EWARS Structure and Function

PSSS operates through an Early Warning Alert Reporting System (EWARS) structure. The PSSS is thus part of the global EWARS. The two main components of EWARS are:

1. a weekly reporting component (which reports weekly data aggregated by health facilities/sentinel sites – *see Table 2*) and
2. an immediate alert component (which signals the early stages of an outbreak).

Figure 1. EWARS continuum from early warning, to alert and response

Management
Management of EWARS requires:

1. the coordinator experienced in disease surveillance, disease control during emergencies; and knowledge of surveillance systems and the local disease epidemiology.
2. at least one focal point assigned for each of the PICs is required.

EWARS requirement is a network of surveillance officers who collect data on infectious disease syndromes, inform the next reporting level and; implement necessary control responses and measures. These complementary components ensure timely detection and verification of outbreaks, and effective monitoring of morbidity patterns. EWARS can therefore serve its role of early warning, trigger alerts to potential outbreaks (*see Figures 1 and 2*) and thereby reduce morbidity and mortality during outbreaks.

Figure 2. EWARS: Early warning cycle of data collection, analysis and interpretation, feedback

Sentinel Sites by Country

Sentinel sites provide the major source of weekly data for the PSSS and is the single most important data tracking infectious diseases in PICs. Many PICs, especially those with larger populations, have expanded the number of sentinel sites (*see Table 2*) within their jurisdiction. This has enabled representative and wider surveillance coverage. Total PICs sentinel sites increased from 119 in 2016 to 188 in 2022.

Table 2 Sentinel sites by countries

Country	Total number of sites in 2016	Total number of sites in 2022
American Samoa	1	0
Cook Islands	13	14
Fiji	12	29
French Polynesia	30	30
Guam	0	0
Kiribati	14	9
Marshall Islands	2	2
Federated States of Micronesia	0	4
Nauru	1	0
New Caledonia	1	26
New Zealand	0	0
Niue	1	1
Northern Mariana Islands (the)	7	8
Palau	1	1
Papua New Guinea	0	0
Pitcairn Islands	1	1
Samoa	8	11
Solomon Islands	9	14
Tokelau	0	3
Tonga	4	11
Tuvalu	1	3
Vanuatu	11	19
Wallis & Futuna	2	2
Total sites	119	188

Global EWARS and PSSS

The PSSS is a part of the global EWARS. Global EWARS provides support to PICs during emergencies. Through the PSSS the Global EWARS assists Pacific island countries in the following areas:

- as an initiative to strengthen surveillance and therefore provide early warning, alert and response in emergencies
- support to Ministries of Health and partners with
  - Field-based tool
  - Training

       o   Technical support
- online, desktop and mobile applications, that can be rapidly configured and deployed

Three main types of data are in EWARS, each having its own purpose, mode of collection, and action points. These are:

- Alert signal data: unstructured informal information that signals a health event or potential risk
- Weekly aggregate data: structured and systematic collection of data, used to calculate health indicators and trigger alerts when threshold levels are crossed by the infectious disease trends
- Outbreak investigation data: which ultimately serves to control outbreaks

The alert system quickly raises alarm as infectious diseases trends reach trigger levels. Test sampling of the cases for laboratory testing and laboratory surveillance must be included in order to rapidly confirm the infecting agent that triggered the alert (*see Figure 3*).
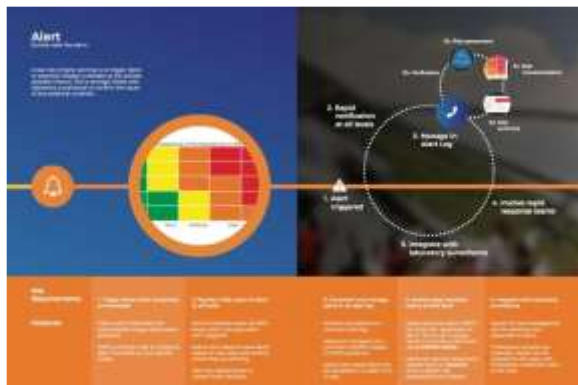

Figure 3. Alert system linkages to laboratory testing and laboratory surveillance

Once alerts are triggered it is crucial to mount an outbreak response which is required in order to save lives (*see Figure 4 and Figure 5*)

Figure 4. Outbreak responses upon early warning alert trigger

Algorithm for Infectious Disease Outbreak Investigation

The following algorithm outlines steps in infectious disease outbreak investigation that are to be taken given the different alert scenarios.
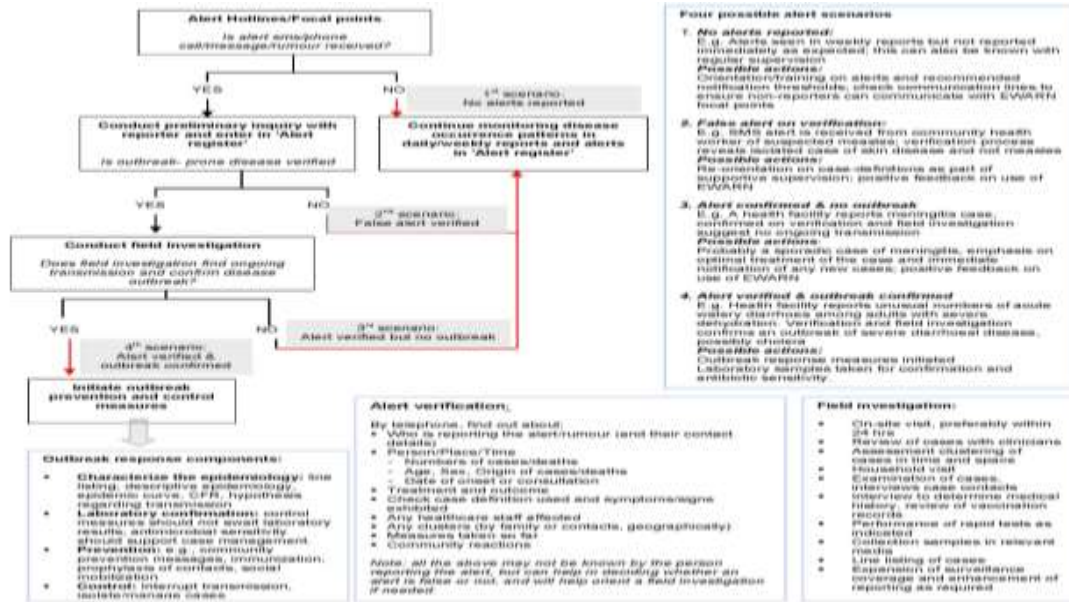

Figure 5. Algorithm for responses following alert signals: verification, field investigation, outbreak response (EWARN=EWARS)

Completeness of Reporting and Utilization of Data

The EWARS is a voluntary participation system and depends on reports and surveillance data being transferred by surveillance officers who are focal persons for each of the PICs into the EWARS system (PSSS). Over the years not all countries completely reported from their sentinel sites and this affects the overall PICs reporting coverage. Accuracy in early warning and alerts signals therefore are better with completeness of reporting from the sites as well as completeness in reporting from all countries in the region (*see Figure 6*). Grading of the information are as follows depending on the completeness in number of sites reporting (*Table 3*).

Table 3. Sentinel Reporting and Information Grade Levels

Percentage of sentinel sites reporting	Grading
< 60%	Poor
≥ 60% - < 80%	Fair
≥ 80% - < 100%	Good
100%	Excellent

Figure 6 below depicts the percentage of PICs reporting annually since 2017. The highest percentage was in 2017 when 83% of all countries reported in EWARS. The lowest was 74% of countries reporting in the subsequent years of 2018 to 2020. In 2021 the percentage of countries reporting rose to 78% from

the previous levels. These figures suggest that the EWARS structure through the PSSS remains however, its use by all countries is not consistent or complete.
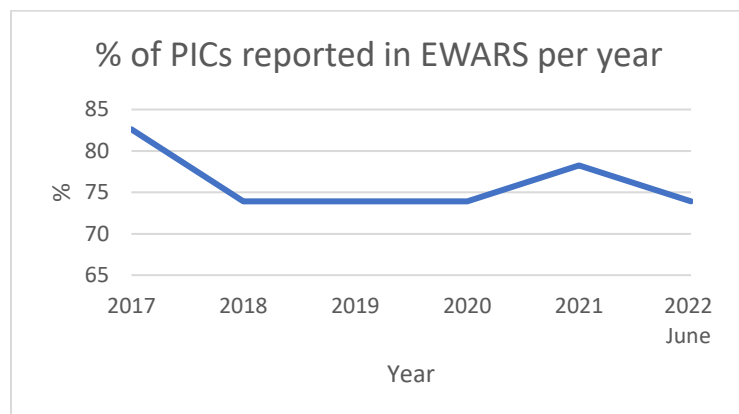

Figure 6. Annual Reporting Tends: Percentage of Pacific Island Countries Reporting to EWARS

EWARS Reported Data 2016-2021

Table 4 below provides the number of cases reported annually. These cases are reported by the indicator diseases/syndromes through EWARS for the six-year period from 2016 to 2021.

Table 4: 2016 -2021 EWARS Reporting Data for Indicator Syndromes

Indicator	2016	2017	2018	2019	2020	2021	Total
AFR	2820	749	1796	1633	913	262	8173
Diarrhea	53306	38249	39256	36305	33858	44749	245723
ILI	111723	86229	109778	103331	90804	73037	574902
PF	10299	6882	8937	5468	3931	4659	40176
Dengue	5997	8305	12372	11504	7579	7833	53590
Total	184145	140414	172139	158241	137085	130540	922564

The total number of consultations averaged 153,760 annually for the period 2016–2021, with the highest number of total consultations of 184,145 recorded in 2016 while the lowest number of total consultations recorded of 130,540 people was reported in 2021. The most typical causes of morbidity reported in EWARS were Influenza-like Illnesses averaging at 95,817 annually, acute diarrhea 40,954 annually, and dengue at 8,932 annually.

Human Resource

PICs commitment to the EWARS is realized with the allocation of surveillance personnel (as focal points-see Table 5 below) creating a clear pathway of communication and responsibilities towards the PSSS/EWARS data collection, alert systems and response. Coordination has improved dramatically with this commitment.

Table 5: Surveillance Focal Points by Country

PICs	Surveillance officer-Focal point	Email address
American Samoa	Aifili Tufa	a.tufa@doh.as
	Johnson Astrid	astrid.johansson@doh.as;
Cook Islands	ESR	esrcookislands@cookislands.gov.ck
Fiji	Shakila Naidu	shakila.naidu@gmail.com
Kiribati	Maryanne Utiera	marymsanne@gmail.com
Marshall Islands	Jill McCready	indepicon@gmail.com; jillmccready@yahoo.com
Micronesia (Federated States of)	Eliashib Edward	eedward@fsmhealth.fm
New Caledonia	Natacha Massenet	natacha.massenet@gouv.nc
Nauru	Chanda Garabwan	Chanda.Garabwan@health.gov.nr
Niue	Andy Manu	andy.manu@mail.gov.nu
French Polynesia	Aurélie VIGOUROUX	aurelie.vigouroux@sante.gov.pf
Northern Marianas	Jennifer Dudek	jennifer.dudek@chcc.health
	CHCC Surveillance	surveillance@chcc.health
Palau	Cheryl-Ann Tmong Udui	tmong.udui@palauhealth.org
Pitcairn Islands	Darralyn Griffiths	mo@pitcairn.gov.pn
		nurse@pitcairn.gov.pn
Samoa	Rosa Lei	RosaleiT@health.gov.ws
Solomon Islands	Bobby Teobasi	bteobasi@gmail.com
	Cynthia Joshua	cynthiajoshua6@gmail.com
Tonga	Teresa Fakailoa	teresafakailoatonga@gmail.com;
Tokelau	Barbara Tali	levibarb.tali@gmail.com
Tuvalu	Miliesi.Kapuafe	anilosa89@gmail.com
	Vine Sosene	vine.sosene@gmail.com
Vanuatu	Joanne Mariasua	jmariasua@vanuatu.gov.vu
	Wendy Williams	wwilliams@vanuatu.gov.vu
Wallis & Futuna	Monika TOA	monika.toa@adswf.fr
	Clément COUTEAUX	clement.couteaux@adswf.fr

Tools for the EWARS

EWARS uses a set of tools including data collection forms and outbreak or event reporting and assessment forms. (Figure 7). These forms should be at clinical facilities to ease and direct the collection of information that then is fed into the electronic system

EWARS Data collection form at Facility

Figure 7: Data Collection Form Information and Input into Electronic Form (Insert EWARS reporting form)

		Early Warning Syndromic Surveillance Weekly Tally form							

Health Facility Name --------------------- Epi week -----Date of week beginning ---/--/--- Date of ending

	Indicators	Mon	Tue	Wed	Thurs	Fri	Sat	Sun	Total
		Cases	Cases	Cases	Cases	Cases	Cases	Cases	Cases
	Total Consultations								
Weekly Reporting	Acute Fever and Rash (AFR) suspect measles								
	Prolonged fever (PF)								
	Influenza-like illness (ILI) suspect influenza								
	Diarrhoea 3 or more loose or watery stools in 24 hours (nonbloody) period with dehydration in age >5 years (suspect cholera)								
	Suspected dengue								
	Severe acute respiratory infection, requiring hospitalisation (SARI)								
	COVID - 19								

Report to Surveillance officer every Monday before 12noon.

Early Warning Syndromic Surveillance Data reporting form				

Health Facility Name --------------------   Epi week -----   Date of week beginning ---/--/---   Date of ending ---/--/--

	<5 years	>5 years	Total	Comments (example : sample collected)
Total consultations				
Acute Fever and Rash (AFR) suspect measles				
Prolonged fever (PF)				
Influenza-like illness (ILI) suspect influenza				
Diarrhoea 3 or more loose or watery stools in 24 hours (nonbloody) period with dehydration in age >5 years (suspect cholera)				
Suspected dengue				
Severe acute respiratory infection, requiring hospitalisation (SARI)				
COVID - 19				

Report any suspicious condition or event urgently in Event Based form

(Insert all attached forms here: 1) EWARS reporting form pfd 2) EBS form Pdf 3) reporting form 4) Facility Tally form 5) reporting form here)

Evaluation of a Public Health Surveillance System

It is necessary to gather credible evidence about the system's performance and therefore its ability to provide for public health safety.

The evaluation should:

- indicate the level of usefulness by describing the actions taken in response to analysis and
- interpretation of the data from the public health surveillance system;
- characterize the implementing partners that have used the data to make decisions and take
- actions;
- describe each of the following system attributes

Assessment of system attributes, includes its simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability. The following enquiries can help surveillance officers to describe attributes and assess their country's surveillance system:

- Simplicity

  Does the system's structure and ease of operation meet the objectives? Create a chart describing the flow of data and the lines of response.

- Flexibility

  Can the system adapt to changing information needs or operating conditions with little additional time, personnel or allocated funds?

- Data quality

  Are data complete and valid? Examining the percentage of "unknown" or "blank" responses to items on surveillance forms provides a straightforward measure of data quality.

- Acceptability

  Are staff and NGOs willing to participate in the surveillance system?

- Sensitivity

  At the level of case reporting, what proportion of cases of a disease is detected by the surveillance system. At the system level, can the system detect outbreaks, including monitoring changes in the number of cases over time?

- Predictive value positive

  What is the proportion of reported cases that actually have a disease of outbreak potential?

- Representativeness

  Is the system describing the outbreak over time and its distribution in the population by place and person?

- Timeliness

How fast is the transfer of information between steps in the alert and surveillance system? Does it meet the decision-making timeline demands for the emergency?

- Stability

Formal evaluation of an EWARS are resource intensive in terms of funding, staff and time, and it is not advisable to divert Outbreak surveillance and response in humanitarian emergencies. Once the EWARS is operational after set up, improvements may be needed (e.g. in data quality). Necessary improvements should be identified or evaluated through effective monitoring and supervision, and subsequent corrective measures applied.

Data and Alert Utilization

Utilization of the PSSS EWARS can be an evaluation of the system. It has been noted that over the period from 2017 to 2021, there has been a declining use in the Pacific islands of the EWARS alerts (see Figure 8).

Alerts by the PSSS EWARS should trigger local teams to verify or disprove, through investigations, that an outbreak has occurred. The rapid decline in verification over the past three years to below 20% suggests that although the system of early warning functions their use have been declined and potential outbreaks and epidemics will be missed through the lack of investigation of alerts.
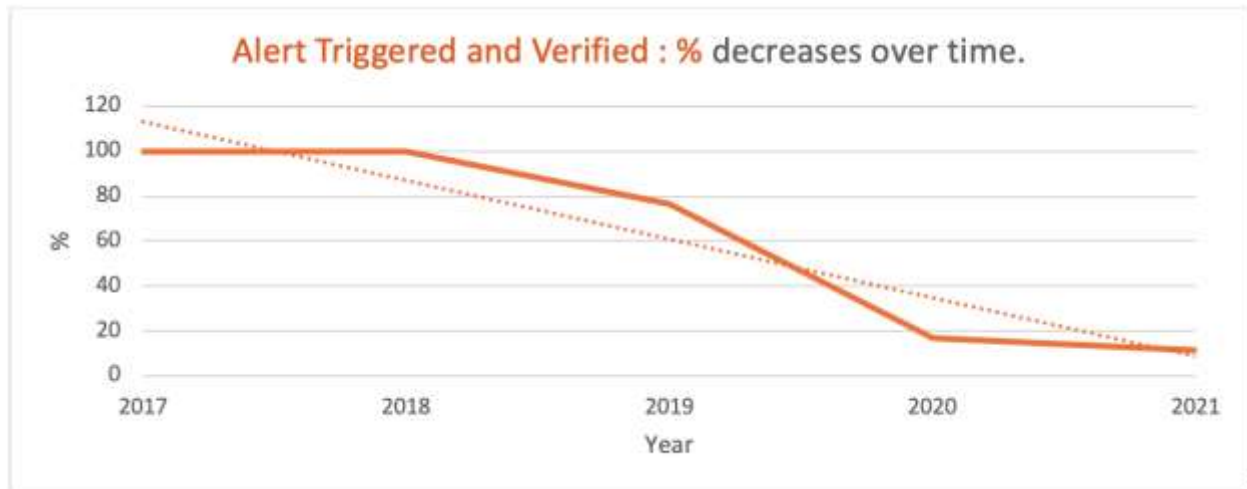

Figure 8: Declining verification of triggered alerts over 5 years

Countries can use an alert monitoring record (see Figure 9 below) to assess their responses.

Reported alert	Date of report and by whom	Alert details Who is affected? Where is the affected area? When was the initial occurrence? How many are affected? Are deaths reported?	Alert update as of (date and time)	Actions taken (including name of who has taken action, time and date, and specify action taken)	Remarks	Status of the alert Ongoing Closed

Figure 9: Sample Alert Monitoring Log

The following Assessment Form (see Figure 10 below) can be used by EWARS focal points/surveillance officers for verification of outbreaks.

Outbreak/ Event Report and Assessment Form

Information about source of report	
What is your **name**?	What is your **phone number**?
What is your **position**?	
If report is second-hand information, what is the **original source of the information**? (Name, contact info)	

Location of event	
What is the **name of the village**/ specific location where the event took place?	
What is the **district**?	
What is the **province**?	

Description of event	
What do you want to report? (What happened / Who is affected / What are the symptoms?)	
Number of **cases among children**:	Number of **deaths among children**:
Number of **cases among adults**:	Number of **deaths among adults**:
When did problem **begin**?	
Is problem **ongoing**? YES / NO	
What do you think is the **cause** of this event?	
What are the **controls measures** being implemented?	
What **support** do you need from us?	
Is there any **other information** you wish to share?	

Thank You.

For Office Use Only:

ASSESSMENT - If ANY of these conditions are met, a response is REQUIRED	
Is the disease unusual/unexpected in this community?	YES / NO
Can the suspected disease cause outbreaks with a high potential for spread (e.g., cholera, measles)?	YES / NO
Is there a higher than expected mortality or morbidity from the suspected disease?	YES / NO
Is there a cluster of cases or deaths with similar symptoms (e.g., bloody diarrhoea, rashes)?	YES / NO
Could the disease be caused by a contaminated product used by many people (e.g., food item)?	YES / NO
Is there suspected transmission within a health care setting?	YES / NO
If the event is a NON-HUMAN EVENT (e.g., animal disease or chemical spill), does the event have KNOWN or POTENTIAL consequence for human health?	YES / NO

ACTION TAKEN BY NATIONAL SURVEILLANCE UNIT:

Name of person filling out this form:	
Date:	Record No. (complete after entering into database):

Figure 10: Outbreak and Event Report and Assessment Form