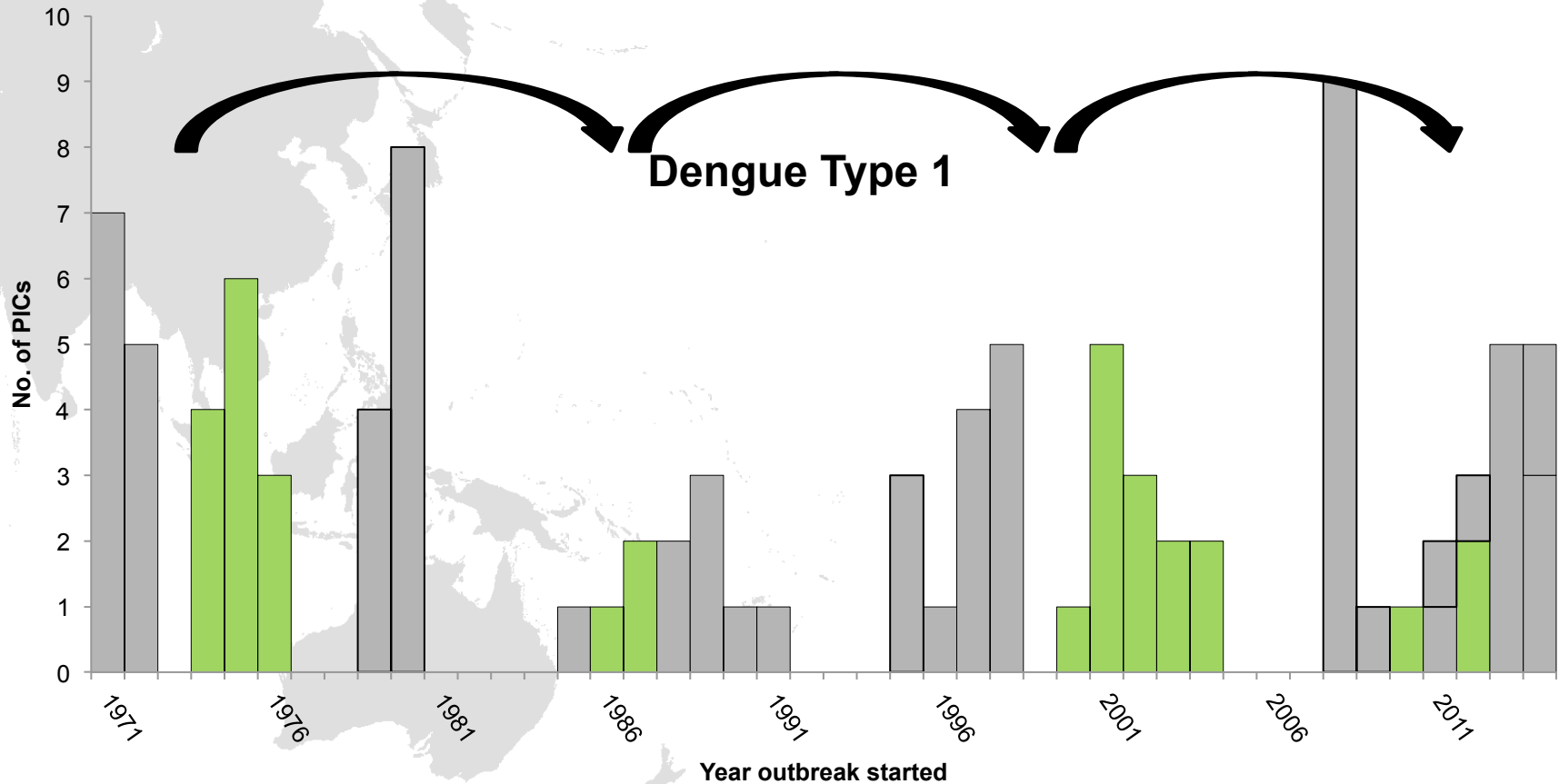
# Pacific island dengue outbreaks 1971 to 2014



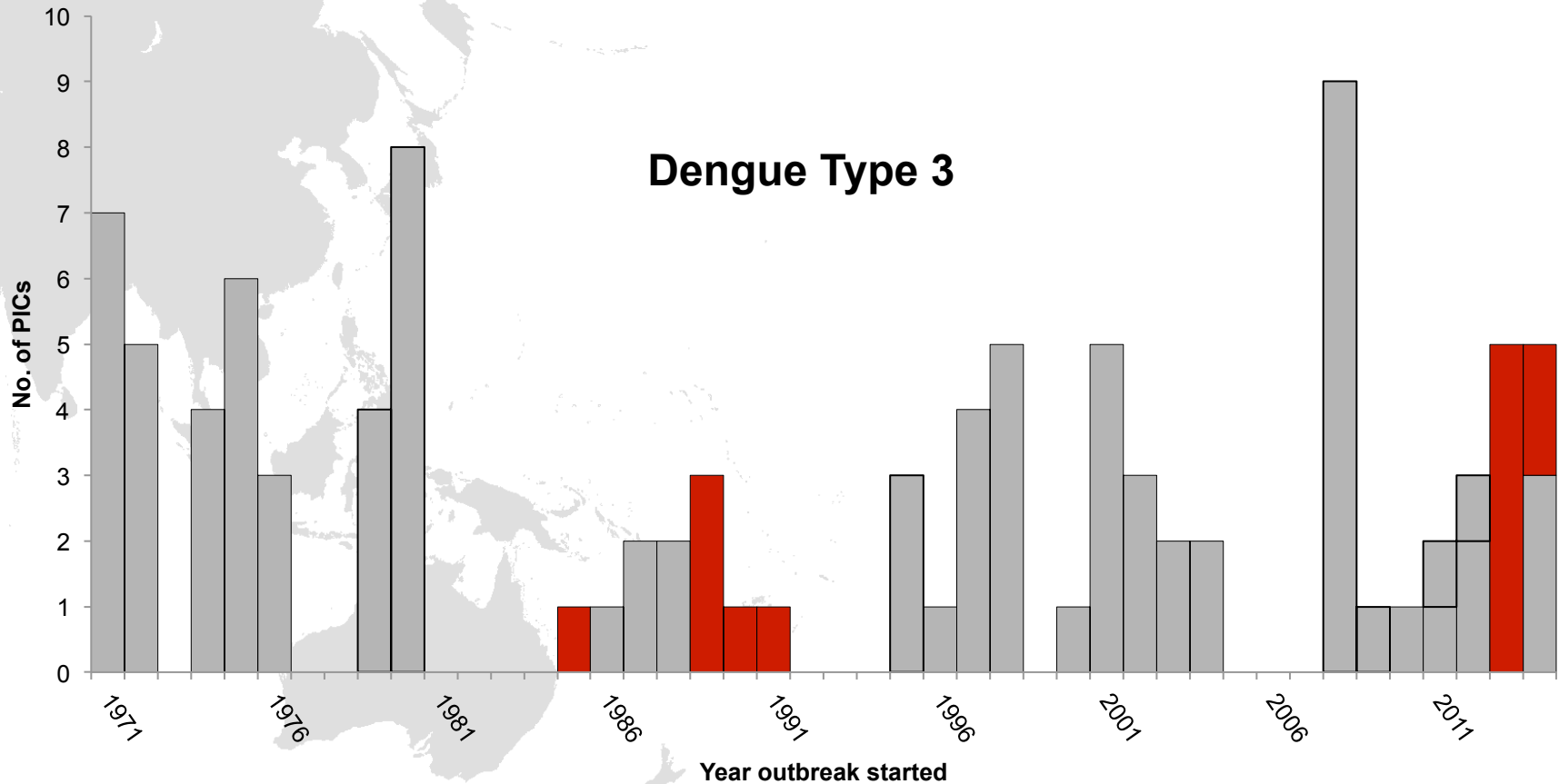
# Pacific island dengue outbreaks 1971 to 2014



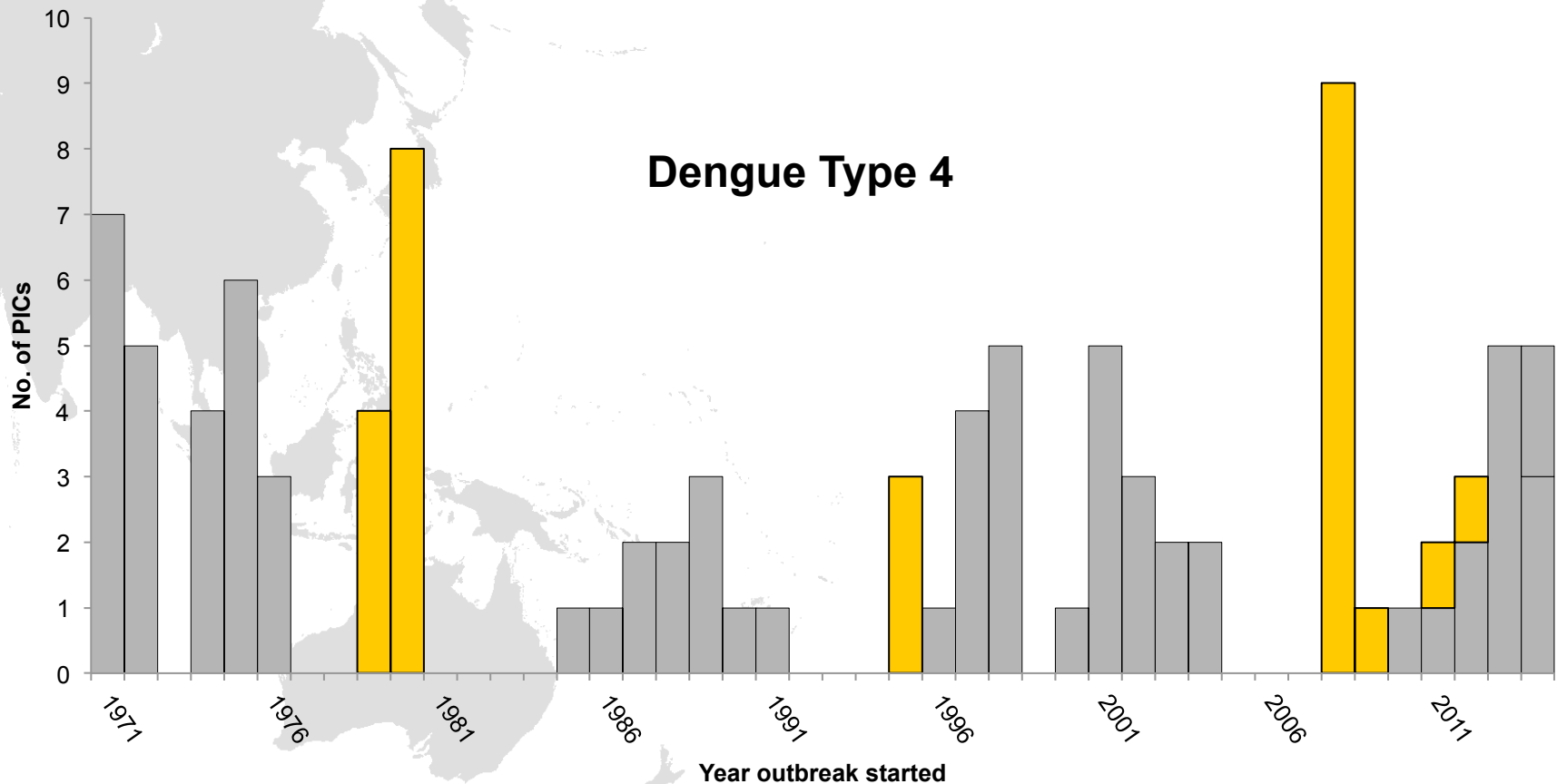
# Pacific island dengue outbreaks 1971 to 2014



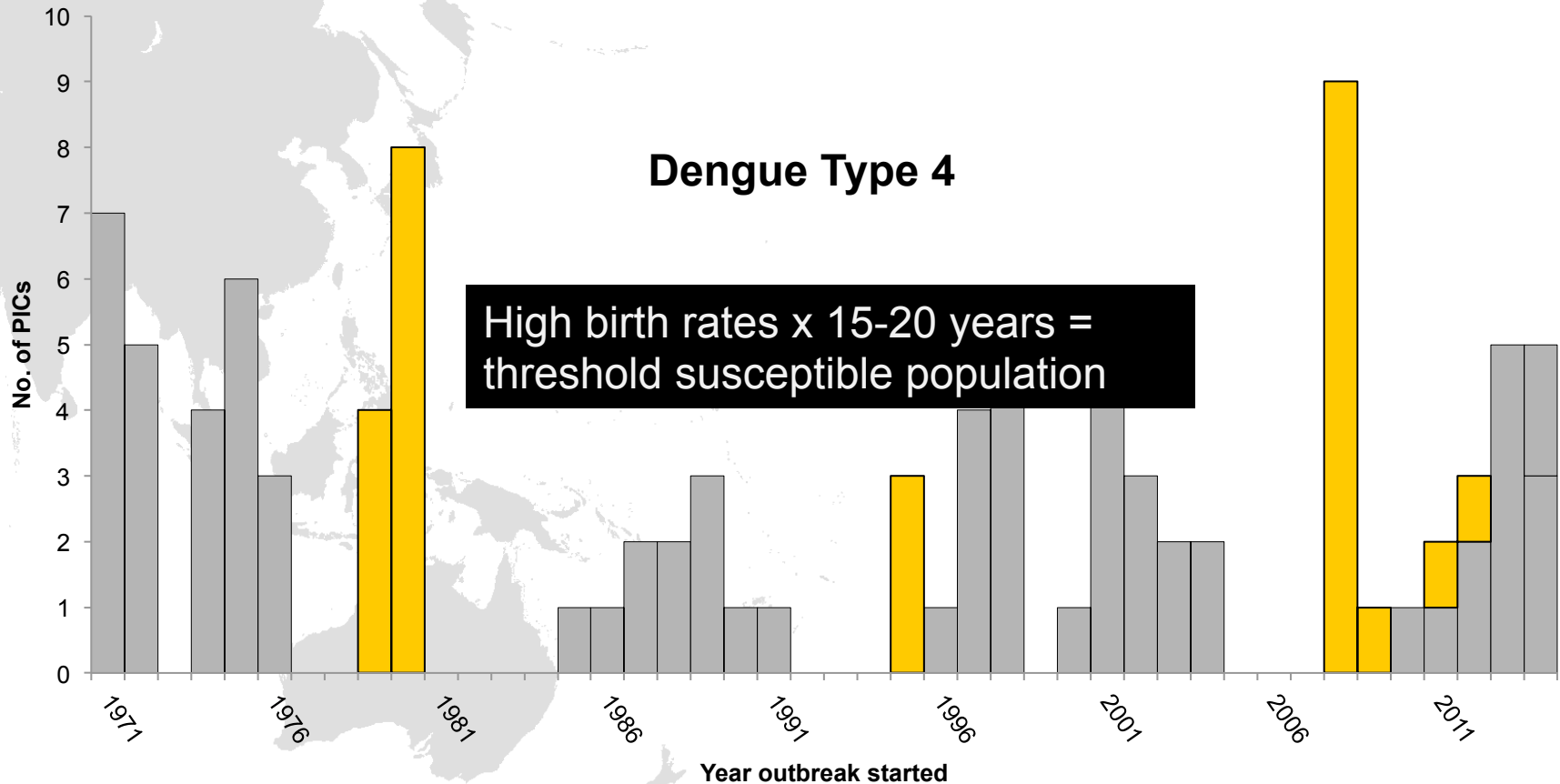
# Pacific island dengue outbreaks 1971 to 2014



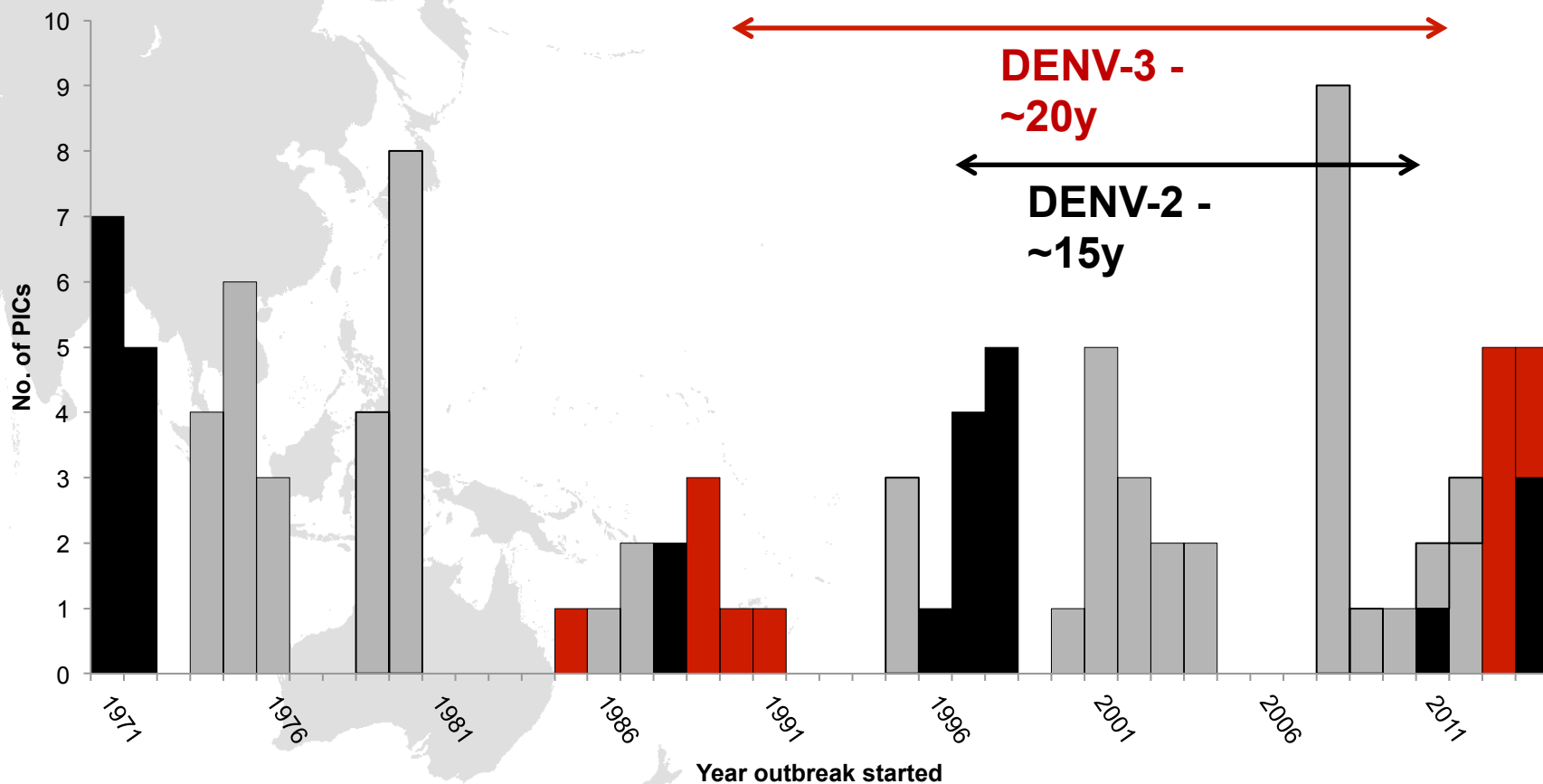
# Pacific island dengue outbreaks 1971 to 2014



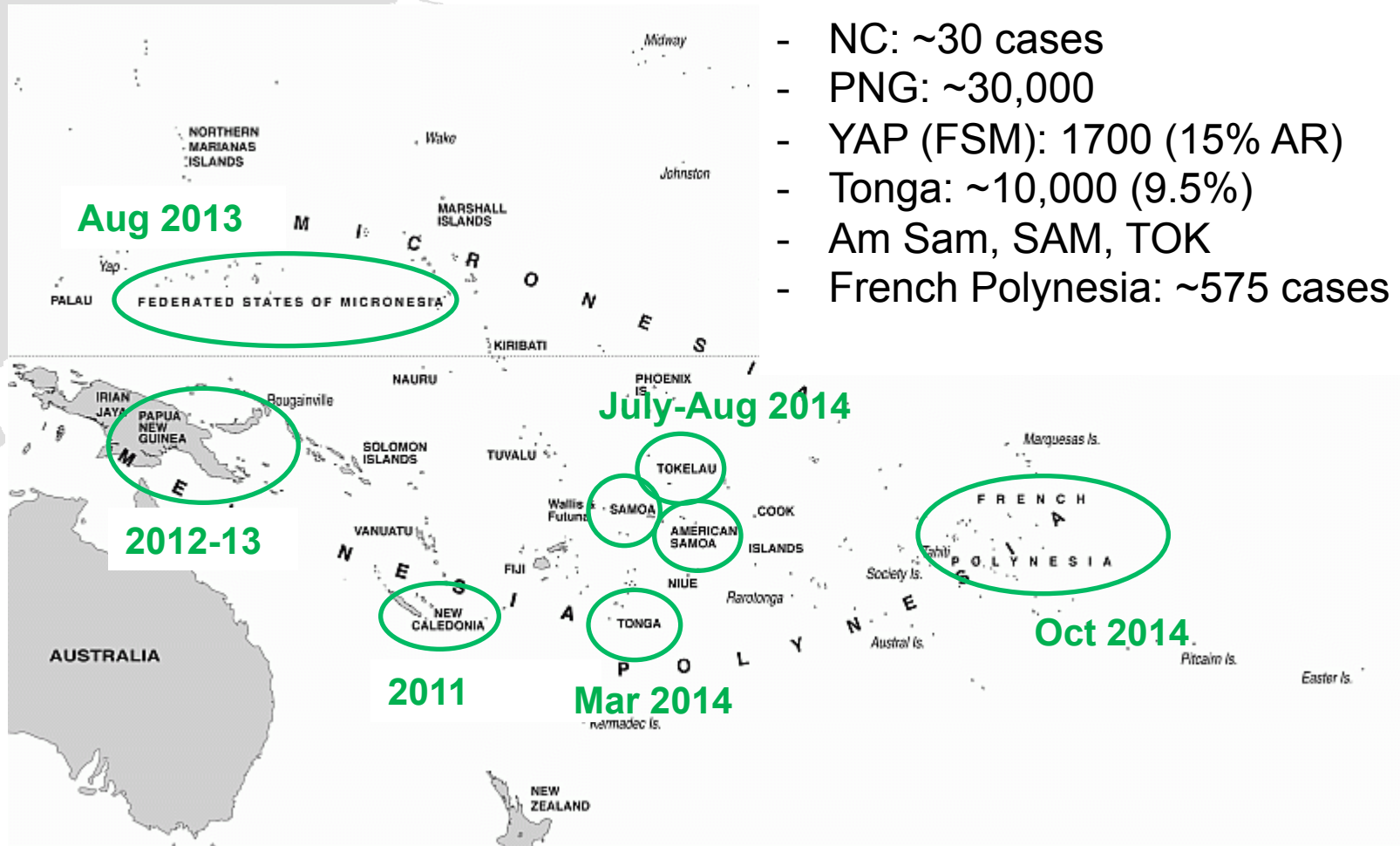
# Pacific island dengue outbreaks 1971 to 2014



# Pacific island dengue outbreaks 1971 to 2014



# Chikungunya virus: Emergence in the Pacific

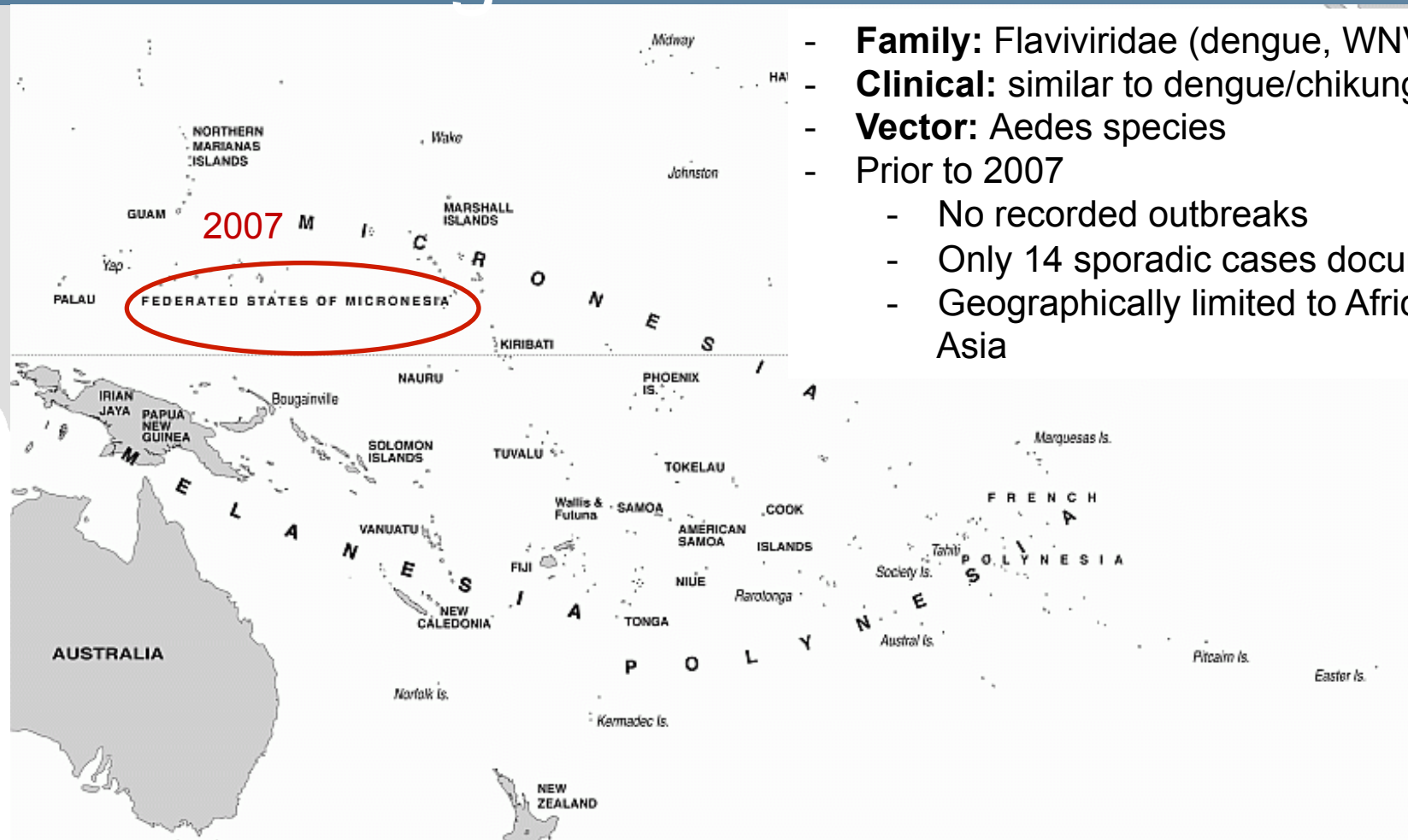


- NC: ~30 cases
- PNG: ~30,000
- YAP (FSM): 1700 (15% AR)
- Tonga: ~10,000 (9.5%)
- Am Sam, SAM, TOK
- French Polynesia: ~575 cases





# Zika virus: Emergence in the Pacific



- **Family:** Flaviviridae (dengue, WNV, YF)
- **Clinical:** similar to dengue/chikungunya
- **Vector:** Aedes species
- Prior to 2007
  - No recorded outbreaks
  - Only 14 sporadic cases documented
  - Geographically limited to Africa and Asia



## Zika Virus Outbreak on Yap Island, Federated States of Micronesia

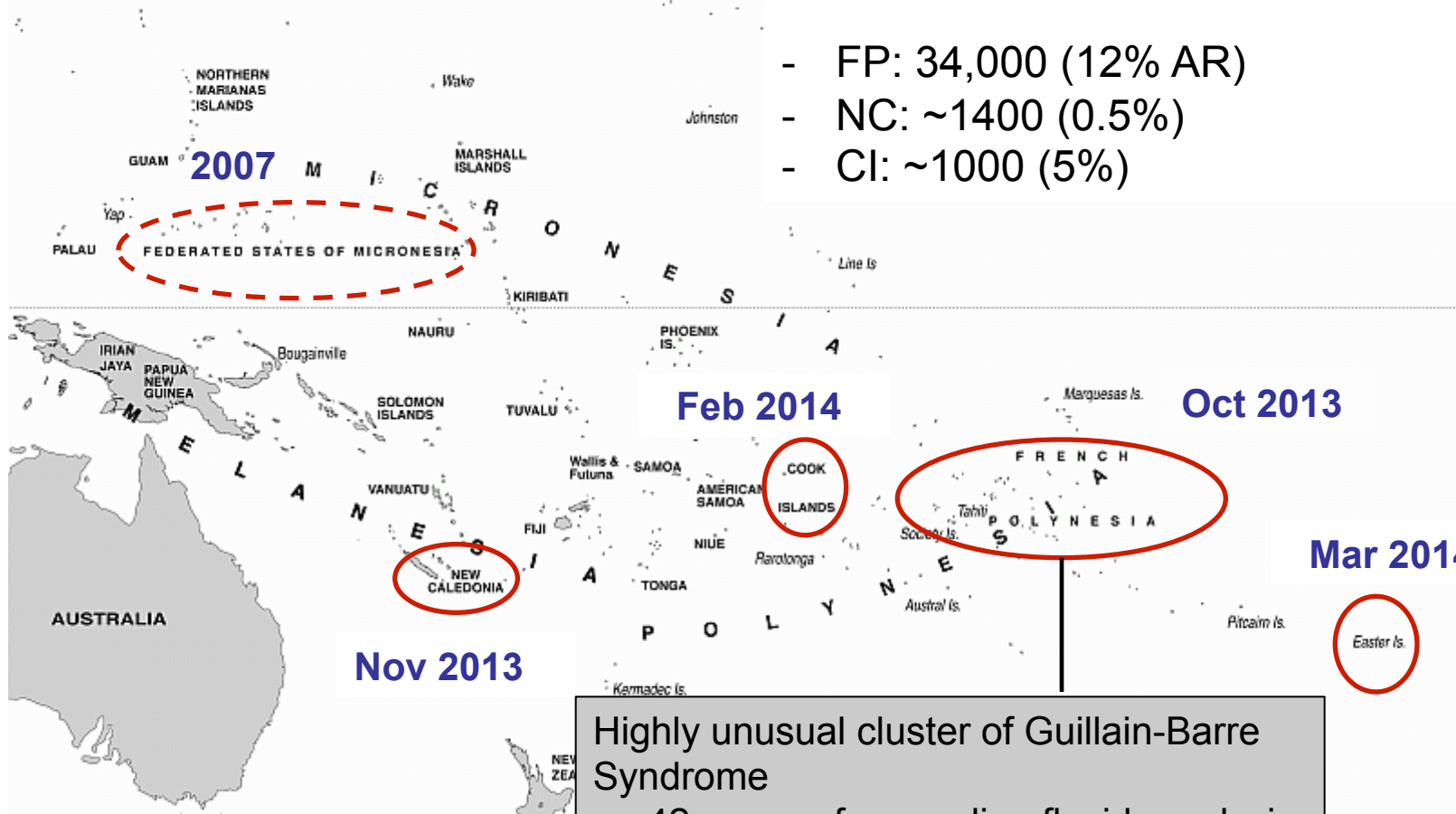
- Mild disease without need for hospitalization
  - Reported or documented fever
  - Maculopapular rash
  - Conjunctivitis
  - Edema of hands/feet
- Attack rate ~90%
- 60-70% asymptomatic
- No complications or deaths identified
- Vector unproven – likely *Aedes hensilli* vs *Ae aegypti*



# Rapid spread of emerging Zika virus in the Pacific area

D. Musso<sup>1</sup>, E. J. Nilles<sup>2</sup> and V.-M. Cao-Lormeau<sup>1</sup>

Clinical Microbiology and Infection ©2014



- FP: 34,000 (12% AR)
- NC: ~1400 (0.5%)
- CI: ~1000 (5%)

Highly unusual cluster of Guillain-Barre Syndrome

- 42 cases of ascending flacid paralysis
- Temporally associated with ZIKV
- Strained intensive care capacity



# Disasters in the Pacific



# Natural Disaster Risk - Pacific

## WorldRiskIndex

Rank	Country	Risk (%)
1.	Vanuatu	36.31
2.	Tonga	28.62
3.	Philippines	27.98
4.	Guatemala	20.75
5.	Bangladesh	20.22
6.	Solomon Islands	18.15
7.	Costa Rica	17.38
8.	Cambodia	17.17
9.	Timor-Leste	17.13
10.	El Salvador	16.89
11.	Brunei Darussalam	15.92
12.	Papua New Guinea	15.81
13.	Mauritius	15.39
14.	Nicaragua	15.36
15.	Fiji	13.69

- Cyclones, floods, earthquakes, tsunamis
- January 2013 – Sept 2014: 7 major disasters in PICs
- Climate change exacerbates the impact of disasters
- Poorest and most vulnerable populations bear the greatest burden




# Post-disaster epidemic risks?

## **Negligible Risk for Epidemics after Geophysical Disasters**

Nathalie Floret,\*† Jean-François Viel,\*† Frédéric Mauny,\*† Bruno Hoen,\*† and Renaud Piarroux\*†

Emerging Infectious Diseases • [www.cdc.gov/eid](http://www.cdc.gov/eid) • Vol. 12, No. 4, April 2006

## **Conflict and Health**

 Conflict and Health 2007, 1:2

Research

**Open Access**

**Occurrence and overlap of natural disasters, complex emergencies and epidemics during the past decade (1995–2004)**

Paul B Spiegel\*<sup>1</sup>, Phuoc Le<sup>1</sup>, Mija-Tesse Ververs<sup>2</sup> and Peter Salama<sup>3</sup>

## **Epidemics after Natural Disasters**

John T. Watson,\* Michelle Gayer,\* and Maire A. Connolly\*

Emerging Infectious Diseases • [www.cdc.gov/eid](http://www.cdc.gov/eid) • Vol. 13, No. 1, January 2007



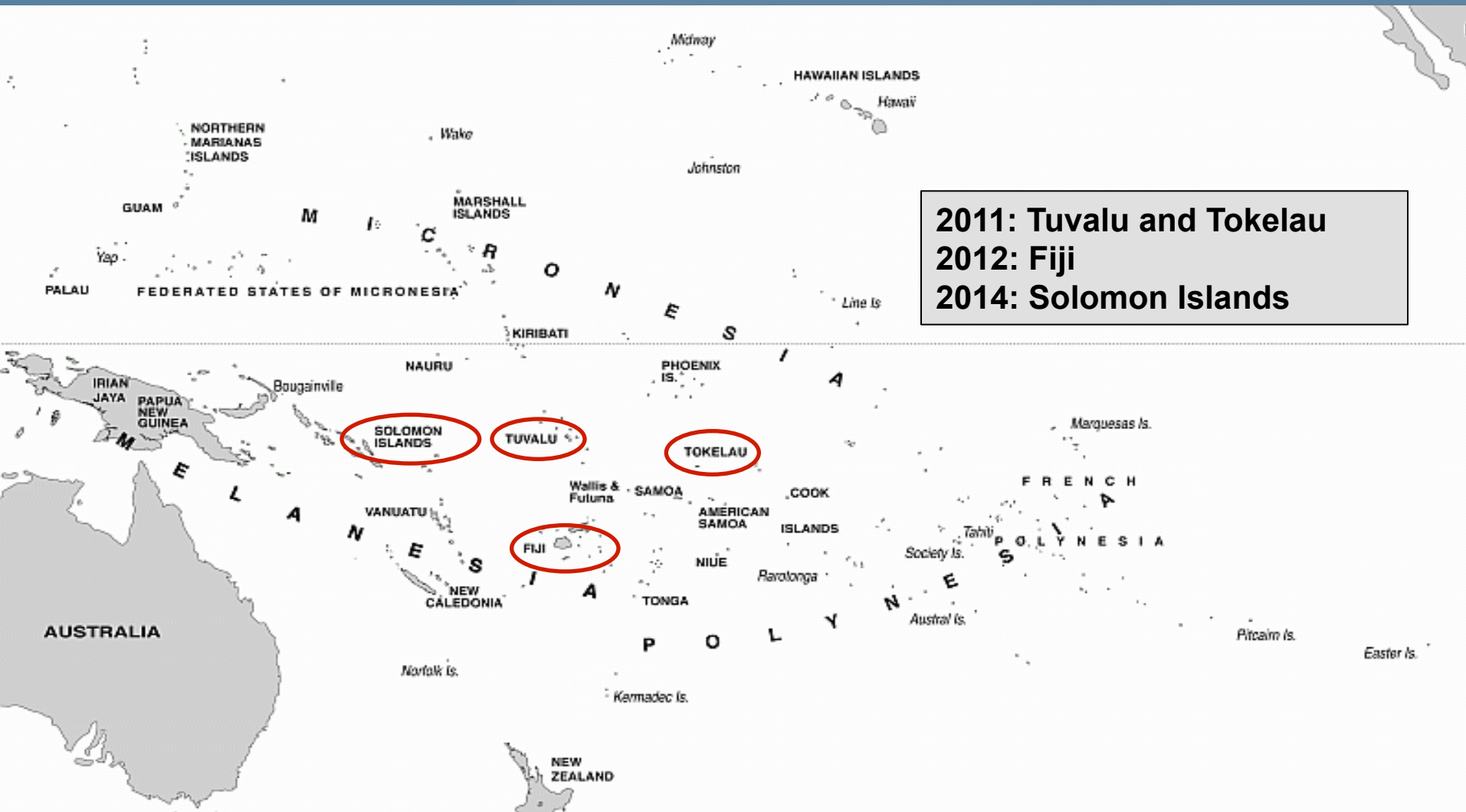


# Post-disaster: Factors increasing epidemic risk

- **Displaced populations**
  - Overcrowding
  - Limited clean water
  - Limited latrines & sanitation
  - Limited access to healthcare
  - Increased exposure to disease vectors
- **Poor baseline population health**

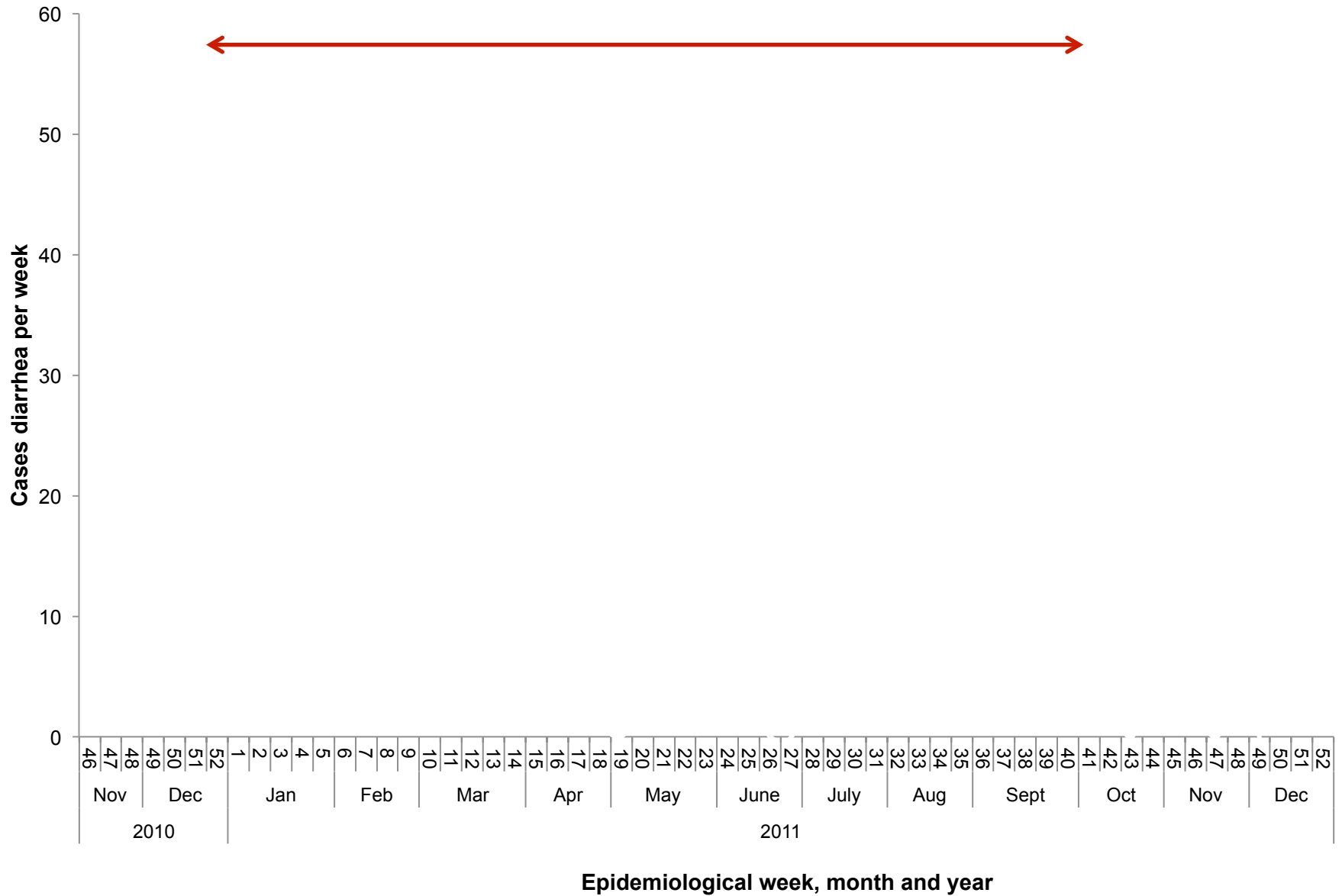


# Recent major disaster-related epidemics

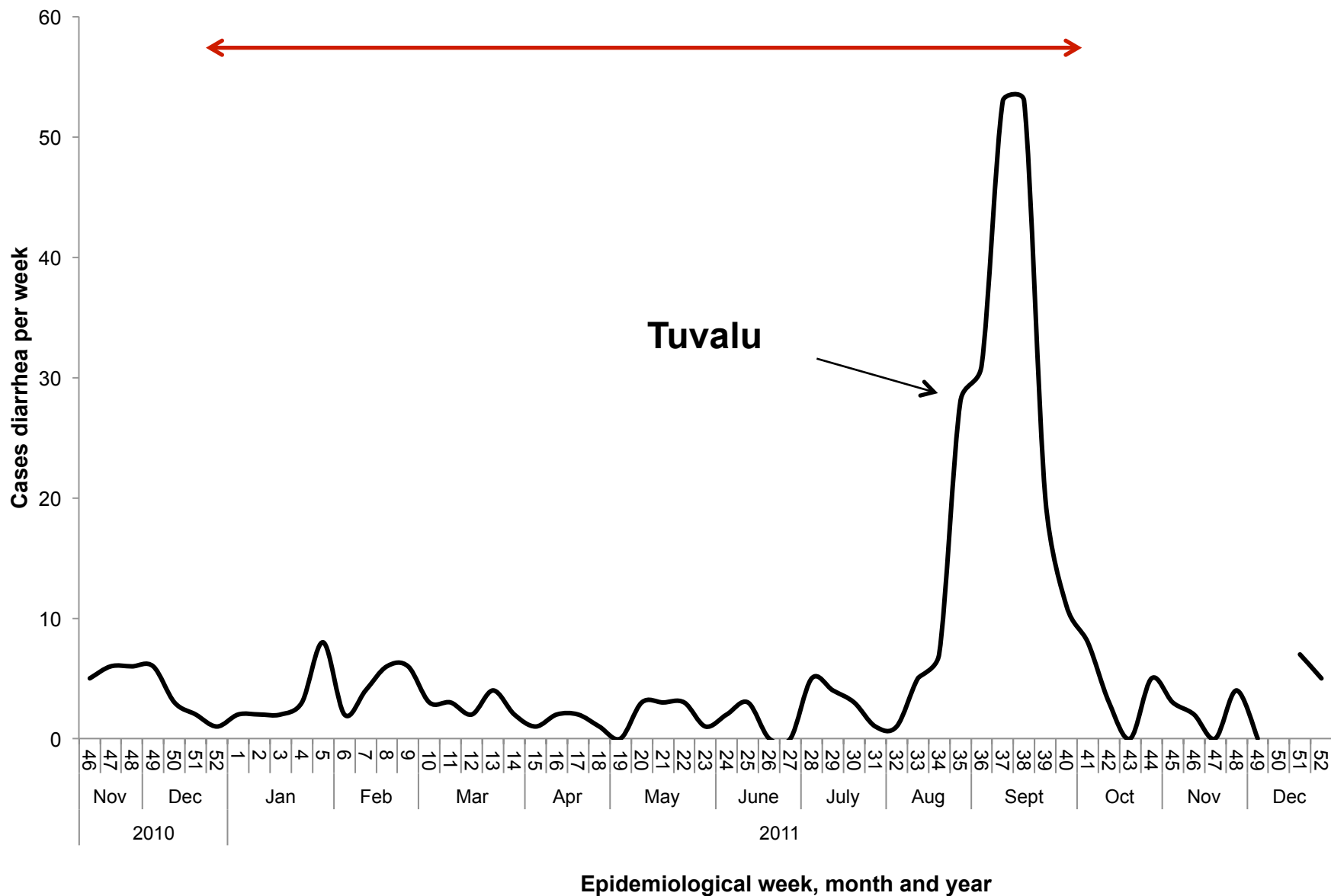




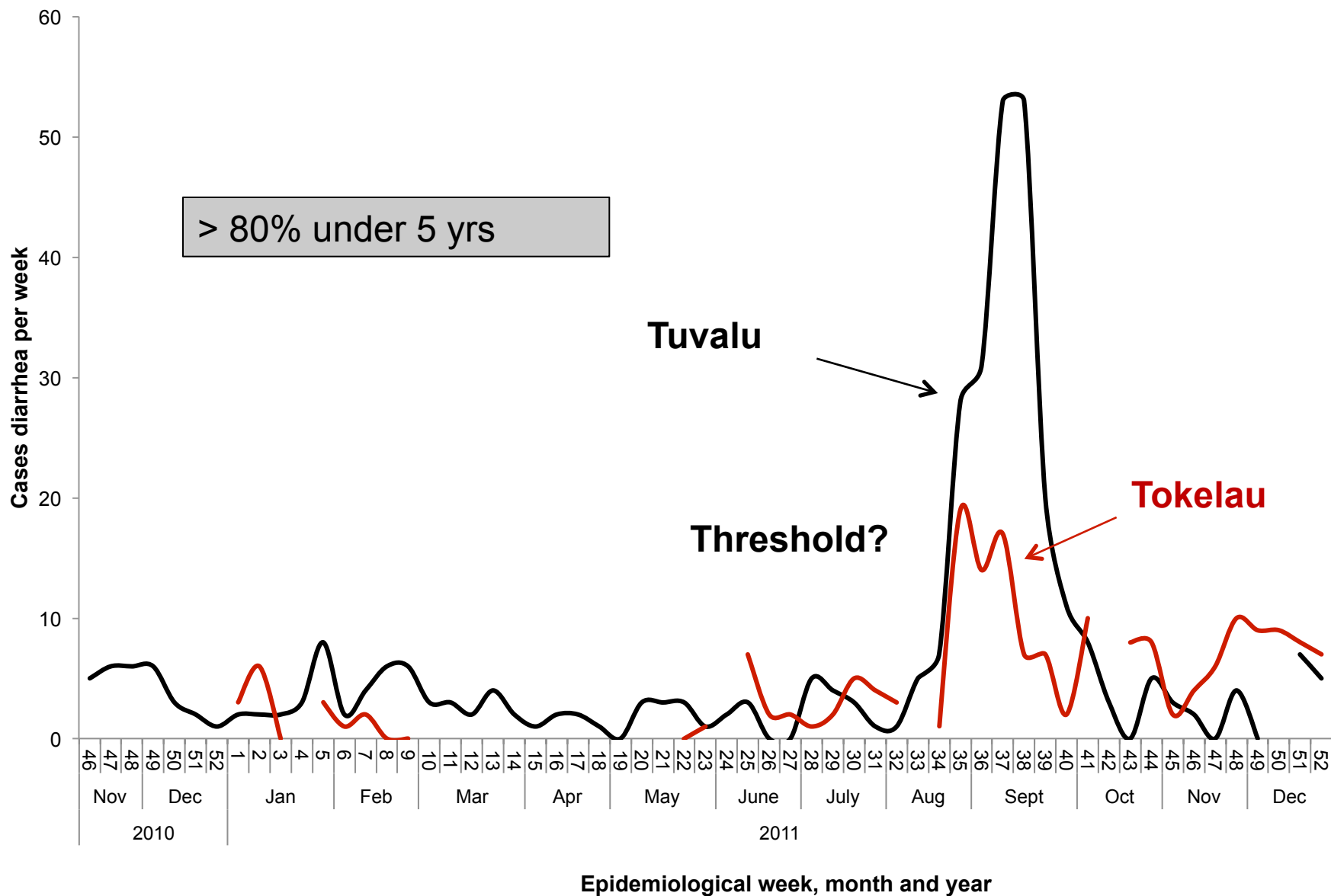
# Tuvalu & Tokelau: Drought emergencies and diarrhoea



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26 January 2012 Last updated at 03:20 GMT

### Fiji declares a state of disaster over severe flooding



# Flood disaster— Western Division, Fiji, 2012

**State of emergency  
declared**

Tropical Depression  
TD06F



12/01/2012 -	02/02/2012 -	01/03/2012 -	26/04/2012 -	31/05/2012 -	06/06/2012
18/01/2012	08/02/2012	07/03/2012	02/05/2012	06/06/2012	
19/01/2012 -	09/02/2012 -	08/03/2012 -	03/05/2012 -	07/06/2012 -	
25/01/2012	15/02/2012	14/03/2012	09/05/2012	13/06/2012	
26/01/2012 -	16/02/2012 -	15/03/2012 -	10/05/2012 -	14/06/2012 -	
01/02/2012	22/02/2012	21/03/2012	16/05/2012	16/06/2012	
02/02/2012 -	23/02/2012 -	22/03/2012 -	17/05/2012 -		
08/02/2012	29/02/2012	28/03/2012	23/05/2012		
09/02/2012 -		29/03/2012 -	24/05/2012 -		
15/02/2012		04/04/2012	30/05/2012		
16/02/2012 -		29/03/2012 -	31/05/2012 -		
22/02/2012		04/04/2012	06/06/2012		
23/02/2012 -		05/04/2012 -			
29/02/2012		11/04/2012			
		12/04/2012 -			
		18/04/2012			
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		06/06/2012			
		31/05/2012 -			
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		07/06/2012 -			
		13/06/2012			
		14/06/2012 -			
		16/06/2012			

January

February

March

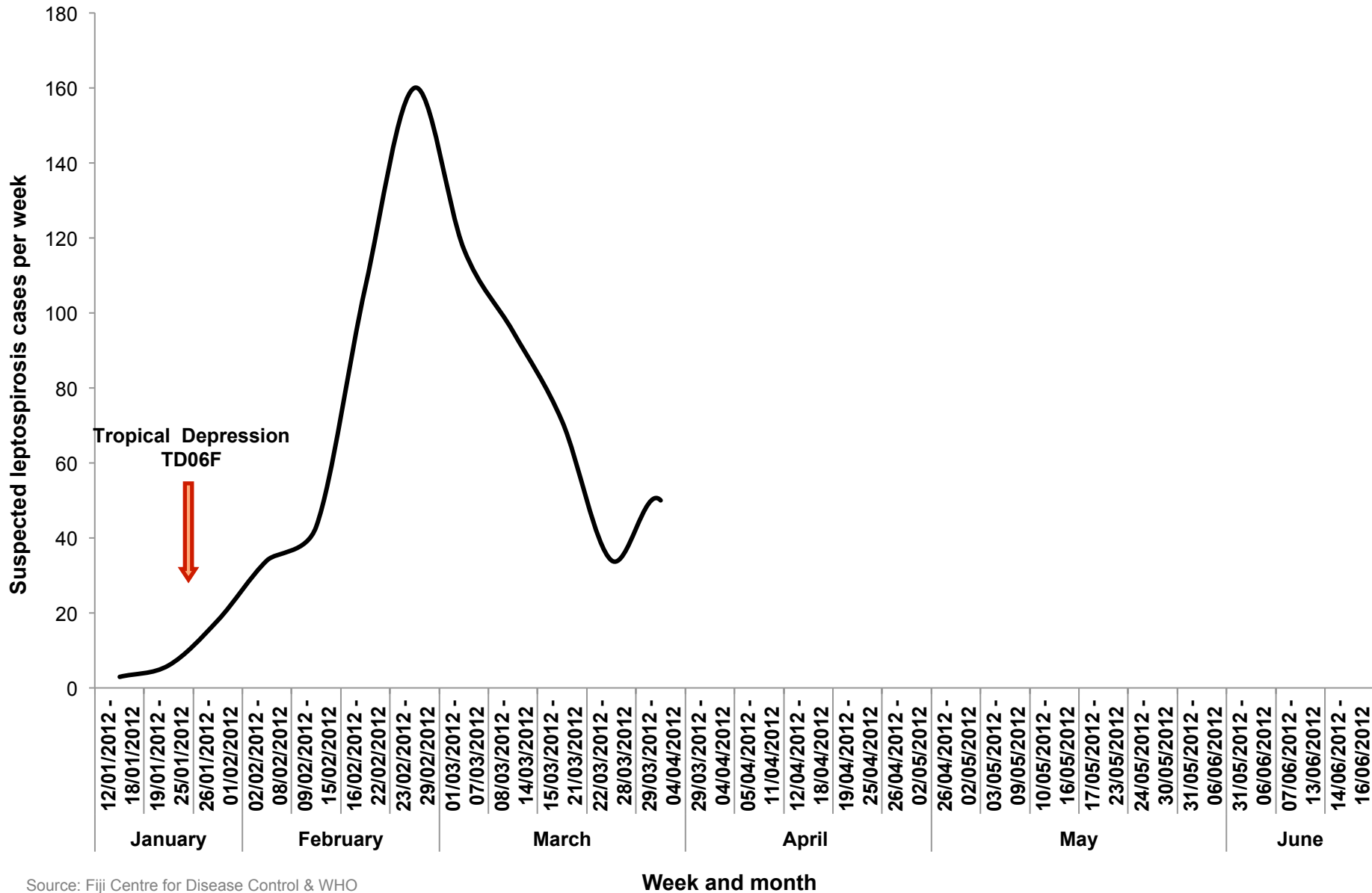
April

May

June

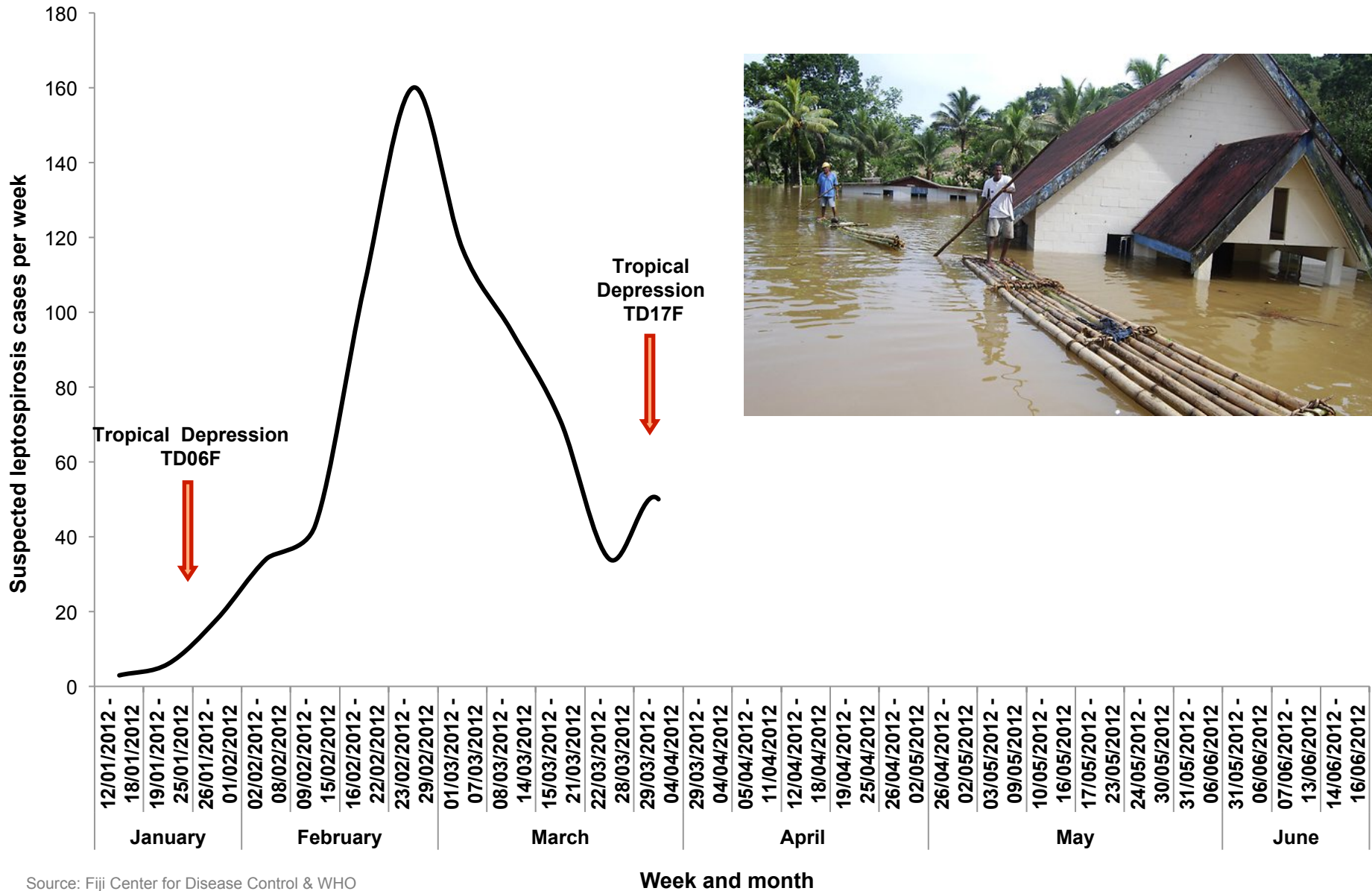
Week and month

# Leptospirosis outbreak — Western Division, Fiji, 2012



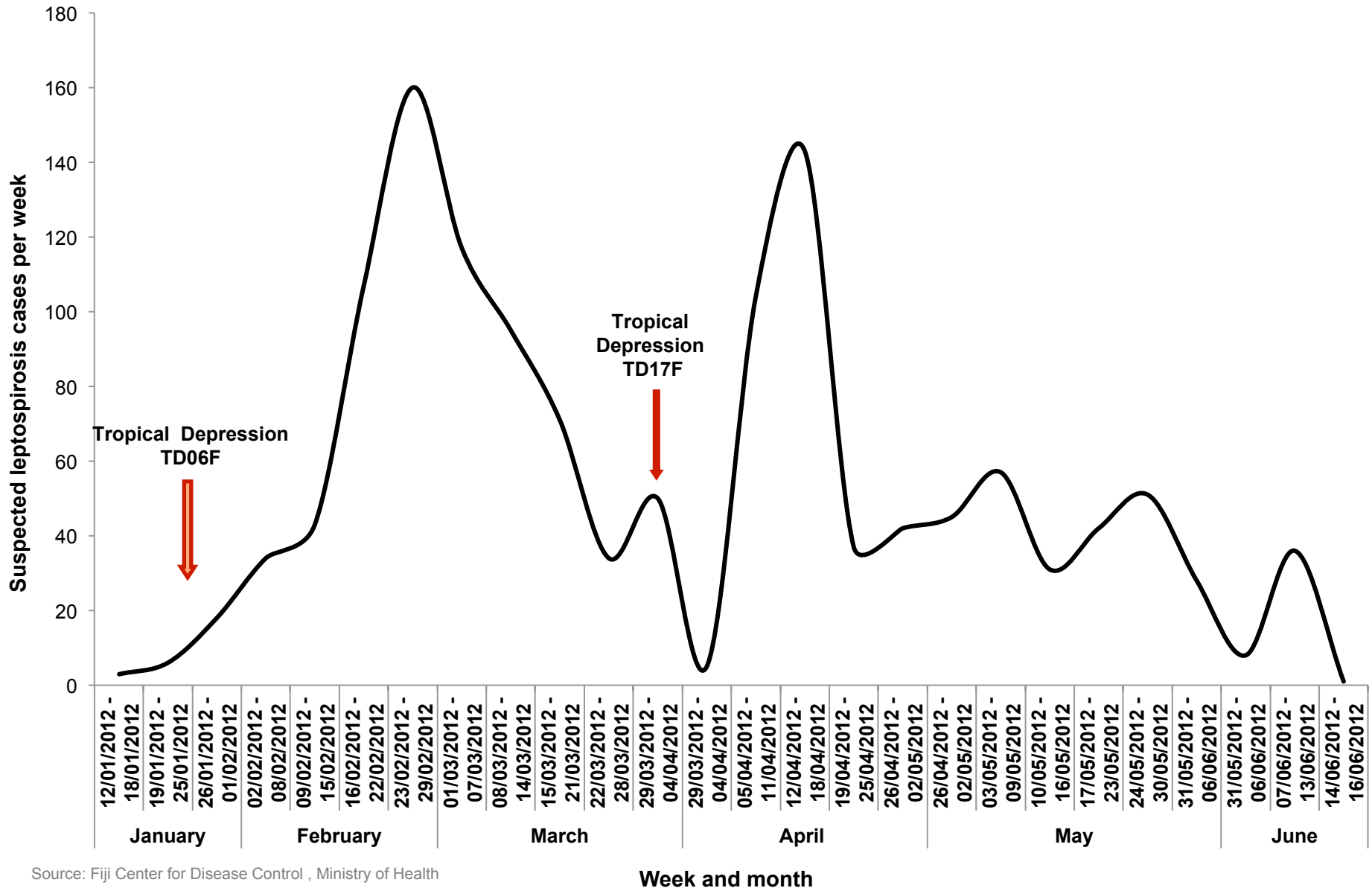
Source: Fiji Centre for Disease Control & WHO

# Leptospirosis outbreak — Western Division, Fiji, 2012



Source: Fiji Center for Disease Control & WHO

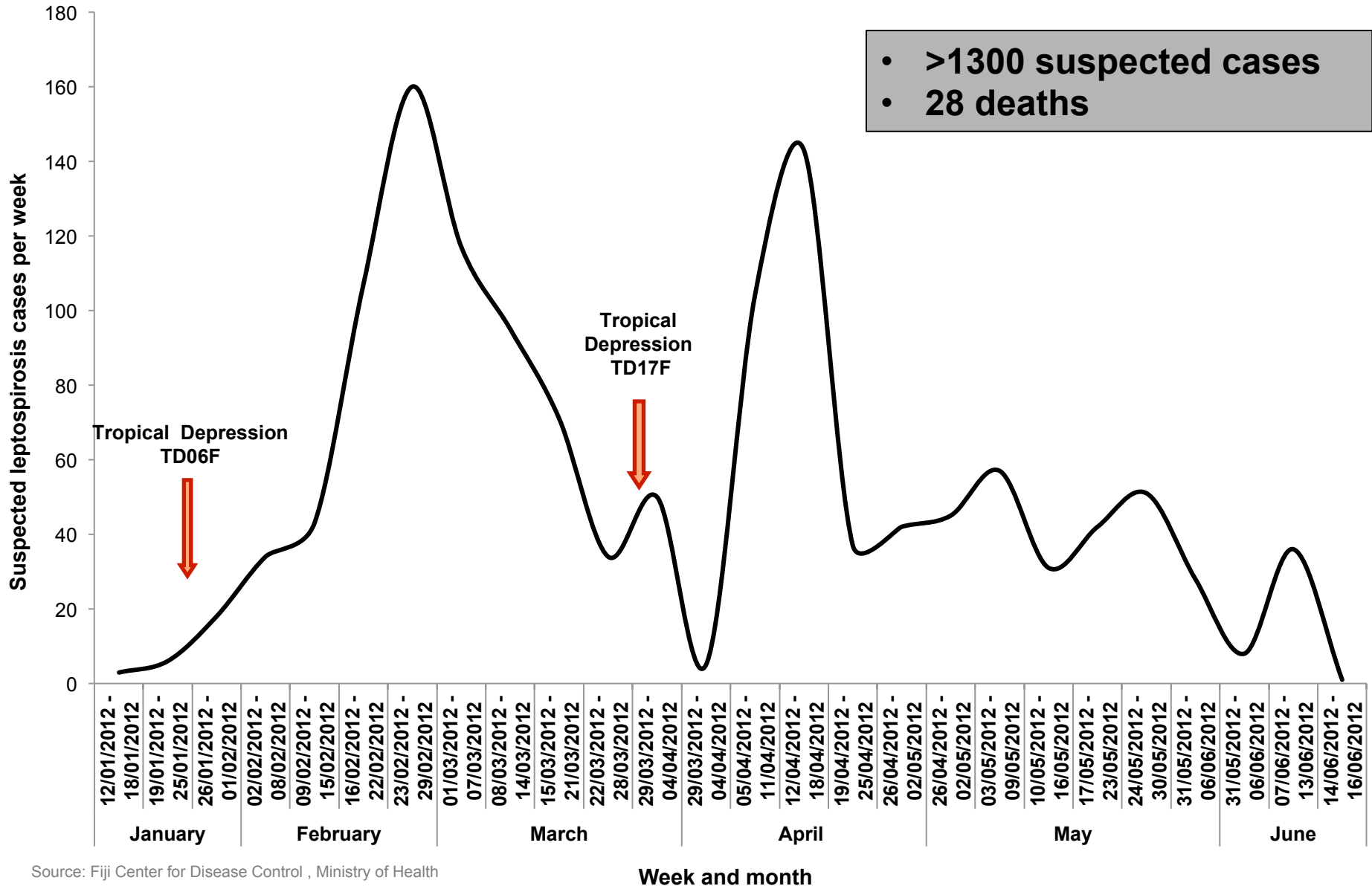
# Leptospirosis outbreak — Western Division, Fiji, 2012



Source: Fiji Center for Disease Control, Ministry of Health



# Leptospirosis outbreak — Western Division, Fiji, 2012

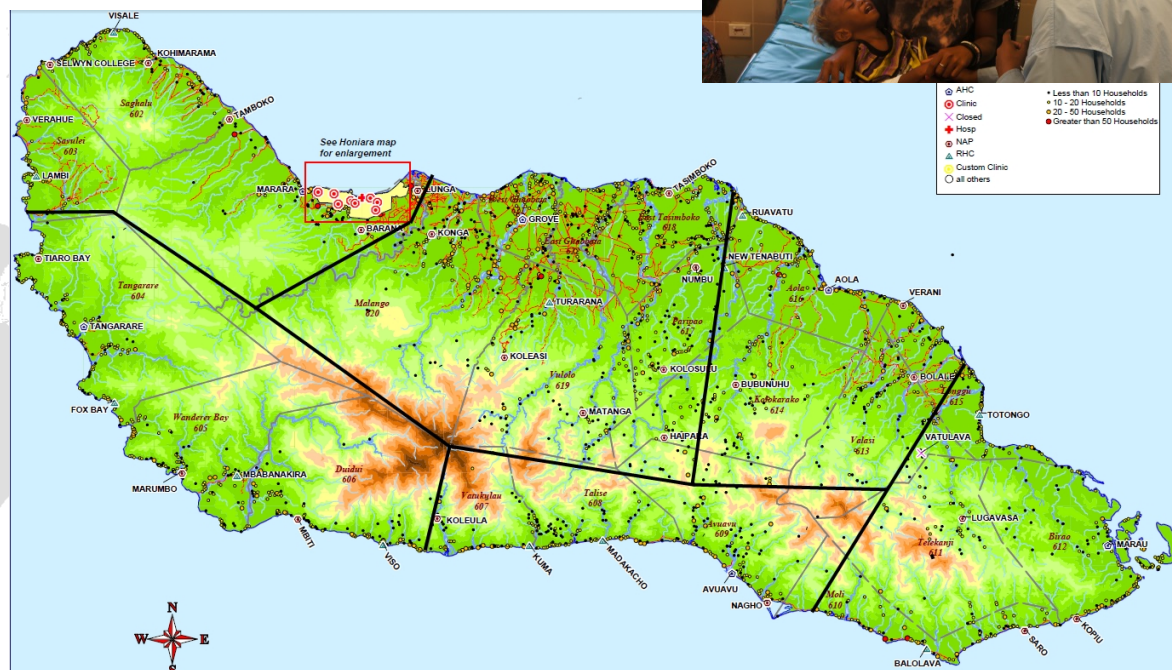


# Solomon Islands 2014 – Flash floods



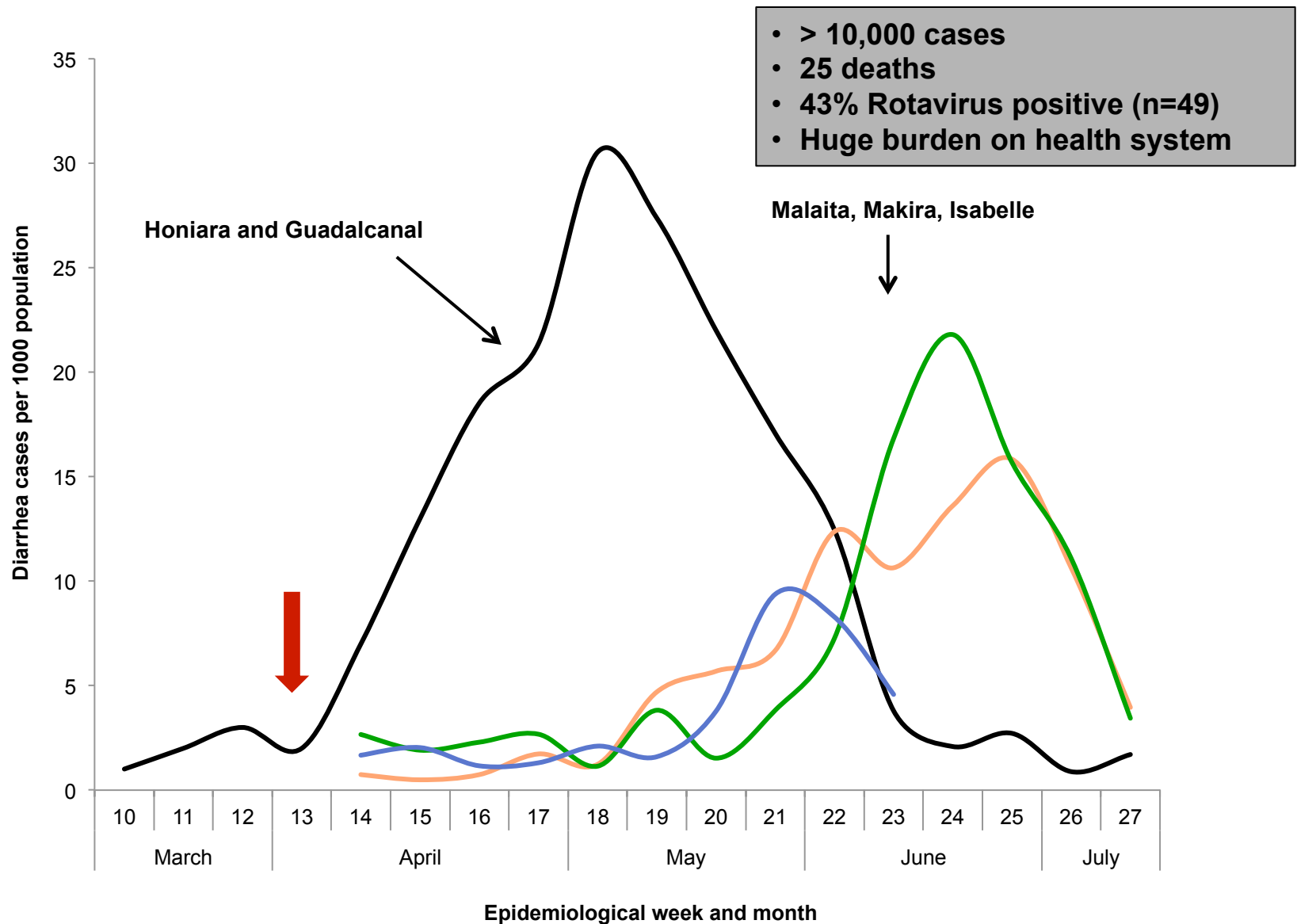
# Solomon Islands – Flash Flood Disaster

- Torrential rains 3-5 April
- 52,000 affected (10,000 displaced in Honiara)
- Large international response

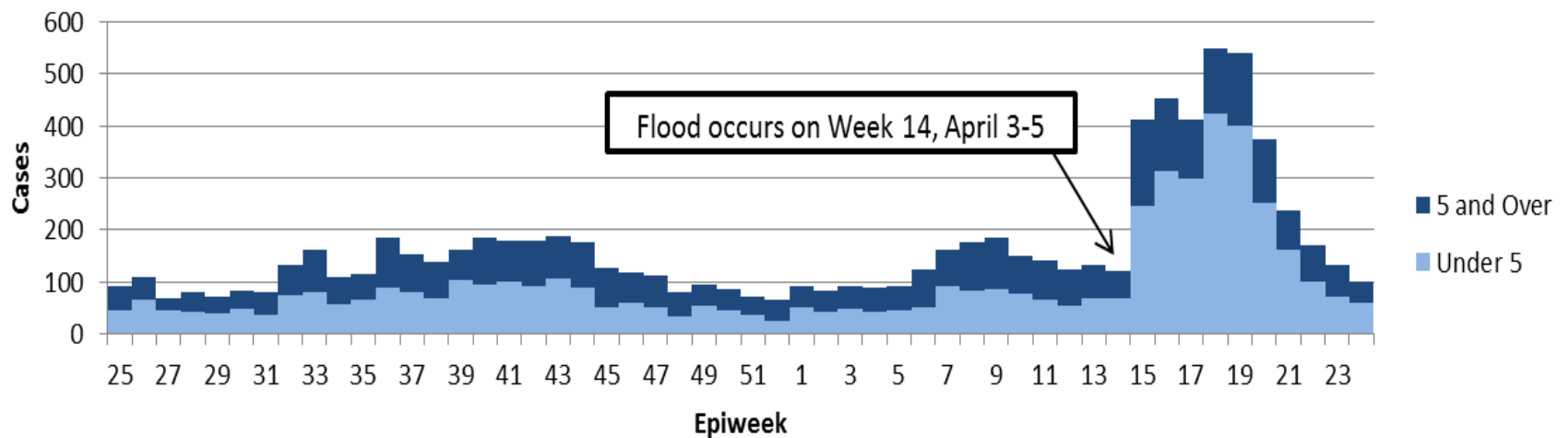




# Post flash-flood emergency diarrhoea outbreak



## Watery Diarrhea Cases in Honiara, Age Stratified (June 2013 - June 2014)



# WHO post-disaster response

## Rapid epidemic risk assessment – critical initial step

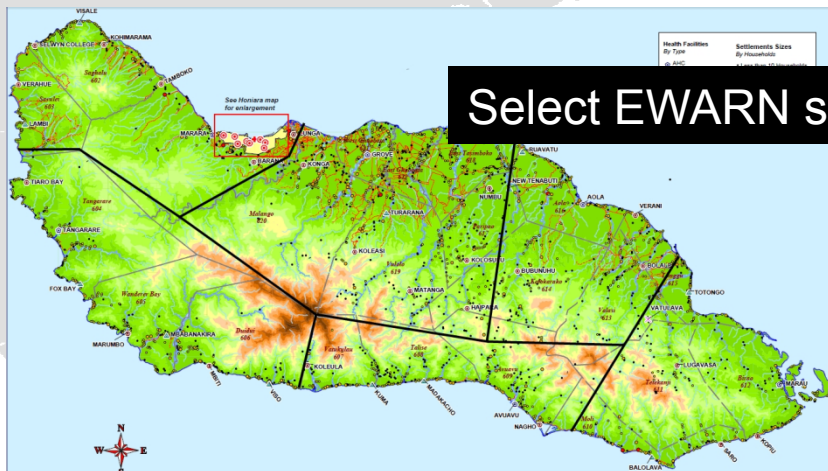
- Assess local epidemic prone diseases
- Population displacement? Overcrowding?
- Clean water, sanitation, healthcare?
- Pre-existing surveillance? Functional?
- Outbreak response capacity
- Available resources

Disease	Likelihood of substantial outbreak (A)	Impact of substantial outbreak (B)	Combined public health risk (A + B)/2
Shigella/dysentery	Moderate	High	Moderate-High
Leptospirosis	Mod-High	Mod-High	Moderate-High
Malaria	Moderate	Moderate	Moderate
Dengue*	Low-Mod	Mod-high	Moderate
Cholera	Low	High	Moderate
Typhoid Fever	Low	Moderate	Low-Moderate
Measles	Low-Mod	Mod	Low-Moderate
Hepatitis A	Low	Low	Low



# WHO post-disaster response

## Early warning alert & response networks (EWARN)



Select EWARN sites

**Early Warning Epidemic Surveillance Reporting Form – Flash Flood Emergency**  
Ministry of Health and Medical Services, Solomon Islands, 2014

Health Center: \_\_\_\_\_ Date of week beginning: \_\_\_\_/\_\_\_\_/\_\_\_\_ Date of week ending: \_\_\_\_/\_\_\_\_/\_\_\_\_

	< 5 Years	5 + Years	TOTAL
<b>Acute fever and rash</b> <i>Case definition: Fever plus rash</i>			
<b>Prolonged fever</b> <i>Fever for 3 days or more</i>			
<b>Influenza-like illness</b> <i>Fever plus cough or sore throat</i>			
<b>Watery diarrhea</b> <i>3 or more loose or watery stools in 24 hours (non-bloody)</i>			
<b>Bloody diarrhea</b> <i>Any episode of acute bloody diarrhea</i>			
<b>Acute jaundice syndrome</b> <i>Jaundice (yellow eyes or dark urine) AND severe illness with or without fever</i>			
<b>Malaria</b> <i>Clinically suspected malaria + positive RDT or MPS</i>			
<b>Suspected dengue</b> <i>See below*</i>			

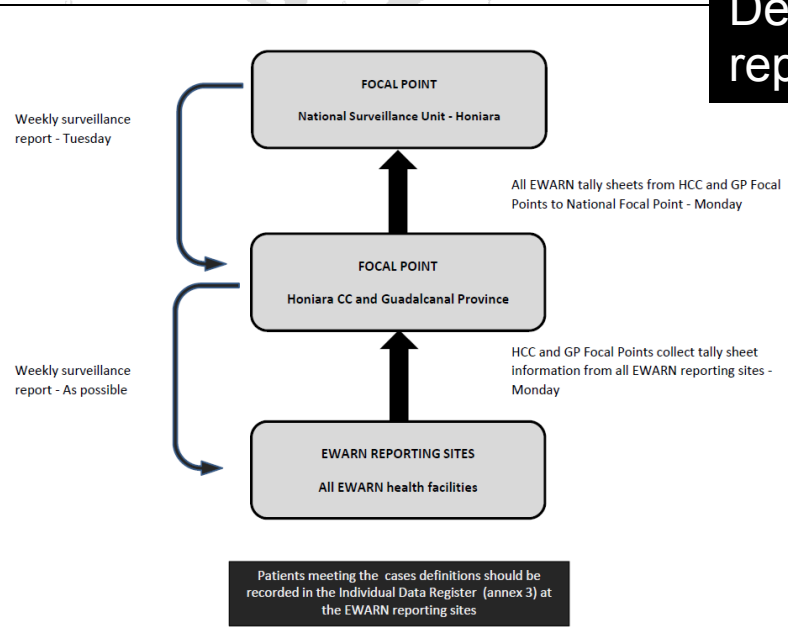
\*Suspected dengue Case Definition: Fever plus 2 of the following: 1) Aches and pains (headache, eye pain, muscle/joint pain); 2) Lack of appetite, nausea or vomiting; 3) Rash; 4) Tourniquet sign; 5) Bleeding from nose or gums; 6) Abdominal pain; 7) Lethargy or restlessness

Unexpected events: \_\_\_\_\_ (deaths, cluster of illness, bird or animal die off, etc)

NAME: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_

of consultations for week \_\_\_\_\_ For immediate reporting contact Cynthia Joshua (phone: 7600864, email: joshuac@wpro.who.int)

Develop forms and reporting protocols



Implement



## Establishing an early warning alert and response network following the 2013 Solomon Islands tsunami

Augustine Bilve,<sup>a</sup> Francisco Nogareda,<sup>b</sup> Cynthia Joshua,<sup>c</sup> Lester Ross,<sup>c</sup> Christopher Betcha,<sup>c</sup> Kara Durski,<sup>d</sup> Juliet Fleischl<sup>d</sup> & Eric Nilles<sup>b</sup>

**Problem** On 6 February 2013, an 8.0 magnitude earthquake generated a tsunami that struck the Santa Cruz Islands, Solomon Islands, killing 10 people and displacing over 4700.

**Approach** A post-disaster assessment of the risk of epidemic disease transmission recommended the implementation of an early warning alert and response network (EWARN) to rapidly detect, assess and respond to potential outbreaks in the aftermath of the tsunami.

**Local setting** Almost 40% of the Santa Cruz Islands population were displaced by the disaster, and living in cramped temporary camps with poor or absent sanitation facilities and insufficient access to clean water. There was no early warning disease surveillance system.

**Relevant changes** By 25 February, an EWARN was operational in five health facilities that served 90% of the displaced population. Eight priority diseases or syndromes were reported weekly; unexpected health events were reported immediately. Between 25 February and 19 May, 1177 target diseases or syndrome cases were reported. Seven alerts were investigated. No sustained transmission or epidemics were identified. Reporting compliance was 85%. The EWARN was then transitioned to the routine four-syndrome early warning disease surveillance system.

**Lesson learnt** It was necessary to conduct a detailed assessment to evaluate the risk and potential impact of serious infectious disease outbreaks, to assess whether and how enhanced early warning disease surveillance should be implemented. Local capacities and available resources should be considered in planning EWARN implementation. An EWARN can be an opportunity to establish or strengthen early warning disease surveillance capabilities.

Abstracts in [عربي](#), [中文](#), [Français](#), [Русский](#) and [Español](#) at the end of each article.

Bulletin of the World Health Organization





# Pacific Syndromic Surveillance System

2000

- Reporting of clinical signs and symptoms only
- No lab
- Fast and simple
- Early detection provides the opportunity to intervene early and limit the impact of outbreak spread



# Standardized Pacific syndromic surveillance: Core case definitions

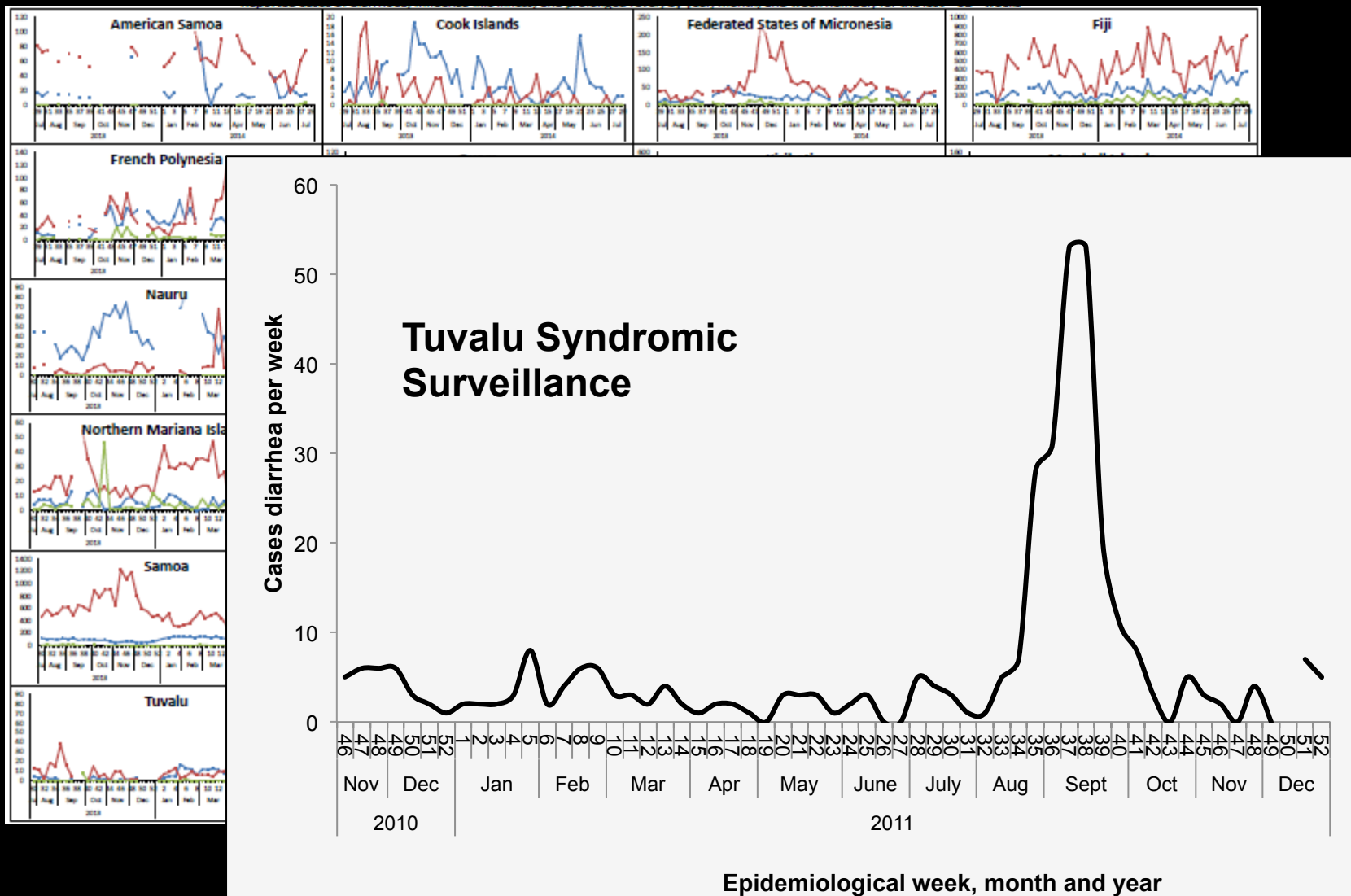
SYNDROME	CASE DEFINITION	IMPORTANT DISEASES TO CONSIDER
1. Acute fever and rash	Sudden onset of fever <b>AND</b> acute non-blistering rash	Measles, dengue, rubella, meningitis, leptospirosis
2. Diarrhoea	3 or more loose or watery stools in 24-hours	Viral or bacterial gastroenteritis (cholera, food poisoning, ciguatera fish poisoning)
3. Influenza-like illness	Sudden onset of fever <b>AND</b> cough or sore throat	Influenza, other viral or bacterial respiratory infection
4. Prolonged fever	Any fever lasting 3 or more days	Typhoid fever, dengue, leptospirosis, malaria
5. Unusual event (that raised concern)		Unusual pattern of disease; high number of cases with common symptoms; potential outbreak situation; environmental disaster ; animal die-off...

# WHO Regional support

- Data collation, analysis & reporting
- Weekly Pacific surveillance and outbreak reports through email
- Regular country missions to support system
- Assistance available when increase in cases detected



# Preparation: Strengthen routine surveillance & response



# Pacific Syndromic Surveillance System

[pacnet] Pacific Syndromic Surveillance report week 34 ending 24 August 2014

EN English (United Kingdom) US

File Message Adobe PDF

From: bounce-887974-91010@lyris.spc.int on behalf of BiaukulaV@wpro.who.int  
To: Pacific Public Health Surveillance Network  
Cc: Pacific Outbreak Surveillance (SP)  
Subject: [pacnet] Pacific Syndromic Surveillance report week 34 ending 24 August 2014  
Message: Pacific Syndromic Surveillance report week 34 ending 24 August 2014.pdf (213 KB)

Sent: Thu 28/08/2014 15:30

Dear Pacific Colleagues,

Please find attached the Pacific Syndromic Surveillance report for Epi week 34 ending 24 August 2014.

The following syndromes have been flagged:

- **Acute Fever and Rash:** American Samoa, Samoa, Solomon Islands
- **Diarrhoea:** Federated States of Micronesia (FSM), New Caledonia, Tuvalu
- **Influenza-like illness:** FSM, New Zealand, Tuvalu
- **Prolonged Fever:** Niue, Tonga, Tuvalu

Other updates:

**Chikungunya**

- As of 26 August 2014 there have been 631 cases of Chikungunya in **American Samoa** since 15 June 2014; including 9 hospitalisations. There have been no deaths reported.
- **Samoa:** Chikungunya outbreak continues. As of 23 August 2014 there have been 308 cases since 24 July 2014. Routine surveillance is enhanced and strengthened with mass gathering surveillance implemented in preparation for the third International Conference on Small Island Developing States which will be held from 1-4 September 2014 in Apia, Samoa.
- **Tokelau:** As of 24 August 2014 there have been 142 suspected Chikungunya cases since 12 July 2014. Cases are distributed over Nukunonu, Atafu and Fakaofu atolls with majority of the cases from Fakaofu. Samples have been collected and sent to the Institut Louis Malarde, French Polynesia for confirmatory testing.

**Dengue**

- Dengue serotype-1 outbreak continues in **French Polynesia**. There 62 confirmed cases for the week ending 17 August 2014, including 5 severe cases that required hospitalisation in July 2014.

**Measles**

Viema Biaukula

# WHO support to PICs

- Support IHR implementation and monitoring in countries
- Coordination and management of the PSSS among the 23 PICs
- Provide Post disaster surveillance (EWARN)
- Outbreak response support in countries.



**Thank you**

