



Review of the Pacific Public Health Surveillance Network, 2023

By Meru Sheel¹, Adeline Tinessia¹, Jessica Hall¹, Ikram Abdi¹, Adam Craig², Peta-Anne Zimmerman³, Rebecca Rockett¹, Sajani Nadeeka⁴

¹ The University of Sydney, New South Wales, Australia

² The University of Queensland, Queensland, Australia

³ Griffith University, Queensland, Australia

⁴ National Centre for Immunisation Research and Surveillance, New South Wales, Australia

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Abbreviations

AFD	Agence Française de Développement
CDC	United States Centres for Disease Control and Prevention
CNMI	Commonwealth of the Northern Mariana Islands
DFAT	Australian Department of Foreign Affairs and Trade
DPS	WHO Division of Pacific Technical Support
ESR	New-Zealand Institute of Environmental Science and Research
EU	European Union
EWARS	Early Warning, Alert and Response System
FCDC	Fiji Centre for Disease Control and Prevention
FNU	Fiji National University
FSM	Federated States of Micronesia
HAI	Healthcare Associated Infections
IHR	International Health Regulations
ILM	Institut Louis Marlade
IPC	Infection Prevention and Control
IPNC	Institut Pasteur de Nouvelle- Calédonie
ISST	International Standard for Testing Calibration Laboratories
JEE	WHO Joint External Evaluation Tool
LQMS	Laboratory Quality Management System
MFAT	New-Zealand Ministry of Foreign Affairs and Trade
NRL	National Serology Reference Laboratory
PHOCCIS	Public Health Outbreak, Case and Contact Information Systems
PICTs	Pacific Island Countries and Territories
PIHOA	Pacific Island Health Officer Association
PNG	Papua New Guinea
PPHSN	Pacific Public Health Surveillance Network
PPTC	Pacific Pathology Training Centre
PRIDA	Pacific Regional Infectious Disease Association
PSSS	Pacific Syndromic Surveillance System
PVN	Pacific Vector Network
RCCE	Risk Communication and Community Engagement
RMI	Republic of the Marshall Islands
SHIP-DDM	Strengthening Health Interventions in the Pacific – Data for Decision Making
SLIPTA	Stepwise Laboratory (Quality) Improvement Process Towards Accreditation
SIST	Infectious Substances Shipping Training
SPC	The Pacific Community
TAG	Technical Advisory Group
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
VIDRL	Victoria Infectious Diseases Reference Laboratory
WHO	The World Health Organization

Executive Summary

The Pacific Region covers a vast group of islands home to diverse communities that differ in language and culture. The location and topography of the islands, together with their relatively small, heterogeneous populations, pose distinctive environmental and service delivery-related challenges that can negatively impact health outcomes. Climate change poses a significant threat to this region, potentially altering the spread and impact of infectious and vector-borne diseases, exacerbating existing challenges. The increasingly high burden of non-communicable diseases in the region also weakens community resilience to public health emergencies and places individuals at an increased risk of severe outcomes associated with infectious diseases. Based on the 2019 Global Burden of Disease estimates, the burden of infectious disease in the Pacific Islands remains much higher than other regions including Southeast Asia which faces similar climate-related risks.

The Pacific Public Health Surveillance Network (PPHSN) was established in 1996 by the Pacific Community (SPC) and the World Health Organization (WHO) in response to a call by countries to address the disproportionate burden of infectious disease faced by the islands. In particular to address the frequent waves of dengue fever outbreaks occurring at the time and support Pacific Island Countries and Territories (PICTs) efforts to prevent, detect and respond to these outbreaks in an effective and sustainable way. The main strategy at the time was to provide a mechanism for PICTs and technical advisors to communicate, co-ordinate efforts and share knowledge. PacNet– the dedicated communication forum through which PICTs and partner organisations share infectious disease information. In subsequent years, additional service arms were added, LabNet for disease verification and identification in 2000, EpiNet for preparedness and response in 2001, PICNet for infection prevention and control in 2006, the Pacific Syndromic Surveillance System (PSSS) for outbreak detection in 2010 and in 2014 the Strengthening Health Interventions in the Pacific– Data for Decision Making (SHIP-DDM) training program to build the capacity of health professionals). This suite of dedicated services is governed by the PPHSN Coordinating Body. A new initiative, the Pacific Vector Network (PVN) was established in 2023.

The PPHSN serves as a collaborative network of public health services that aims to strengthen the ability of PICTs to detect, monitor, and control infectious disease threats. PPHSN core members include Ministries and Departments of Health of the 22 PICTs including American Samoa, Cook Islands, Commonwealth of the Northern Mariana Islands (CNMI); Federated States of Micronesia (FSM); Fiji, French Polynesia, Guam, Kiribati, Republic of the Marshall Islands (RMI); Nauru, New Caledonia, Niue, Palau, Papua New Guinea (PNG); Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna. Permanent Coordinating Body members are the Pacific Community (SPC); World Health Organization (WHO); Fiji National University (FNU) College of Medicine, Nursing & Health Sciences; and the Pacific Island Health Officers Association (PIHOA). Temporary allied members include: United States Centers for Disease Control and Prevention (USCDC); Communicable Diseases Network Australia (CDNA); Fiji Centre for Communicable Diseases (Mataika House); College of Medicine, Nursing & Health Sciences; Hawaii State Department of Health, Hunter New England Health, Australia; Institute of Environmental Science and Research (ESR), New Zealand; The Pasteur Network (formerly called International Network of Instituts Pasteur and Associate Institutes); James Cook University (JCU); Institute Louis Malardé, Tahiti; Micronesian Human Resources Development Center, National Centre for Epidemiology and Population Health / Australian National University (NCEPH/ANU); Pacific Basin Medical Association (PBMA); Pacific Pathology Training Center (PPTC); Institut

Pasteur de Nouvelle-Calédonie (IPNC); Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET); UNICEF and Western Pacific HealthNet.

During the 2019 Pacific Heads of Health meeting, the Pacific member states proposed and endorsed an independent evaluation of the PPHSN to identify opportunities to strengthen the networks' impact and support updates to the networks' vision and strategic plans.

In 2023, SPC commissioned the University of Sydney to lead a consortium to undertake a review of the PPHSN. The aims of the review were to evaluate the governance, communication structures, and actors involved in PPHSN operational activities, assess their respective contributions to the overall success of the network and to review the activities and impact of each of the six PPHSN service arms.

PPHSN is governed by a Coordinating Body which sets the PPHSN's strategic direction and monitors activities. The Coordinating Body membership consists of seven core members which are representatives from PICTs. Representatives serve for a rotating three-year term. In addition, there are six allied members including development and academic partners. Four of the allied member seats are permanently held by SPC, WHO, FNU and PIHOA, while the two non-permanent member seats are elected every three years. SPC is the designated Focal Point for the Coordinating Body, serving as the Secretariat and is responsible for PPHSN coordination, resource management, knowledge exchange, and communication.

We employed a mixed-methods research approach, which involved a desktop review including documents from 2018 to mid-2023, an online survey with PPHSN members in October-November 2023 and focus group discussions during October 2023 with core and allied PPHSN members from each of the 22 PICTs. Additionally, we conducted secondary data analyses of the PSSS and LabNet.

Overall, 28 documents were reviewed, 149 stakeholders from across 22 PICTs contributed to the online survey, and seven focus group discussions with 38 participants were conducted. Participants in the focus group discussions represented both past and present Coordinating Body members including permanent key members (11) and non-permanent members (27). Six participants were Coordinating Body members, 13 were non-Coordinating Body Government representatives from PICTs and 8 were non-Coordinating Body allied members.

The commitment of member states and partners to the PPHSN was evident and demonstrated through the networks' longevity. This provides a strong foundation for future growth and sustainability of the network. Several notable achievements became apparent during the review. These included the integral role that the PPHSN has played in the design, implementation, and support of the world's largest (in terms of geographic coverage and the number of countries involved) early warning disease outbreak surveillance system, the PSSS; the well-performing regional communication network, PacNet; and ongoing efforts to implement a contextually feasible field epidemiology training program-SHIP-DDM. Further, the flexible and inclusive nature of the PPHSN was considered by many a unique and positive feature in that it has enabled regional dialogue, problem-solving and swift responses to emergent needs.

The review also highlighted challenges relating to optimal function and governance of the network. These included a lack of clarity regarding the overarching goal, objectives, and strategic direction of the PPHSN and the lack of transparency in financial and decision-making aspects of the network (e.g., who the network supports based on what rationale); a reliance on limited-term project-based (often vertical) funding; a North - South Pacific divide impeding a cohesive whole-of-Pacific approach; and the lack of a performance assurance/performance

monitoring, evaluation and learning (MEL) framework to track progress and impact, and against which development goals can be set and measured over time. Further, interviewees repeatedly highlighted the lack of clarity about roles and responsibilities, duplication in services, and periodic tension between technical agencies (notably SPC and WHO) which negatively affected the smooth function of PPHSN. Interviewees call on the PPHSN-Coordinating Body to address these issues of transparency and clarity through more assertive and clear coordination of development efforts, and that the development needs of PICTs – the ultimate beneficiaries of PPHSN’s work—remain the focus.

The review examined the functionality of six service arms of the PPHSN. The new initiative of the Pacific Vector Network (PVN) was beyond the scope of this review.

The review found that, in line with its stated objective, **PacNet** provided a forum for communication on public health emergencies, including those of international concern. Participants of the review found PacNet was most useful for providing alerts about potential threats and disseminating response information and guidance, therefore supporting countries to prepare and plan for outbreak response and public health prevention and control measures. Key challenges included inconsistent timeliness of reports to PacNet, and preventing real-time information sharing which could reflect the voluntary nature of data sharing within the network. While traditional email communication was dominant and acceptable, new modalities such as WhatsApp, Facebook and other means of communication that are easy to access and popular in the PICTs would be useful to explore moving forward. To increase its uptake and usefulness, members highlighted the need to include data on other important indicators such as vaccination coverage, environmental and social factors, and data from other countries in the WHO Western Pacific region whose disease epidemiology might impact the PICTs (e.g. The Philippines).

The **PSSS** was reported to have been helpful in providing early warning alerts for some outbreaks but lacked the sensitivity, coverage and stability required to meet national needs and IHR (2005) requirements for early warning surveillance and, hence, should not be relied upon as a stand-alone surveillance strategy. The review indicated a need for a comprehensive review of the PSSS’s function and role within the broader context of national and regional health security needs and what is optimal, given resource constraints, in the PICT contexts. Our review highlighted issues of timeliness, completeness, and data quality, along with inconsistent use of case definitions as well as appropriateness of currently applied surveillance signals detection algorithms and thresholds.

Significant efforts were made to strengthen **LabNet** during the COVID-19 pandemic which led to improved testing for PPHSN priority diseases, surveillance, and accelerated outbreak response. However, the review found that only a small number of laboratories had Laboratory Information Management Systems (LIMS) to support rapid communication of diagnostic and surveillance results to then trigger a response. Like other services, modes of communication between network members varied and included PacNet-lab emails, reporting notifiable diseases and routine sharing of data, electronic records, encrypted emails and online portals. The timing of specimen confirmation by reference laboratories varied from less than a week to one month and remained a challenge for timely detection and response. The lack of key indicators for laboratory monitoring was raised as a factor that inhibits effective public health response. The shortage of skilled laboratory personnel was also highlighted, reinforcing the need for further training to upskill health workers laboratory skills. Acknowledging the recent advances made by LabNet, it will be critical to ensure that these advancements are sustained and embedded into LabNet for future surveillance activities.

PICNet was considered effective for building capacity for infection prevention and control (IPC) in PICTs. Its strengths were noted in raising awareness and strengthening partnerships towards addressing priorities in IPC. Significant contributions have been made by development partners including from Australia to fortify hand hygiene programs and healthcare-associated infection surveillance, revitalising the PPHSN Infection Prevention and Control Guidelines 2021 and staff training. Limited human resources and infrastructure present obstacles for effective implementation of prevention and control measures, particularly for remote and outer islands. With strong advancements in this service arm, a comprehensive evaluation across the region would ensure that efforts are consistent, standardised, and sustainable across different PICTs and health facilities.

EpiNet aims to provide a coordinated response to outbreaks occurring at national and regional levels. The review found variable expertise and success in the use of the EpiNet function across the PICTs. Many EpiNet teams had members with expertise in field investigation, data management, public health management/supervision, laboratory science, health policy, health promotion and communication and infection control. Fewer teams had expertise in clinical medicine, immunisation policy and planning, disaster management, risk communication, food and agriculture science and environmental health. Overall, the multi-disciplinary nature of the teams was seen as making them effective at preparing for and responding to outbreaks. In relation to meeting the objective of EpiNet, there were some critical challenges such as a lack of standard reporting procedures, members not always feeling equipped to respond to outbreaks in a timely manner and a lack of practical experience in outbreak investigation and/or response. Considering the centrality and significance of EpiNet teams in meeting the goals of the PPHSN, these issues should be addressed as a priority. There was recognition that to build capacity in field epidemiology, continued professional development will be needed, as will support to develop, and test outbreak response plans and protocols at the national and sub-national levels.

The **SHIP-DDM** programme was considered useful by students for facilitating networking and engagement between health professionals in the region. Most graduates who participated in the review were involved in outbreak response since their training, including during the COVID-19 pandemic. At the same time, travel restrictions during COVID-19 hindered the delivery of the SHIP-DDM program with some modules delivered online. While this was beneficial for some, access to the online component of SHIP has been difficult for students due to infrastructure limitations, emphasising the importance of in-country training. While the focus of SHIP-DDM has traditionally been for students to be trained at work for work, these findings raise broader questions about the feasibility, opportunity and challenges offered by e-learning in workforce development in the PICTs, and the impact it may have on exacerbating or overcoming challenges related to equitable access to opportunities. Participants expressed a desire for ongoing training in areas like epidemiological analyses. Data on numbers or career trajectories of SHIP-DDM graduates was not available preventing evidence-based assessment of the program's impact. This limitation emphasises the need for a monitoring and evaluation framework for the SHIP-DDM program and the network.

In summary, the review found that PPHSN was critical for communication and coordination of surveillance and outbreak response activities across the PICTs. Many of the PPHSN activities support the efforts of PICTs to meet core capacities under International Health Regulations (IHR) 2005 and respond effectively and efficiently to public health risks and emergencies. However, there were persistent challenges with the PPHSN governance and funding structures, lack of clarity on who is charged with (and has responsibility for) meeting objectives of the PPHSN and its service arms and how success (or not) is measured and monitored over time. Addressing these challenges should be a short-term focus of the PPHSN-Coordinating Body. Many of the individual service arms achieved their stated objectives but

require in-depth evaluations to identify and understand enablers and bottlenecks to effective delivery and strategies that support implementation. Doing so will support the PPHSN to meet the current needs of the region and maintain relevance in the future. The issues of recruitment and retention of adequate numbers of appropriately skilled health staff continues to be one of the major challenges in the PICTs requiring innovative solutions. Participants raised the issues of capacity, capability, and ongoing professional development to prevent attrition from ministries of health to other organisations and clear career development pathways. This has also been highlighted by recent studies conducted by the review team.

Below we provide key recommendations to inform the strategic direction of PPHSN over the coming years.

- The PPHSN governance should be revised by the Coordinating Body to reflect its current role and functions. This should include revising the terms of reference, roles and responsibilities for the Coordinating Body, Focal Point, permanent members, core and allied members and each of the service arms. Governance review may also consider how to promote active participation and accountability amongst members. A specific focus should also be placed on ensuring there is a strong mechanism to attract ongoing, stable funding for the PPHSN and that all operations are managed with transparency.
- As part of the development of the PPHSN's next five-year strategy, there should be greater alignment between the PPHSN's core objectives and implementation of the new International Instrument on Pandemic Prevention, Preparedness and Response, the Asia Pacific Health Security Action Framework, and other relevant frameworks.
- The network should consider a focus on One Health in the design of its new strategy. The collaboration between existing human, animal and environmental networks would help to address the complex health challenges facing the region. There are many ways to explore this including the use of WHO's collaborative surveillance framework, cross-disciplinary meetings and building principles of One Health into training programs such as the SHIP-DDM.
- An indicator-based performance monitoring framework is recommended to foster improvement in the quality and performance of the PPHSN and the six service arms. The framework should collect baseline data and set achievable, time-bound performance targets with reference to the baseline.
- The Coordinating Body should establish a coordinated mechanism to provide technical support and assistance to PICTs. SPC has a clear and central role in this, and the impact would be greater if efforts of donors and partners were coordinated to avoid duplication and ensure resources are maximised. It will be critical to ensure all technical working groups across the services and partners are brought together with equal opportunity to promote cohesiveness and prevent fragmentation and siloed delivery of services.
- The PPHSN-Coordinating Body should consider an in-depth evaluation of the service arms. This evaluation should:
 - Consider how best to increase the impact of PacNet in providing a communication and coordination mechanism in the region, with a greater focus on real-time relay of information. Some strategies could include the use of visualisation dashboards on the PPHSN website, the creation of online communities of practice or forums using social media platforms like Discord or Yammer.
 - Provide advice on the suite of feasible surveillance strategies that ought to be in place to meet outbreak detection needs. As part of this, the syndromes under

surveillance, reporting mechanisms and methods for signal generation should be reviewed. Furthermore, there is a clear need for multi-source surveillance in the PICTs and for collaborative surveillance more broadly to address the issues of coordination, resource management and decision-making. There is a need to link organisations across different sectors and teams within organisations to bring together data from various types of surveillance (case-based, syndromic, laboratory and genomic) and for different vaccine-preventable diseases, and specialised surveillance programmes such as malaria, tuberculosis. Use of collaborative surveillance approaches is likely to enhance data sharing, resources and expertise and therefore enable faster and more effective public health response.

- Provide advice to PICNet on a comprehensive mechanism for end-to-end surveillance for infection prevention and control throughout the region. This includes the development of guidelines, implementation at the health facility level a systematic approach to collecting, analysing, and reporting of hospital-acquired infections and finally closing the feedback loop with the focal points in each PICT.
- Establish a list of priority diseases and clear protocols for surveillance through LabNet beyond diagnostics and training. While both diagnoses and training of staff are critical, effective laboratory surveillance is critical for timely detection and public health response. Considering the advancements made during COVID-19 in the region, this should be prioritised. Consider the establishment of interoperable LIMS in all PICTs.
- Consider and review the SHIP-DDM programme to examine how best to ensure its relevance in the region, especially with the emergence of other field epidemiology training programs. Some of these include the potential for online training and building operational research capacity in the PICTs which would ultimately provide local data and actional evidence to improve policies and practices in PICTs.
- Consider ongoing professional development and systematic training of EpiNet teams, for example through simulation exercises to ensure response teams are maintaining their skills and agility to respond in a timely manner.

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Authors

A/Prof Meru Sheel, The University of Sydney
Ms Adeline Tinessia, The University of Sydney
Dr Jessica Hall, The University of Sydney
Dr Ikram Abdi, The University of Sydney
Dr Adam Craig, The University of Queensland
Dr Peta-Anne Zimmerman, Griffith University
Dr Rebecca Rockett, The University of Sydney
Dr Sajani Nadeeka, The National Centre for Immunisation Research and Surveillance

Technical Advisory Group

Dr Nemia Bainivalu, Ministry of Health and Medical Services, Solomon Islands
Dr Thane Hancock, United States Centers for Disease Control and Prevention, Guam
Dr Nuha Mahmoud, World Health Organization (WHO) Division of Pacific Technical Support (DPS)
Dr Sala Saketa, The Pacific Community (SPC)
Ms Amy Simpson, The Pacific Community (SPC)

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Introduction

The Pacific Region covers a vast and diverse group of islands and is home to equally diverse communities. The location and topography of the islands, together with their relatively small and diverse populations, pose distinctive environmental and service delivery-related challenges that negatively impact health outcomes. Climate change poses a significant threat to this region, potentially altering the spread and impact of infectious and vector-borne diseases, exacerbating existing challenges. The increasingly high burden of non-communicable diseases in the region also weakens community resilience to public health emergencies and places individuals at an increased risk of severe outcomes associated with communicable diseases (1). The burden of infectious disease in the Pacific Islands (29.13%) remains much higher than other regions including Southeast Asia which face similar climate-related risks (21.46%) (2,3) .

The purpose of the PPHSN is to collaboratively strengthen public health surveillance and response in the PICTs in a sustainable way, prioritising target diseases of dengue, measles, rubella, influenza, leptospirosis, typhoid fever, cholera and HIV/STIs. The network serves as the link between the PICTs and relevant partners facilitating the exchange of information and expertise among 22 PICTs to detect, monitor and control health threats.

Key strategies of the PPHSN as stated in the 2003-2006 strategic framework (4) include:

- Harmonisation of surveillance data and development of appropriate surveillance systems (with priority given to outbreak surveillance and response).
- Publication/dissemination of timely, accurate and relevant information, in various forms.
- Training in applied epidemiology and public health surveillance, adapted to regional needs.
- Extension of the electronic communication network to new partners, new services, and other public health networks (telehealth).
- Development of relevant and cost-effective computer applications.

Below are the six service arms (and year of establishment) that were developed to achieve PPHSN's vision:

- i. PacNet – for alert and communication (1997)
- ii. LabNet – for disease verification and identification (2000)
- iii. EpiNet – for preparedness and response (2001)
- iv. PICNet – for infection prevention and control (2006)
- v. Pacific Syndromic Surveillance System (PSSS) – for early warning and outbreak detection (2010)
- vi. Strengthening Health Interventions in the Pacific (SHIP) – Data for Decision Making (DDM) -Training program to build the capacity of health professionals to meet public health challenges in the region by using data for decision-making (2014).

A new initiative of PPHSN called the Pacific Vector Network (PVN) was introduced in 2023. The evaluation of this initiative is outside the scope of this review.

The core members of the PPHSN are the Departments and Ministries of Health of the PICTs; the allied members of the PPHSN comprise regional training institutions, laboratories, and other organisations or networks involved in public health surveillance in the region that chose to be a member. The PPHSN is led by a Coordinating Body that consists of 7 core members

from PICTs, with 3- yearly membership rotated in a staggered manner and 6 allied members, 4 permanents (SPC, WHO, FNU College of Medicine, Nursing & Health Sciences and PIHOA) and 2 non-permanent elected every 3 years. SPC is the designated Focal Point for all communications and other ongoing support functions such as performing secretariat duties, organising meetings, disseminating meeting outcomes, attending external meetings on behalf of the PPHSN, providing minimum funds to support secretariat function and sharing of information.

The establishment of the PPHSN also aligned with the development of the revised International Health regulations adopted in 2005 acknowledging that while national public health surveillance and response systems were key, PPHSN could be used to facilitate IHR implementation, including dissemination of IHR-related information and materials such as guidelines and capacity building initiatives(5).

Aims

This review aimed to identify the strengths and weaknesses of the PPHSN, identify opportunities and make recommendations for improvement. Specifically, the review aimed to assess the role of the PPHSN in supporting regional preparedness, alert, and response in alignment with IHR2005.

The objectives of the review were to:

- Examine the governance, communication structures, and actors involved in PPHSN operational activities and how they contribute to the PPHSN goals, objectives, and sustainability.
- Examine the status, impact, and progress of each of the six PPHSN service networks and how they contribute towards the goals of PPHSN, its objectives and sustainability.
- Examine whether PPHSN is providing an effective mechanism for sub-regional surveillance and whether the current governance mechanism for PPHSN is effective.
- To develop recommendations that support PPHSN's efforts for the next 5 years.

Rationale for the evaluation

Since the establishment of the PPHSN – no formal reviews and evaluations of the entire network have been undertaken. Evaluations of surveillance systems and networks can promote the best use of public health resources by ensuring that the most important health issues are under surveillance and that systems operate efficiently(6). Reviews can help to evaluate the quality, efficiency, and relevance of existing systems, considering the changing epidemiology of diseases and health conditions.

An external review of the PPHSN was requested by the Coordinating Body and endorsed at the PPHSN-Coordinating Body meeting in March 2019 followed by the 7th Pacific Heads of Health meeting in April 2019. This review addresses a direct request from the PICTs and will provide timely data for the design of the new strategic framework for PPHSN, and opportunities for strengthening efforts.

Methods

The review employed a mixed-methods approach, applying both quantitative and qualitative methods using primary and secondary sources. The results of data analysis were triangulated

to develop a deeper understanding of the context and function of the network and the six service arms. We also analysed data provided by SPC and WHO on LabNet and PSSS activities.

Technical Advisory Group

A review technical advisory group (TAG) was formed to guide the evaluation. Membership of the TAG was open to any PPHSN Coordinating Body member through an open expression of interest process. Membership included representatives from SPC, WHO, and PICT Ministries of Health. Complete terms of reference are included in Appendix 1.

Document review

All documents pertaining to the PPHSN, and its service arms were collected and logged in a Microsoft Excel Sheet. Documents were obtained from (a) the PPHSN website and (b) on request from SPC and the WHO. All documents published before 2018 were excluded, except the terms of references (TOR). A content extraction and deductive thematic analysis was performed. Data were collected on: PPHSN's governance structure, objectives, activities, and challenges that had been encountered. A list of documents included in this review is available in Appendix 1. Data collection and extraction was carried out in August 2023.

Survey of PPHSN users

An online bi-lingual survey was developed using Qualtrics, a web-based surveying platform. The survey was designed to collect information from PPHSN stakeholders regarding the strengths and challenges of each of the six PPHSN service arms. The tool was designed to allow respondents to select (and answer questions related to) the PPHSN networks they had direct involvement in/with. The tool was developed in English and French and checked by SPC translators for accuracy. The survey was reviewed by TAG members and pilot tested amongst review team members to check comprehension and flow. Survey participants were recruited using contact lists provided by SPC as well as professional connections of review team members. Emails with the online survey link were sent to invitees through the PacNet list and by direct email. The survey was open for a 3-week period (16 October to 6 November 2023). Reminder emails were sent in the last week of October to encourage participation. Data was cleaned and analysed using R Studio and Microsoft Excel and tables were produced that summarise and describe the survey responses.

Focus group discussions

Online semi-structured focus groups were conducted with key stakeholders and users of the PPHSN between 18th October and 2nd November 2023. We developed and used an open-ended semi-structured discussion guide to facilitate the focus group discussions. The questions posed in the guide were formulated based on the desktop review and through consultation with all study team members. The tool was pre-tested with public health experts, with minor changes made. Each of the online focus group discussions was recorded and transcribed. Anonymity of statements in the transcripts and the final report was ensured, as was the confidentiality of the data. Participants gave verbal consent which was recorded. A semi-structured focus group data collection method allowed dynamic discussions among stakeholders while covering all required content areas.

Focus group participants were selected from a contact list provided by SPC, suggestions from wider TAG members, as well as professional connections of review team members. Participants were selected by the review team to ensure a mix of experience; roles and responsibilities and PICTs were represented. Direct emails with invitations to participate

accompanied by a participant information sheet were sent by the review team. Given the diversity of focus group participants, discussions centred on the broad functioning and role of PPHSN, not individual service arm activities.

Data was analysed thematically using an inductive approach that involved reading and re-reading transcripts to develop themes and sub-themes. The analysis and coding process was done collaboratively among team members.

Pacific Syndromic Surveillance System data analysis

One of the key purposes of the PSSS is to detect outbreaks at an early stage using syndromic surveillance that indicates diseases caused by pathogens of epidemic potential in the PICTs. Multiple past evaluations of the PSSS have been conducted, including by those in the review team, however an in-depth evaluation of PSSS was considered out of scope by the PPHSN Focal Point. With that in mind, the following were considered:

- Distribution of the number of sites
- Timeliness and completeness of reporting into PSSS
- Impact of COVID-19 on reporting for syndromic surveillance using two syndromes as examples (acute watery diarrhoea and influenza like illness).

We received aggregated data for PSSS provided by the WHO Division of Pacific Technical Support for the years 2018 (epidemiological week i.e. epi week 31) to 2023 (epi week 34). As the number of sentinel sites in each PICT was not recorded in the database provided, the count data for 2022 were obtained from SPC and used as the denominator when calculating proportions. Mid-year population estimates for 2022 were used when reporting population proportions. These data were downloaded from SPC's population estimates database (7). We analysed data on the number of sites reporting and completeness of the data against key data fields such as "number of sites reporting" using Microsoft Excel.

LabNet data analysis

Performance indicator data, such as timeliness, for LabNet was unavailable; however, aggregated data on Laboratory Quality Management System assessments (LQMS) and training in LQMS was provided by SPC and PIHOA for 26 laboratories across the PICTs. LQMS assessment scores were determined using the Stepwise Laboratory (Quality) Improvement Process Towards Accreditation (SLIPTA) assessment tool. Data on SLIPTA indicators was available for 15 laboratories undergoing assessment in 2022-2023. SLIPTA is one of the most used frameworks for improving the quality of results generated by public health laboratories in developing countries and assists in achieving ISO 15189 standards (8) SLIPTA assessment scores were available from the 12 key components of the SLIPTA quality system (Document Control, Organizational Management, Management Review, Process Control, Equipment Management, Customer Service, Facilities and Safety, Supplies and Inventory, Information management, Occurrence management, Corrective measures, and Internal Audit) for these 15 laboratories. However, comparable SLIPTA assessment scores were not provided at consistent timepoints between LabNet laboratories. Individual SLIPTA component scores were also not provided for earlier years. The inconsistent collection of this assessment data makes it difficult to measure LQMS improvements in individual laboratories or across the network.

Ethics

Ethical approval for this review was provided by the University of Sydney Human Research Committee (protocol number 2023/634).

Results

Document Review

Governance of PPHSN

At the core of PPHSN's governance structure lies the Coordinating Body, which is central in steering the PPHSN activities and objectives. The Coordinating Body membership consists of seven PICT representatives which rotate in a staggered manner (each PICT sits on the Coordinating Body for a 3-year term) and six allied members, four of which are permanent (9). The list of allied members is available in Table 1.

The Coordinating Body's role is to develop and execute an action plan for PPHSN and guide any new network activities, including regional response to outbreaks, liaising with relevant organisations and securing resources. Furthermore, the Coordinating Body is to monitor and evaluate all PPHSN activities and communicate the status of these endeavours to its members and external entities. Its leadership role involves identifying and controlling public health issues within the region and advocating for evidence-based practices in surveillance and response(9,10). SPC, as the designated PPHSN-Coordinating Body Focal Point, has responsibility for the effective function of the network, and its ongoing monitoring, evaluation, and improvement. SPC has remained the Focal Point since the network's inception. One of its primary roles is to provide a secretariat function, acting as the administrative hub for meetings, document and resource management, knowledge exchange, and communication. Furthermore, SPC represents PPHSN at regional and global conferences and meetings, advocating for investment in the network and fostering partnerships with others. SPC also manages the PPHSN website(11).

PPHSN has six operational arms, called service networks. These are PacNet, PSSS, LabNet, PICNet, EpiNet and SHIP-DDM.

PacNet

PacNet is governed under PPHSN and serves as a forum for disseminating information relevant to regional public health surveillance. PICTs report data and situation reports through PacNet (12), while allied partners disseminate weekly reports on Epidemic and emerging disease alerts in the Pacific and the Pacific Syndromic Surveillance System report.

PSSS

The Pacific Syndromic Surveillance System is an integral component of the region's emergency surveillance response program, each PICT designates a surveillance officer as the focal point for PSSS, thereby ensuring a streamlined approach to data aggregation and dissemination(13). This is complemented by the appointment of a central coordinator within the WHO Division of Pacific Technical Support (DPS) Office in Suva, Fiji to facilitate the collaboration (10).

LabNet

LabNet operates within a three-tiered structure, comprising of Level 1 (L1) labs at member countries and territories, Level 2 (L2) regional labs responsible for initial confirmation testing, and Level 3 (L3) reference labs situated in Pacific rim countries (14).

Integral to LabNet's governance is the Technical Working Group, consisting of 12 members that provide technical support for human and animal health lab services within PICTs (15). Core members include heads of Laboratory allied partners and training institutions (CDC, New Zealand Institute of Environmental Science & Research (ESR), Fiji Centre for Disease Control (FCDC), Fiji National University (FNU), Institute Louis Malarde (ILM), Pasteur Institute, New Caledonia (IPNC), National Serology Reference Laboratory (NRL, Australia), PIHOA, Pacific Pathology Training Centre (PPTC), SPC, Victoria Infectious Diseases Reference Laboratory (VIDRL) and WHO) and representatives of L2 and L3 Reference laboratories (15). This collaboration spans diverse domains, encompassing the development of lab services, quality assurance, biosafety measures, training initiatives, and advanced laboratory techniques. The Technical Working Group's endeavours resonate with its commitment to fostering an ecosystem that emphasises evidence-based practices and preparedness for public health challenges. LabNet's external partners lend additional support to the Technical Working Groups' advisory capacity and contributes to the holistic enhancement of lab services, thereby strengthening the Pacific's public health surveillance and response capabilities (16).

External partners comprise of WHO Collaborating Centres (Influenza and Measles (VIDRL, Australia), ESR, ILM. WHO plays a central role in supporting LabNet by compiling national lab frameworks, capacity building, quality assurance, and technical expertise. Recognised WHO Collaborating Centres and ESR provide key referral pathways for confirmatory testing such as PCR and genotyping, whole genome sequencing and virus isolation for samples from PICTs. This is in addition to supporting emerging disease response, laboratory training and data sharing. IPNC is a reference laboratory for referral of priority vector-borne diseases, whereas ILM focuses on bolstering skills and proficiency among scientists and biologists in the human and animal sectors. Collectively these external partners contribute their expertise, resources and collaboration to bolster LabNet's capacities, to continue to develop capacity across PICTs (16). Figure 1,2, and 3 exemplify LabNet's referral pathways for different types of diseases.

Figure 1 PPHSN LabNet Reference Laboratories for COVID-19, 2023

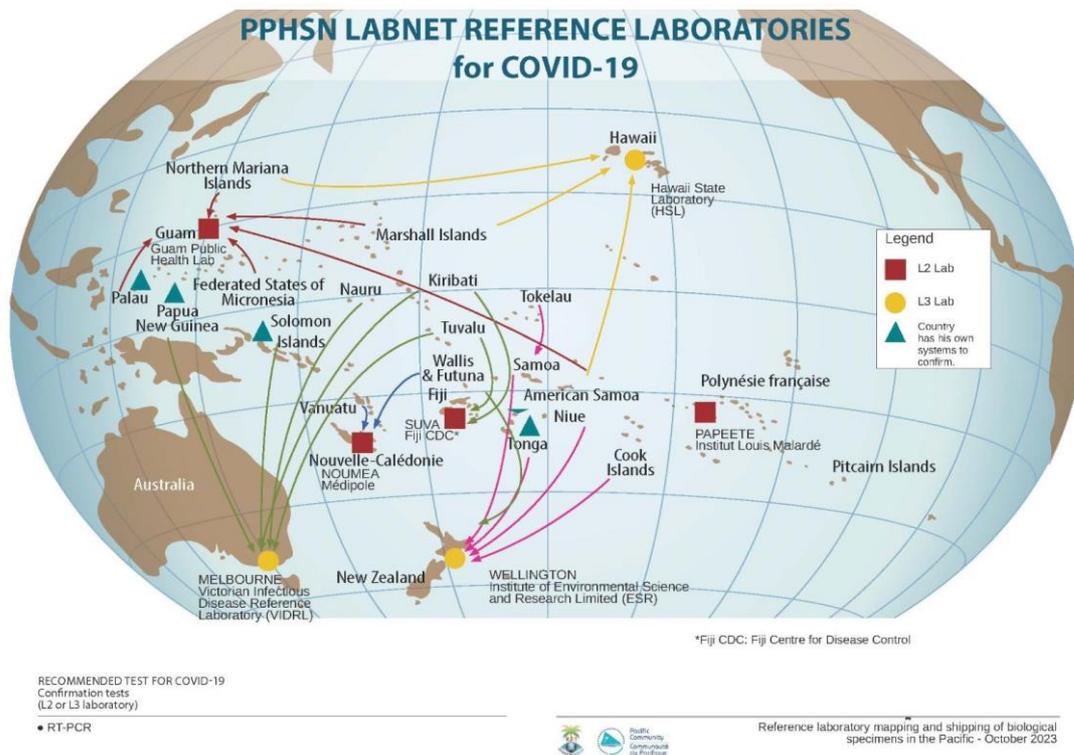


Figure 2 PPHSN LabNet reference laboratories for influenza, 2023

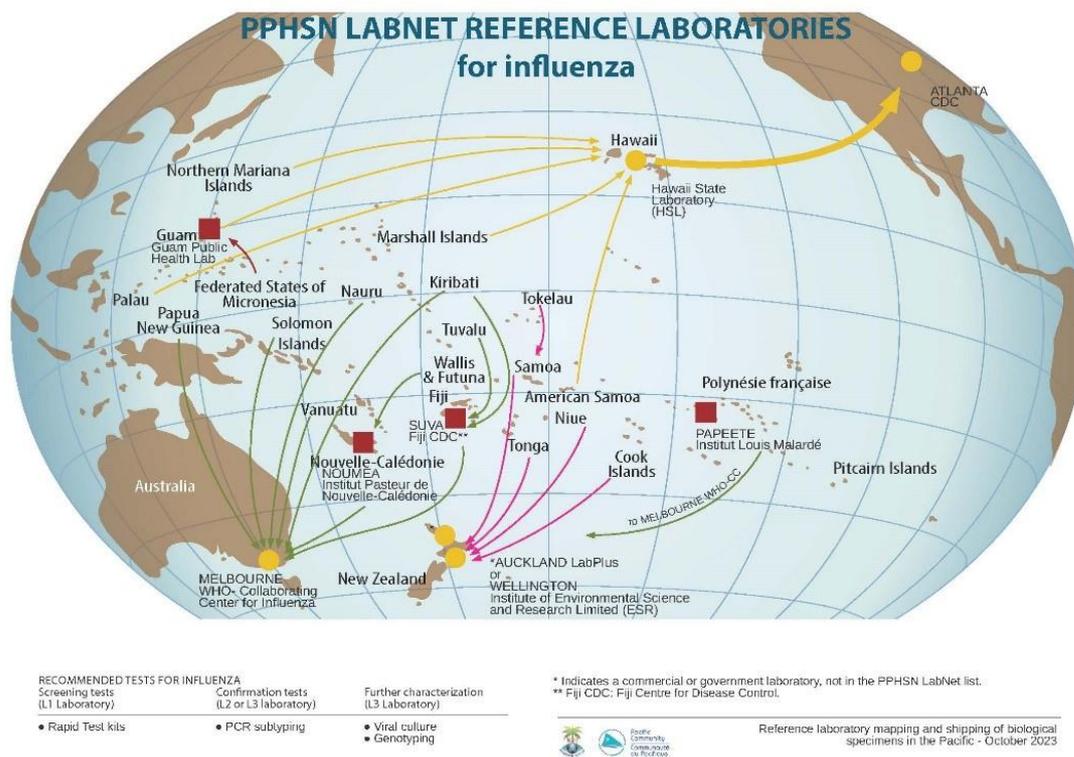
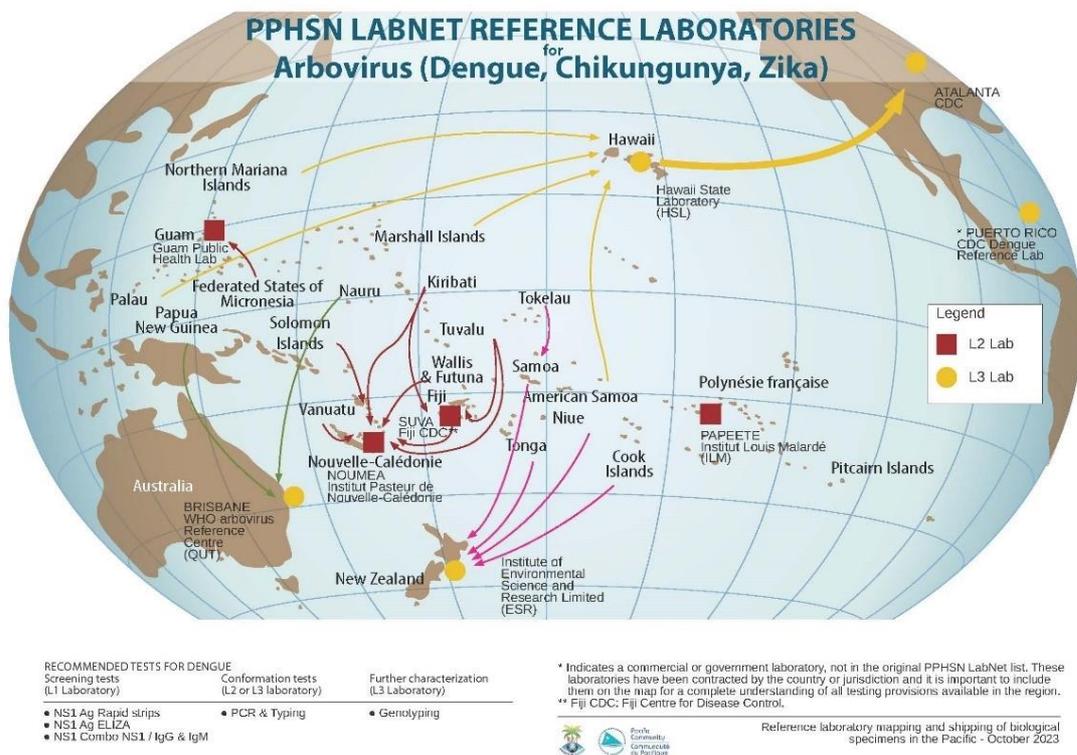


Figure 3 PPHSN LabNet reference laboratories for arboviruses, 2023



PICNet

Allied membership encompasses health professionals with a vested interest in infection prevention and control (IPC) from Australia and New Zealand, international organisations (WHO, SPC), training institutions, and donors. The Steering Committee, comprising representatives from WHO, SPC, FNU College of Medicine, Nursing & Health Sciences and six core national Focal Point members, undertake facilitation and oversight of the accomplishment of objectives, meticulously documenting PICNet meetings, education and surveillance initiatives and workshops, and orchestrating internal communication. The PPHSN-Coordinating Body is entrusted with the responsibility of cultivating and sustaining network communication with both core and allied members, nurturing external linkages, and collaboratively offering technical assistance in tandem with other agencies and members. The Doherty Institute has been contracted to provide technical support to PICTs to fortify hand hygiene and hospital-acquired infection surveillance, including training of PICTs’ focal points as hand hygiene auditors. The institute also undertook a comprehensive healthcare associated infection training package in Fiji and a surgical site infection (SSI) pilot project in collaboration with clinical ward staff (10,17). The Pacific Regional Infectious Disease Association (PRIDA) has more recently been contracted and has delivered a blood stream infection (BSI) pilot project with training to Samoa, Fiji, Palau, and the Solomon Islands. PICNet through the SPC has also partnered with the Australasian College for Infection Prevention and Control (ACIPC) to develop and deliver the Foundations of Infection Prevention and Control course for low-and middle-income settings, providing a pathway for credentialing and recognition of IPC specialisation and expertise. The PICNet terms of reference were updated following the PICNet meeting held in May 2023.

EpiNet

Each of the PICTs have their own EpiNet team, with variation of structure across the region(16). The composition of EpiNet teams includes a diverse range of professionals from various fields, such as health, clinical medicine, epidemiology, laboratory management, nursing, public health, and disaster management, among others(18). EpiNet teams tend to be proportionate to the size of the country; smaller countries tend to have smaller teams (2-3 members), whilst larger countries have more extensive teams. The selection of the members of each EpiNet team is at the discretion of each country. Some PICTs have considered replicating EpiNet teams at the subnational level to strengthen surveillance and response efforts.

The expertise within EpiNet teams spans several critical areas, including notifiable disease data management, clinical medicine, laboratory operations, field investigations, environmental health, public health management, disaster management, and risk communication. These teams are composed of professionals with a wide range of skills, collectively contributing to robust disease surveillance and response capabilities (19).

Currently, there are 25 EpiNet teams spread across the Pacific region, 21 corresponding to a national team (for all PICTs except Pitcairn Islands) and 4 sub-national teams in the FSM. These teams are intended to be comprehensive and well-structured, ideally incorporating various expertise areas to ensure efficient surveillance and response. The PPHSN allied partners play a significant role in supporting the capacity development of these teams and enabling communication channels for sharing information and initiatives among teams. The PPHSN Focal Point also facilitates the dissemination of updated EpiNet information through email lists and the PPHSN website (20). Moreover, external entities like US CDC provide financial support and technical expertise to strengthen the EpiNet teams' effectiveness and functionality(21). An updated EpiNet terms of reference is an action item based on the EpiNet meeting in July 2023(20).

SHIP-DDM Programme

Central to the SHIP-DDM governance is the collaborative partnership between PICTs, the PIHOA, FNU, US CDC, Hunter New England Local Health District in Australia, WHO, the University of Guam and SPC (8,22). This confluence of regional health authorities, educational institutions, and international organisations collectively guides the program's objectives, strategies, and outcomes. The SHIP-DDM programme and other service arms of the PPHSN are financed from diverse sources, including the AFD, Australia's Department of Foreign Affairs and Trade (DFAT), the European Union (EU), the German Development Bank, the New Zealand Ministry of Foreign Affairs and Trade, and US CDC.

Stated aims of the PPHSN service arms

PacNet

PacNet serves as a crucial communication platform on surveillance and control measures, particularly for high-priority disease outbreaks, both locally and those of international concern. This communication network aims to enable rapid sharing and transmission of relevant health-related data and information, supporting responses to health emergencies and public health threats. It is the main tool PPHSN members use for communication and coordination (12).

PSSS

PSSS aims to support local outbreak response capacity by collecting, collating, and reporting syndromic surveillance data on the following syndromes: acute fever and rash, prolonged fever, diarrhea, dengue-like illness, influenza-like illness, SARI and COVID-19 from PICTs. Additionally complementary event-based surveillance using informal sources such as written media, social media, etc has been added. The primary objective of the PSSS is to be an early warning system to accurately detect outbreaks in the community quickly, allowing prompt initiation of responses to contain and manage public health threats. PSSS uses existing health data for immediate analysis and feedback (13).

LabNet

LabNet acts as a platform for providing recommendations and support in the areas of shipping and testing specimens and quality and laboratory management improvement. This support network, facilitated through dedicated mail communication lists, contributes to the efficient and reliable transportation and testing of specimens for disease diagnosis surveillance (14). Additionally, LabNet's three-tier regional laboratory referral network plays a pivotal role in identifying and confirming priority infectious diseases, thereby enhancing the region's capacity to respond to health threats effectively. By providing harmonised quality laboratory services and technical support, LabNet aims to ensure accurate and timely pathogen verification and identification, ultimately bolstering the region's disease detection and response capabilities (15).

The LabNet Technical Working Body operates as a critical component within the LabNet framework, focusing on distinct objectives. Foremost, the technical working group is dedicated to advising and supporting the development and strengthening of both human and animal health laboratory services across PICTs. It leverages its expertise to foster the creation of effective lab services, advocating for the allocation of adequate resources and the formulation of regional and national plans for lab development. The Technical Working Body should play a significant role in advancing public health surveillance and testing by promoting collaboration and communication between laboratories and promoting digital reporting infrastructure. In addition to promoting and offering training programs to PICTs' lab staff, the Technical Working Body should offer technical expertise on methods and technology and support the establishment of a comprehensive regional lab accreditation system. Through these multifaceted endeavours, the LabNet Technical Working Body contributes to enhancing the overall quality and efficacy of laboratory services in the Pacific region (22).

PICNet

The objective of PICNet encompasses several key aspects. It functions as a communication platform and knowledge-sharing resource, facilitating the exchange of experiences among IPC professionals (17). PICNet also assumes the role of supporting and advocating for the capacity building of these professionals, aiming to strengthen their expertise in IPC. Moreover, it seeks to establish and fortify institutional connections with regional and expert bodies within PPHSN. A core focus of PICNet is the establishment of minimum IPC standards, including workforce, and surveillance methodology across PICTs through evidence-based and best practice adaptation. By nurturing IPC capacity within PICTs, raising awareness of pertinent issues, and maintaining collaborative links with healthcare and related entities, PICNet strives to ensure effective IPC strategies across all health sectors and community. An additional objective is the formulation of a strategic plan to guide PICNet's endeavours (23). Looking ahead, PICNet's future objectives are the development and maintenance of standardised

mechanisms for comprehensive IPC programs including hospital-acquired infection surveillance and response, thereby bolstering the future safeguarding of public health within the region (23).

EpiNet

The primary objective of EpiNet is to establish a comprehensive disease surveillance and response mobilisation within PPHSN. This network aims to support disease surveillance, timely detection and alert notification and ensure rapid, coordinated responses to outbreaks and epidemics at a national level. EpiNet seeks to enhance early detection, investigation, and effective management of public health threats within PICTs (20,24).

The objective of EpiNet team members is to contribute to the successful implementation of the disease surveillance and response framework. Their responsibilities include immediate mobilising during outbreaks, forming and leading multidisciplinary task forces, advocating for political support, fostering communication through platforms like PacNet, establishing clear communication channels and actively participating in the Pacific Network of health professionals. Their role expands to become the official national surveillance and response team, advising authorities and advocating for disease control measures (19).

SHIP-DDM Program

SHIP-DDM program's main objective is to enhance the knowledge and skills of health professionals in the Pacific region (25). This program focuses on improving the calibre of information and surveillance systems while strengthening the capacity of health professionals in data-driven decision-making. Implementation of the SHIP-DDM program is conducted through the collaboration of PPHSN core and allied members. The program aims to equip health officers with the expertise needed to effectively use data for informed decision-making, enhancing the overall public health response and management in the Pacific (26).

Pacific Vector Network (PVN) initiative

The new PPHSN initiative, the PVN, aims to promote sharing of information among members, improve entomology skills and vector management expertise, establish or improve the capacity of entomology laboratories in each subregion, strengthen preparedness and response to outbreaks of vector-borne diseases, support use of digital tools for collecting and sharing vector surveillance data. Based on the desktop review, the governance of the PVN is through the PVN Technical Working Body and supported by permanent Coordinating Body members WHO, SPC and PIHOA. As this is a new initiative of the PPHSN established in June 2023, it is beyond the scope of the current review.

Activities, Strengths, and Challenges

This section outlines the activities conducted by each PPHSN service arm, as reported in documents reviewed, along with challenges that are recorded. Activities and challenges are summarised and listed under the corresponding service arm.

PacNet

Strengths of PacNet include its role in highlighting essential information for immediate action, enhancing information sharing by encouraging PICTs to provide situation updates, alerting neighbouring PICTs for preparedness by creating regional alerts, and members contributing to Risk Communication and Community Engagement (RCCE) through PacNet (10). Further,

information shared on PacNet was used to develop risk assessment both domestically and internationally (20), and PacNet was used to declare the start and end of outbreaks or public health threats (10). It was noted that PacNet experienced increased traffic due to a rise in subscribers and posts during COVID-19 (10).

Documents also noted challenges experienced by PacNet. PICT reports to PacNet are not consistently timely, therefore affecting real-time information (20). It was also noted that data source verification was required as data often comes from sources like Facebook and Sitreps (20). Further, there is a wish for inclusion of diverse data, including data sharing from countries outside of the Pacific (27).

PSSS

The PSSS is undertaking an expansion of multisource surveillance, with allied partners preparing a concept paper to map out various health information (11). Another activity includes plans to transform PSSS into (SurvNet) to integrate systems encompassing syndromic surveillance, disease surveillance, vector surveillance and alert mapping (28). A strength of the PSSS is its linkage to the Early Warning, Alert and Response System (EWARS) providing technical support and features syndromic indicators along with event-based indicators (10). Furthermore, PSSS facilitates early information sharing to detect outbreaks in regions with sentinel sites (20).

Several challenges of the PSSS include inconsistent use of case definitions causing interpretation challenges. Discussions have been held to create case definitions, however the current list of syndromes in PSSS was retained. A lack of automatic collation and analysis of regional trends also caused some outbreaks to not be captured in the system (28). There was also a desire to include participation of countries to explore the potential for use of data visualisation and techniques currently unavailable (28).

LabNet

Post COVID-19, LabNet's scope has broadened to encompass testing beyond PPHSN priority diseases, now including global and regional health priorities (10). LabNet also engages in LQMS, including Lab Standards Implementation and Assessment, to ensure the quality and reliability of laboratory testing (10). It conducts training activities, such as Infectious Substances Shipping Training (SIST) aimed at enhancing the skills and knowledge of laboratory staff and focuses on enhancing laboratory capacity through activities like International Test Assessment (ITA) and supporting PICTs in developing Laboratory Information Management Systems (LIMS) (16). LabNet receives support from WHO in terms of maintaining and sustaining quality laboratory services, including implementing quality programs like International Standard for Testing Calibration Laboratories (ISST) (16).

Areas for improvement reported include the need to update and review plans, policies, guidelines, and protocols (26). A shortage of skilled personnel in laboratory settings is a significant hurdle in maintaining quality testing and responding to outbreaks (28). Outdated or inadequate laboratory infrastructure can impede efficient and accurate testing, especially during critical situations. The need for more laboratories to have LIMS to support rapid detection and response was also highlighted (28). Proper management and maintenance of laboratory equipment are needed for ensuring accurate testing results and preventing disruptions (16). Challenges in inventory management and reagent availability may lead to underutilisation of diagnostic capabilities, impacting outbreak response (16). Addressing occupational health and safety concerns is crucial to safeguard laboratory staff and maintain a safe working environment (16). The absence of PICT representatives on the Technical

Working Group and the need for improved coordination between labs and outbreak response teams present challenges (28). The absence of established regional or national guidelines that define when and how laboratories should conduct testing during infectious disease outbreaks makes it difficult for laboratories to determine the appropriate level of testing required to detect and respond to outbreaks effectively (28). There is an issue in establishing well-defined communication channels that facilitate prompt reporting of positive cases from laboratories to outbreak response teams and vice versa which can lead to delays in reporting critical information, hinder coordination, and impede the timely initiation of outbreak surveillance testing (20).

PICNet

PICNet activities include responding to outbreaks and other public health needs by adapting WHO guidance to suit the unique conditions of the Pacific region(11). PICNet plays a role in developing, disseminating, and maintaining IPC guidelines, ensuring they are relevant to the Pacific context and to the needs of individual member states (11). PICNet also engages partners to deliver education in PICTs focusing on IPC program implementation, monitoring, workforce development, and improvement inclusive of active surveillance of healthcare associated infection and hand hygiene (11). PICNet provides technical advice and guidance on IPC measures. It contributed to the COVID-19 response through the Pacific Joint Incident Management Teams (11) and adopts a road map to strengthen IPC in the Pacific whilst assisting member states to develop national IPC workplans. A multi-modal approach is utilised to prevent healthcare associated infection, antimicrobial resistance, and improve hand hygiene (11).

Some challenges that PICNet experiences as highlighted in documents include limited availability of resources, including workforce and equipment, presents obstacles to effectively implement IPC measures. Further, ensuring that IPC measures reach remote and outer islands is challenging due to logistical issues and the need for effective distribution networks. Maintaining consistent adherence to IPC practices over time requires ongoing prioritisation, dedication, and vigilance from healthcare leadership and professionals. Conducting thorough monitoring and evaluations across the region is intricate and resource intensive. Ensuring that IPC and efforts remain consistent and standardised across different healthcare facilities is an ongoing challenge (21).

EpiNet

EpiNet undertakes a variety of activities geared towards efficient management and mitigation of health events, particularly during crises and emergencies. These activities include a multistakeholder approach involving collaborative engagement, and developing strategies, protocols, and playbooks tailored to address differentiated crises (11) EpiNet advocates for scenario planning exercises to assess and enhance response capabilities. This involves simulating potential health event scenarios to validate response plans and identify gaps (11). It also establishes plans to manage secondary crises for holistic crisis management, ensuring that cascading consequences can be addressed effectively(11). EpiNet collaborates with development partners, allied, and technical assistance providers to foster the development of simulation exercises and workbooks. This facilitates practical training and skill enhancement for the response teams (11) and engages in developing a roadmap to national self-sufficiency. This strategic endeavour involves tasking development partners to outline a concept paper, thus ensuring long-term sustainability of EpiNet teams (21).

EpiNet challenges include, determining when an outbreak has occurred and delayed outbreak response due to varying case definition criteria and delayed testing and notification (20). Contributing to delays in the detection and response to outbreaks is the lack of appropriate infrastructure within some PICTs for rapid testing and notification of diseases (20). Coordinating actions across diverse sectors during crises poses difficulties. Clearly defining EpiNet's role within response structure is challenging. Assigning specific responsibilities to each unit requires meticulous planning to avoid confusion (20). The ability to rapidly bring specialised experts is hindered. EpiNet's capacity to incorporate specific skills during emergencies is often constrained (10).

SHIP-DDM Program

The SHIP-DDM program has several strengths. Courses are fully accredited by FNU, with FNU planning to seek accreditation from Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) (11). Graduates of the program undertake projects to improve health services and contribute to outbreak management, including during COVID-19 (26), and have been able to implement policy changes (28). The program also fosters networking and collaboration among health professions from different PICTs. Graduates of SHIP-DDM become part of a larger community of practice, allowing the exchange of knowledge and experiences, and best practices (26).

Challenges encountered by the program include travel restrictions due to COVID-19 which hindered in-country delivery of SHIP-DDM and led to prolonged course timelines. Innovation in course delivery led to the hybrid course model and the development of online components. Some participants experienced issues accessing online components due to limitations in infrastructure (10). Some participants faced challenges enrolling in the courses due to the enrolment requirements of needing a birth certificate, while others expressed a desire for a shorter timeframe for course delivery (21). Some participants experienced frustration due to a lack of understanding about course progression and confusion about course intentions (21). There is also a need to integrate SHIP-DDM graduates into the local health workforce and utilise their enhanced skills effectively. The challenge of retaining SHIP-DDM graduates within the health sector was noted, especially with attrition to other ministries (21).

Survey of PPHSN users

In total, 186 participants responded to the online survey, of which 149 (80%) completed it. Table 2 provides a summary of the number of complete responses per survey section.

Survey responses were received from all 22 PICTs. The largest number of responses were from FSM (20, 13%) followed by Fiji (16, 11%), Kiribati (12, 8%), Guam (10, 7%) and Solomon Islands (10, 7%). When grouped by subregion, 59 (40%) responses came from Micronesian, 43 (29%) from Melanesian, and 37 (25%) from Polynesian PICTs. In addition, 10 (7%) responses were received from allied members in Australia, New Zealand and the Philippines (Table 3).

Of the 149 respondents, 110 (74%) worked for government health departments. Others were from research institutions, hospitals, and international and regional health development agencies. Responses were received from all jurisdictional levels, with over half (76, 51%) working at a national level, 37 (25%) at the subnational level and 36 (24%) of respondents worked at the regional level or across multiple jurisdictions.

Respondents held a variety of roles. These included 77 (52%) who worked in public health roles (i.e., outbreak and response team members; infection, prevention and control

professionals; environmental health specialists; surveillance officers and other professional public health roles); 24 (16%) as clinicians (i.e., clinicians, nurses, community health workers), 23 (16%) in leadership roles; 9 (16%) in laboratories, 5 (3%) in research or data analytics, and 4 (3%) as health educators. Over two-thirds of respondents (110, 74%) had worked in public health for 10 or more years.

Respondent's experience working with the PPHSN ranged from <1 year to >16 years with the most common response being 1-5 years (54, 36%). Twelve respondents were from the current Coordinating Body core member countries (New Caledonia, Nauru, Cook Islands, Solomon Islands, Vanuatu, Palau, Tonga) and two from current Coordinating Body allied membership. The remaining responses were from allied member organisations and PPHSN member countries. Interpretation of this question is limited by individual responses to jurisdictional-level questions.

When participants were asked what they perceived the main purpose of the PPHSN to be, most reported 'a communication platform for surveillance and response' (42, 28%). This was followed by 'a mechanism to support the strengthening of outbreak surveillance and response capacity' (34, 23%) and 'a mechanism to strengthening health systems' (27, 18%). Table 4 presents the full list of responses.

PacNet

Of the 149 respondents who completed the PPHSN survey, 60 (40%) completed the PacNet section. The 60 respondents represented 19 of the 22 (86%) PICTs. No responses were received from PNG, Pitcairn Islands or RMI.

Questions in this section asked about the usefulness of the PacNet email alerts and maps, and how these resources had been used for outbreak preparedness and response. Results for this section are summarised in Tables 5 and 6.

Of the 60 respondents, most (53, 88%) reported receiving PacNet alerts. Among those that received the alerts only one-third (18, 30%) were satisfied with the current email-based communication format and suggested that instant messaging using Facebook, WhatsApp, SMS, or a dedicated phone application would be valuable supplementary methods to disseminate information and aid member communication. Six of the seven respondents who reported not receiving the PacNet alerts were public health officers/environmental specialist/health inspector from the Departments of Health in the Micronesian subregion and one respondent was from an organisation in Australia.

Over two thirds of respondents (41, 68%) reported that they had used PacNet to send an outbreak/public health emergency alert. Those that had not used PacNet to send alerts or could not recall doing so (19, 32%) tended to work at the national level and held public health officer positions (1) or were from non-government organisations (3). Almost all respondents reported that the emerging disease alert maps were 'very' or 'extremely' useful (48, 80%).

Participants were asked whether they felt PacNet was meeting its objective of facilitating communication between PPHSN members and partners. Table 6 presents a breakdown of responses to this question by country. Of the 60 respondents, 45 (75%) reported feeling that PacNet was meeting this objective.

Respondents were also asked to identify in what ways PacNet had been useful to them and their organisation (Table 5). Respondents were able to select multiple options from a list. The four most frequently selected options included 'providing alerts on potential threats' (56, 93%),

‘supporting preparedness and planning’ (41, 68%), ‘outbreak response’ (43, 72%) and ‘public health prevention and control measures’ (42, 70%).

PSSS

Sixty-three participants out of the 149 respondents (42%) completed the PSSS section of the survey. Survey respondents from all PICTS except Tuvalu, PNG, Nauru and RMI responded. Participants were asked questions about how PSSS data is captured and used in their jurisdiction. The results to these questions are presented in Table 7 and 8, below.

The number of sentinel sites reported by survey respondents from the same country varied, reflecting the limitations of a survey of individuals to capture accurate information on jurisdiction-level indicators. The number of sentinel sites are provided in Table 7. Forty-seven (78%) respondents reported that their national syndromic surveillance system had both indicator-based (IBS) and event-based surveillance (EBS) components. Survey respondents from Pitcairn Islands and, Wallis and Futuna reported capturing IBS data only. Of the survey respondents, 37 (63%) reported that their national systems extracted syndromic data from a clinic/hospital logbooks or patient registers while 28 (47%) reported using a weekly paper tally sheet, 25 (42%) used electronic patient records and 14 (23%) used event reporting and assessment forms. Again, data based on a survey designed to be completed by individuals can only provide an indication of the true situation, and further data (perhaps collected through key informant interview or observation) is required.

Among respondents (28,44%) that reported their PICT used weekly paper tally sheets, 14 (50%) reported that the tally sheets were always complete. Interestingly, 70% (42) reported that submission of weekly reports was not always timely due, most often, to delays or non-submission of tally sheet from sentinel sites (33, 79%). Lack of internet coverage (20, 48%), no credit for phone calls/SMS (15, 36%), no phone or computer access (12, 29%) and lack of time (11, 26%) were cited as reasons tally sheets were not sent/received on time (Table 7). Respondents reported that various methods were used to transfer surveillance data from sentinel sites to a surveillance office with the most frequent being by email (52, 87%) followed by phone call (28,25%), on paper (24, 40%), SMS (15,22%) and phone application (13, 22%) (Table 8). Again, there was inconsistency in the responses received suggesting that further investigation is required.

Fifty-nine of 63 (94%) respondents reported that the PSSS had been effective in providing early warning alerts and supporting responses to emergencies. Most (48, 81%) felt the PSSS was very or extremely effective. When asked about the utility of the PSSS during the COVID-19 pandemic, this proportion fell to 73% (Table 7). Participants were asked how the data captured by their country PSSS is used. The three main reported uses were: to identify outbreaks (48, 81%), to monitor diseases (8, 81%) and as a signal to trigger an investigation (45,76%). Other responses included raising awareness and educating staff about the importance of infectious disease surveillance (36, 61%), as a tool for health promotion (32, 54%) and to support health systems planning (26, 44%).

LabNet

Thirty (20%) of survey respondents completed the LabNet section. Most of the respondents were from L1 (10, 33%) and L2 (13, 43%) laboratories with a smaller number from L3 (4, 13%) or working across all laboratory levels (3, 10%). Eleven respondents (37%) were members of the LabNet Technical Working Group. Table 9 and 10 provide the results of the LabNet section of the online PPHSN survey. Respondents in this section of the survey were

from the following countries Cook Islands, Palau, FSM, Tuvalu, New Caledonia, Guam, Kiribati, Solomon Islands, Guam, Samoa, Fiji, Niue and Nauru.

When asked about the impact of the COVID-19 pandemic on laboratory capacity, most respondents (26, 87%) reported that laboratory capacity had increased during the pandemic. Among those that reported an increase in capacity most (26, 93%) felt that LabNet had been helpful in sustaining and advancing capacity. The two respondents who felt it was not helpful were from L2 and L3 laboratories.

Timing of specimen confirmation by reference laboratories varied from less than a week up to a month. Table 10 presents the confirmation times by subregion. The average timeframe for specimen confirmation was 3-4 weeks (6, 75%) in Polynesia (Cook Islands, Niue, Samoa, Tuvalu), 1-2 weeks (8, 67%) in Micronesia (FSM, Guam, Kiribati, Nauru, Palau) and less than one week (3, 43%) for Melanesia (Fiji, Solomon Islands).

Only 12 respondents (40%) reported using the PacNet-Lab email to communicate with the network, including to seek advice from colleagues or to request support. Forty percent (12/30) of respondents reported having an electronic Laboratory Information Management System (LIMS) in place. These were from Cook Islands, FSM, Fiji, Guam, RMI, Palau, Solomon Islands and international countries. Of those that had a LIMS, only two participants responded that the LIMS had capacity for direct electronic notification to PPHSN. Communication between public and private laboratories was primarily through routine reporting of notifiable disease and data sharing mechanisms (11, 37%). Five (17%) respondents reported that communication with private laboratories was supported by the PacNet-Lab listserv. It is noteworthy that not all PICTs have private laboratory service providers in their countries.

Participants were asked how effective LabNet has been in helping to strengthen health laboratory services in the Pacific. Of the 30 respondents, 29 (97%) thought it had been effective including by providing testing support for PPHSN priority diseases. Participants were asked questions on PPHSN laboratory workforce capacity building support with respondents indicating that they had received training in the following: testing methodologies (22, 73%), laboratory equipment (17, 56%), information management systems (12, 40%), procurement and stock management (10, 33%), sample referral networks (9, 30%), occupational health and safety (8, 27%). Six respondents (20%) reported that the question was not relevant to them as they had not received training or were trainers themselves.

PICNet

Of the 149 survey participants, 16 (11%) responded to questions related to PICNet; three of the respondents were members of the PICNet steering committee. Respondents in this section of the survey were from American Samoa, Tonga, Guam, Solomon Islands, Palau, PNG, Cook Islands, French Polynesia, Samoa, Niue, RMI, Kiribati, Vanuatu and Nauru. Table 11 presents the results from the PICNet section of the survey.

When asked about the effectiveness of PICNet for building capacity for IPC professionals most (13, 81%) answered that it was moderately to very effective. Most respondents (12, 75%) reported that there were trained IPC staff available in their organisation and 11 (69%) respondents reported that hospital-acquired infection surveillance was conducted at their organisation/health facility/ies. Respondents from Tonga, French Polynesia, Vanuatu, Nauru, and Kiribati indicated that they either didn't have, or did not know if they had, a hospital-acquired infection surveillance program in place in their country.

Eighty-eight percent (14) of respondents reported feeling that PICNet was moderately, very, or extremely effective at raising awareness about IPC and strengthening partnerships to addressing ICT priorities.

Participants were asked whether their organisation used the PPHSN Infection Prevention and Control Guidelines 2021. Ten of the 16 respondents (63%) (from American Samoa, Tonga, Solomon Islands, Palau, PNG, Samoa, RMI, Solomon Islands, Vanuatu and Nauru) reported they used the guidelines. Of those that used the guidelines, 9 (90%) reported their organisation had changed policy and practices to be compliant with the guidelines. Respondents indicated areas where changes to IPC policy and process had occurred with the most frequent adaption reported being to the management of the IPC program (9, 90%), improved hand hygiene (8, 80%) and monitoring of IPC practice (8, 80%). These results are presented in the Table 11.

EpiNet

Forty-seven of the 149 participants (32%) responded to the section on EpiNet. Participants were asked questions about the outbreak response team in their jurisdiction. Of the 47 respondents 43 (91%) reported having a designated team/s in place in their jurisdiction to detect and respond to public health alerts (Table 12). Countries which did not have respondents in this section were PNG and Pitcairn Islands.

Of those that responded to having a response team only 27 (63%) reported that the team is known as an 'EpiNet' team. Response teams were made up of at least three people with most having five or more team members. Table 13 presents an overview of the reported skills-set of response teams.

Survey participants were asked how many times the response team in their jurisdiction had been deployed in the past 5 years. Most (34, 74%) responded 'less than 10 times' with five indicating that they had never been deployed. Again, these data need to be verified as survey responses were, on occasions, conflicting (Table 12).

Respondents reported using a wide variety of communication tools to receive and convey information about potential and real outbreaks and public health events. These included the PSSS (31, 67%), PacNet (29, 63%), social media posts (29, 63%). A small number of participants reported that there were no standard reporting procedures.

Participants were asked what procedures and tools were available to support response teams to prepare for and coordinate responses to outbreaks and other public health events. Participants were able to select multiple responses. The most frequent responses were 'guidelines' (41, 89%), standard operating procedures (35, 76%), surveillance and response training (33, 72%) and simulation exercises (25, 54%). Other tools included scenario-based planning (14, 30%) and the pandemic playbook (13, 28%). Other useful tools reported by respondents included the Pacific Outbreak Manual, Case and Contact Information Systems (PHOCCIS), National Disaster Management Office plans and response arrangements for Health, National Health emergency plans, WHO Blue Books for Disasters Deployment, and associated national level policies and guidelines to support the establishment of the emergency preparedness and response teams.

Of the 46 respondents, most (33, 72%) felt that their response team was equipped with the resources and skills required to respond appropriately to outbreaks. Those that did not feel equipped were from Cook Islands, Tuvalu, FSM, Samoa, Kiribati, Solomon Islands, Niue and Nauru.

Areas for improvement suggested by participants included building expertise in epidemiology, increasing staff numbers and skills, ensuring SOPs were up to date and contextualised, increased access to technical assistance that could be deployed rapidly in response to events, increasing access to/capacity for confirmatory diagnosis of outbreak prone diseases, improved communication channels and clearly identified roles and responsibilities.

SHIP-DDM

Of the 149 respondents, 36 (24%) from 14 PICTs completed the SHIP-DDM section of the survey. No responses were received from stakeholders from American Samoa, French Polynesia, Niue, Pitcairn Islands, Samoa, Tonga, Tuvalu and PNG. Table 15 presents characteristics of SHIP-DDM participants by sex.

Of these 36 respondents, 20 (56%) were trainees and 16 (44%) had graduated from the program. Thirty-two (89%) were enrolled in or had completed the Postgraduate Certificate in Field Epidemiology program and four (11%) were enrolled in or graduates of the Postgraduate Diploma in Applied Epidemiology program (Tables 15 and 16).

Most respondents (28, 80%) reported that engagement with the programme meant they were better placed to network with other health professionals. Among the seven (20%) that reported not being better equipped or able to network, most were partway through the Postgraduate Certificate program (due to complete their training in 2023). Almost all respondents reported receiving workplace mentoring while being a trainee (31, 86%) and most (31, 86%) had been involved in outbreak responses during/since their training, including during the COVID-19 pandemic (30, 83%) (Table 15). When asked how relevant and helpful SHIP-DDM training had been in their work roles, 32 (89%) reported that it was relevant and 30 (94%) indicated it was very or extremely helpful. Only one respondent indicated that it was not helpful. Most (26, 72%) reported having an intention to pursue further training (Table 15).

SHIP-DDM topics that respondents found the most relevant included ‘epidemiology/field epidemiology’ (31, 80%), ‘disease outbreak investigation and management’ (28, 72%), ‘health information system management’ (23, 59%) and ‘data management and analysis’ (21, 54%). Table 17 provides additional results for this question.

Participants were also asked to provide insight into what they liked most about the SHIP-DDM program and what could be improved. Key attributes were sharing of information, mentoring from faculty, data management, Pacific-focused design, peer-to-peer learning, learning to think in more multisectoral ways, learning how to identify, respond and control disease outbreaks and that the course helps to identify gaps in the graduate’s own health facilities.

In terms of strategies to improve the program, respondents provided a range of options such as creating online and more practical training modules, opportunity to receive feedback /grades after each module, improved career advancement after completing each tier with recognition of skills by the graduates own management and leadership, better networking opportunities with alumni, be on a list of personnel to support outbreak response, provide greater number of opportunities and time for professionals in jobs to complete the training, offer refresher courses and increased frequency.

Focus group discussions

In total, seven online focus groups were conducted during the study period. A total of 38 stakeholders of the PPHSN participated and represented a range of organisations (Appendix 2). Participants included current and past members of the PPHSN Coordinating Body, permanent members from SPC and WHO, representatives from PIHOA, US CDC, Australian

Department of Foreign Affairs and Trade, Agence Française de Développement, and referral labs, along with members of government ministries from the Cook Islands, Solomon Islands, Tonga, Palau, Guam, CNMI, RMI, Vanuatu, and Samoa. The focus groups were broadly separated in the following categories: Coordinating Body members (n=7), permanent members (n=11), EpiNet members (n=4), decision-makers (n=2), funders (n=2), technical partners (n=7), and a mixed group (n=5). Of the participants, 20 were female and 18 were male. The participants' years of experience with the PPHSN ranged from 18 months to 23 years. To maintain the anonymity of the participants, no other demographic characteristics are included.

Purpose of the PPHSN

Health security and preparedness

The PPHSN's role in improving public health surveillance and response was acknowledged, with participants recognising its central position in strengthening surveillance and risk assessment, an IHR Core Competency. Overall, participants consistently portrayed the PPHSN as achieving its goal as a linchpin in fostering effective communication, enabling the flow of information crucial for public health security and preparedness:

“I think PPHSN has remained true, even with 20-plus years, to having surveillance at its core. And with surveillance there's data. And even today the relevance is still there. Everything depends on data. Although the transfer data into information is much faster as it was 20 years ago. But the core still remains the same. And I think that is important in terms of you are thinking about the future. I don't know when a day will come where you won't need data. And I think it's achieved its objective of keeping surveillance at its core; its core business in terms of for the PPHSN.” (P9, FGD2)

PPHSN was also seen to work beyond public health surveillance, and more generally in strengthening health systems and preparedness in the Pacific:

“I think you know; it started off really to build surveillance, and it sort of has, you know, kind of expanded into other areas. I think I see it as a health system strengthening type of a network, and with an emphasis, especially on preparedness. There's a lot of response in there. Not just you know, disease surveillance.” (P4, FGD1)

Information sharing

In the narratives provided by participants, information sharing emerged as a central theme concerning the PPHSN's pivotal role. Participants emphasised the significance of the network in establishing connections amongst Pacific nations, emphasising the sharing of critical health information:

“The number one goal is that it's there to serve the Island countries and territories, to meet their needs, to help advance regional priorities and enhance capacity for sort of public health security or public health protection across the region.” (P2, FGD6)

This function, they noted, served as a linchpin for regional collaboration by keeping countries informed about ongoing developments and potential public health threats:

“But I think one of the key things that I thought was really important as a role of PPHSN at that time, was really just to connect all the countries in terms of sharing of information, what's going on in the region, and the possible threats that they could prepare and respond to. And so, I guess that then led to the development of its first service which was PacNet, was trying to, yes, establish.” (P13, FGD2)

The act of connecting nations through information sharing was not merely a logistical necessity but a strategic approach to bolster collective preparedness and response efforts. The development of PacNet, one of the network's services, stands as a testament to the commitment to facilitating this interconnectedness. Through fostering an environment of shared knowledge, the PPHSN emerges as a catalyst for strengthening the bonds between countries in the region, ultimately contributing to a more coordinated and responsive approach to public health challenges:

“It's to coordinate information, and in the region and as well as activities to better conduct surveillance on public health issues that affect us all, and to provide information and opportunities for us to collaborate and communicate with each other.” (P3, FGD1)

Strengths and challenges

Materials

Participants consistently emphasised on the important role of manuals and guidelines in their public health practices. The materials provided by the network served as comprehensive references, aiding professionals in navigating health scenarios and training staff members:

“So, we've used that (pacific outbreak manual) definitely as a reference. I mean, it's been, you know, from my perspective, like I said, you know, coming from the mainland and not having any knowledge of you know really what's going on, and how they communicate, how different things are like in the island and CNMI, and just the Pacific in general, it was just very useful to use that, as well as you know, following the CDC guidelines for outbreaks as well, and just kind of marrying the 2 basically. But it's been for me, like training others, and that's where it's been useful as well as like training our surveillance coordinator.” (P1, FGD3)

This sentiment was echoed by another participant, as they too affirmed using a dual approach and combining the Pacific Outbreak Manual with other guidelines from other global health organisations:

“One of the documents that we do use is the Pacific Outbreak Manual that comes out of the PPHSN and SPC. But we also use this in conjunction with the different specific guidelines that comes from both SPC and WHO, when it comes to case investigation, clinical treatment guidelines, as well as, what you call, follow up and managing contacts and things like that.” (P1, FGD4)

Resource use variation

Participants reported variations in their use of the resources. Some reported using the resources to provide lab support:

“So, using the LabNet networking through PPHSN has assisted us to ensure that we have samples like, especially the notified policies samples that could not be tested in-country, but can be send out to the reference laboratory to assist us with responses back in country. And those linkages that I've seen at the strongest and have been very helpful to us through the PPHSN network.” (P3, FGD3)

Participants also mentioned that the way the resources were utilised were ultimately dependant on the individual countries and their needs:

“So, in terms of materials, such as IHR guidelines, and all the information on what to do with all of these information or tools to use, like after action review, JEE and all of that, it’s through this network that we can know about it. And yeah, it goes back to what I mentioned; it depends on the individual countries and what they need. And then their requests fall through the network, and then be provided from the network. And they do that. But of course, the situation report and everything that is being updated to us weekly, in a weekly basis, we use that a lot.” (P2, FGD4)

As indicated by the quote, this participant describes the importance of the PPHSN in providing essential materials for countries. And whilst PPHSN materials were identified as valuable tools, many participants mentioned the need to adapt to local contexts, as this adaptability was perceived as essential for the successful implementation of public health initiatives:

“I mean that we use from materials develop for the region by SPC, and our initial outbreak investigation guidelines were from the SPC developed for the regional use. And now with noting that some of the with the syndromic surveillance materials for risk communication and community engagement, I mean, we’ve also adopted materials for that nature as well. So yeah, no, I mean, we use that. And also, we contextualize it with in collaboration with the team from SPC and in others, for example, like, now for the Pacific Games, I mean here do we get French translation services? I mean, we get it from SPC, a practical example. And some of the materials that is actually already being developed and then we’re adapting it to our setting for the Pacific Games. And then not with that, but previously as well, doing some of our outbreaks and some of our mass gathering events that we’ve had over the past 10 years. So yeah, we do definitely use the materials that are being produced, and we adapt based on to our context.” (P5, FGD1)

However, adaptability came with its own challenges as indicated by the participant. This interplay between adapting materials to local contexts and the ongoing need for updates sheds light on the evolving nature of public health practices in the Pacific region, as health professionals strive to align their strategies and practices with new outbreaks:

“It does need to be updated. There are several outbreaks that you know. Covid obviously is not included in there monkeypox. But I mean other than that, I think you know other than some updates. And you know, some minor process changes.” (P1, FGD3)

Ultimately, participants indicated that there should be ongoing efforts to update resources, ensuring that the materials evolve, alongside the latest developments in the region:

“We’re using and promoting the Pacific Outbreak Manual. That was, as far as I understand, developed jointly by technical allied members. So WHO, CDC, SPC and ESR and a number of others. I think this is a very good material, but it’s also maybe the kind of old format. So, either paper format or PDF format. And this is the kind of product that could be improved using new technologies, with more interactive use of this manual. It needs revision, because things like COVID-19 is not included. The model disease is taken by WHO for future pandemics is not included. So, it needs some modernisation, both of the contents and of the format, in my opinion.” (P1, FGD7)

Information sharing

One of the key strengths highlighted by the participants was the ability of the PPHSN to facilitate information sharing amongst participating countries. As one participant aptly put it:

“Yeah, I think one of one of the things that the countries really benefit from when they come together under PPHSN is the sharing of ideas, and coming to understand how

something that they just don't know, don't necessarily have a great way to tackle, how another country is doing it, and they'll get new ideas about that or ways approaches that are feasible in their own context.” (P1, FGD5)

However, the effectiveness of this information sharing model is not without its challenges. Inconsistent reporting practices were highlighted as a factor that hinders the smooth flow of health information. Another participant noted:

“For example, the French territories, or the US territories, they are also part of the PPHSN family. And one of the things that I tend to see a lot, especially when the reports come, is that a lot of these territories are not actually reporting, updating, providing updated reports to PPHSN. Or they do provide, but a lot of missing information per se. And poses the question whether they – how are the different key bodies of PPHSN functioning between SPC, and also the different network, like with EpiNet, PacNet, the Vector Net, EpiNet, whether they are also talking to each other so that there is consistency of reporting.” (P1, FGD4)

This reporting challenge was further compounded by language barriers particularly in relation to English and French, which present another layer of complexity to effective communication. As outlined by another participant:

“One of the barriers that we just experienced is language barrier, from other Pacific Island countries. And that’s one. And we picked that, and we noticed that because of meetings and reports. It’s a minor thing, but it does happen. Because we had discussions with, especially those smaller islands, that are under the French territory. So, it’s always the difficulties in just language barrier itself.” (P2, FGD4)

Addressing these language barriers becomes paramount in enhancing the effectiveness of collaborative efforts across Pacific countries.

Another issue highlighted by the participants is in the timeliness of data. The sharing of information is often delayed due to domestic need for clearances:

“Some of the challenges that I’ve observed and seen during my time is in the communication of outbreaks or confirmed tests from countries. Sometimes it’s quite sensitive, that they won’t release the result unless it gets cleared by their own authorities. So that kind of delay, the information sharing to neighbouring countries, or posted on the PacNet. So sometimes it’s an issue with the internal system of countries, how results or findings should be communicated.” (P2, FGD 7)

Additionally, participants also noted that tension between permanent- Coordinating Body members, SPC and WHO, that create duplication in efforts by PICTs.

“But I did [inaudible] share that I agree very much with what PARTICIPANT #4 said. It does get confusing sometimes when there's the syndromic surveillance report, and then they [SPC] reach out to us, or WHO reach out reaches out to us about what's happening. And then and then we also have the SPC outbreak map. I think there's definitely an opportunity to have those be more aligned and have one communication out that has all of those risks included. It's easier, it's better for us and more.” (P2, FGD1)

Regional isolation

Participants described the impact of regional isolation on information sharing in the Pacific. This regional isolation can limit the frequency and depth of information exchange, impacting the level of contributions made by certain countries. As expressed by the participant below:

“But there has been some sort of segregation from the US-Affiliated Pacific Islands and the South. And I am talking lab capacity, communications, and all that. It seems that - I had always to raise this, and I wanted to raise it in our last meeting in a call that combines EpiNet LabNet at PPHSN meeting in July in Honolulu. There was no chance for the audience to provide comments and all that.” (P7, FGD6).

Due to the Pacific’s large geography, some countries are inundated with information and data that hold little relevance to their unique contexts. This is further compounded by insufficient sharing of information and data leaving them disconnected from crucial information.

“On the downside, I think you know it has, the information is like, really, it's really good for sort of the geographical focus, but it has a lot of stuff in it sometimes about Australia doesn't really pertain very much to the islands, and it lacks information about like what's happening in the Philippines, right? And places where there are a lot of migrants coming back and for. You know, probably, you know, Hawaii. In this part I work up north. So, the Philippines and Hawaii. It would be nice to know as well of the threats that are there that are probably going to show up down here, you know, just from the patterns of migration.” (P4, FGD1)

Recognising the impacts of regional isolation and variation in capacity becomes crucial in fortifying the network's ability to foster robust information sharing and a unified approach to public health surveillance across the Pacific.

Funding

Whilst some participants within the Coordinating Body were knowledgeable about the intricacies of funding mechanisms to the PPHSN, others expressed a lack of clarity and awareness. One participant, for instance, demonstrated an understanding of the funding dynamics, illustrating a keen awareness of the financial aspects that underpin public health initiatives in the Pacific region:

“And with that definition I would say the funding mechanisms we have for PPHSN comes from various sources. We have AFD, we have EU, we have MFAT in New Zealand, we have DFAT in Australia, we have US CDC, we have US state governments. So, there’s a lot of funding mechanisms that are supporting our initiatives in PPHSN.” (P10, FGD2)

In contrast, other participants highlighted the challenges associated with the lack of transparency in funding mechanisms, reflecting a sentiment of uncertainty and limited insight into the financial workings of the network. As mentioned by some coordinating body members:

“I’m not familiar with how the network receives funding. That's, I think, not something that we the countries really are familiar with. I mean, in my experience, I've never even thought about that. I just assume that there's support from the partner organizations that are part of the network.” (P2, FGD1)

This notion was also reiterated by another participant:

“Probably I think SPC, for funding, I think I'm similar to the other colleagues. But I think that this is another issue, how much is actually being shared with the countries in terms of the funding arrangements and the resource mobilization arrangements.” (P5, FGD1)

The discussions also revealed a shared sentiment amongst participants about the pressing need for increased funding for the PPHSN and highlighted the risk with the current funding model relying on multiple donors.

“Just I would say that the funding for PPHSN is from multiple donors and multiple modalities. Is it sustainable? It’s one of those challenges we at the SPC have to face to ensure that PPHSN continues to perform at the level that continues to attract development partners and donors to put in funding. So it is, I would say, a high risk - or is risky - for in terms of that it does not have confirmed funding for endless years.” (P10, FGD 2)

Many emphasised the importance of securing additional funding sources to address the evolving and complex landscape of public health challenges in the Pacific region. One participant proposed:

“Are there opportunities or ways to try to create more consistent funding for the network? Whether it’s through partner support, donor country support and/or ways of maybe the network shifting into a paradigm where it also has an endowment or something that could at least provide some consistent funding over the years.” (P2, FGD6)

This sentiment reflects the overarching consensus amongst participants that additional funding is imperative for fortifying the network's capacity to effectively respond to emerging health threats and support the needs of the PICTs.

Flexibility

When asked about the strengths of the PPHSN, some participants reported the flexibility of the PPHSN as a key strength. Flexibility was described by the participants as the ability of the PPHSN to be adaptable to the evolving needs of PICTs and other key stakeholders:

“And I think the flexibility of the network to be able to implement some of these shared objectives by partners and being able to sort of translate the work of the Islands into the frameworks of WHO requirements, or CDC requirements, or SPC if SPC is - SPC tends to be a bit more of just a supportive rather than giving standards.” (P2, FGD6)

The voluntary and non-obligatory nature of reporting was also described by the participant as a measure of flexibility. This voluntariness was viewed by some as a strength, promoting a collaborative and cooperative environment where countries willingly engage in the PPHSN and provide their unique perspectives to forge Pacific wide directions. As highlighted by one participant:

“Something that I think makes this network very special is that it’s a voluntary network. There’s no obligation for countries to report. Although as everybody was mentioning we verify the information, there’s a trust in countries in the agencies that provide support.” (P15, FGD2)

However, when asked about the challenges, contrasting views were voiced by others who sought more structure within the network, expressing concerns that excessive flexibility might impede cohesiveness. Another participant articulated this perspective, stating:

“It’s something to take into account. I was mentioning that it would be good to structure things. Yes, perhaps. But need to think about the fact that this network has been there for quite a while because - probably because it has been flexible enough. And on the other hand, yes SPC has played a key role, and perhaps a role in - the role of SPC, sorry, needs

to be perhaps re-thought. And that comes together with this - how we structure things.”
(P5, FGD6)

Capacity building and staff turnover

Capacity building emerged as a notable strength within the network, with participants acknowledging its pivotal role in enhancing skills and competencies, and strengthening human resources overall, an IHR Core Competency. One participant highlighted:

“Number two is building our capacity in terms of our surveillance. Before, when we started the syndromic surveillance back in 2015, here in X, it was very specific to just syndromic alone. And it was that the sensing of sites was very, very small at the time, because we just establish it, and we wanted to run it, and see if it works, and things like that. And over the years then we started learning more. And our capacity was building because of the connections that we had with PPHSN. And now we’ve expanded our] sites, from smaller sites that we started off with. And now we’re in a bigger picture. And we’re covering the whole of X, not just here in the mainland, but also the outer islands as well.” (P2, FGD4)

However, this strength juxtaposes with the challenge of in-country staff turnover, as individuals, having received training within the PPHSN, sometimes seek and find alternative opportunities:

“I know, for a fact in the ministries, often they would offer a training opportunity for certain staff in an area. And as soon as that person is trained and has the experience, there’s a promotion opportunity somewhere else. There isn’t much to retain this person.”
(P2, FGD5)

This was a key challenge reported by participants, as the investments made in training individuals may not be fully realised if there is high turnover, impacting the continuity of institutional knowledge and potentially impeding the sustained impact of capacity-building efforts within the network:

“I think one of the major things with the PPHSN, it’s the difficulties related to its success. It’s almost like a victim of its own success. Because for many years it’s focused a lot on the people, building the capacity of the people. And as we know - and also looking at the changes evolving the surveillance systems to accommodate new trend, new ways of doing things. But the difficulty is also with the people that are the clients because the countries are continuously changing in terms of the workforce. There are different people. And we are facing that same problem now, where you started something, but you have to keep new people aligned and keeping them in touch to what has historically the purpose of whether it’s a project or program.” (P9, FGD2)

The role of the PPHSN in capacity building was also seen as part of the response to COVID-19. This was particularly the case in the SHIP-DDM reflections, as outlined by one participant:

“But during this time, we were able to start with the outbreak investigation module so that we can give countries some skills on how to respond to COVID-19. And this, I can say that most of our current students were at the forefront in responding to COVID-19 in their respective countries.” (P4, FGD2)

Strategies

Data sharing

Participants described the importance of data sharing amongst Pacific countries:

“We come to a point in time where we need to ask countries to consent and to - and maybe not just in a verbal consent, but also have some sort of agreement in place in terms of data sharing. As you know that more and more, especially of recent will be of the pandemic and other pandemics that have occurred before this one, that countries also are hesitant to share data as well. So, we need to have some sort of understanding - written understanding - about sharing of data. Yes, well at regional level and also internationally.” (P13, FGD2)

The collaborative sharing of data within the region lays the foundation for informed and data-driven decision-making, enabling countries to leverage shared data to inform decision-making processes, allowing for more informed, evidence-based responses to public health challenges.

“Essentially so like when we're looking at all of this data, how is it then translated all the way up to any sort of national level, to create any sort of policies that would also help implement even bigger change and impacts across all of our different territories and countries.” (P4, FGD3)

Data sharing across countries is a powerful tool for shaping effective, region-wide public health initiatives in the Pacific.

Network Maintenance and Updates

Participants reported that a key focus of the network should be ensuring the effectiveness of services through continuous support and updates. One participant mentioned the importance of the weekly PacNet report:

“I just I think that the weekly you know PacNet report that comes out is incredibly helpful. Just overall, the EpiNet and lab networks are helpful.” (P1, FGD3)

Another participant reiterated that maintaining well-functioning services is imperative, noting that:

“On the short term it's really important that we ensure that the current services work well, and are supported, and are also on the same level of functionality. We've seen that some services may have lapse and have gaps, we need to make sure that they are also on par with the rest of the services. Because we fully understand that those services were put there because of the need that were identified by countries, and so we must ensure that those services are provided the necessary support to the countries.” (P13, FGD2)

Furthermore, participants emphasised on the importance of sustaining active engagement. One participant mentioned that:

“Long term, I think we just need to meet more often. I think one of the recommendations that was given, that was voiced in one of the meetings, and other discussions with the network in this year, was to have this forum. It's good to meet virtually, for sure. But it's also good to meet people face-to-face to discuss things, to discuss issues that are related to what's going on in the region and context of every country” (P2, FGD4)

This was also reiterated by another participant:

“My understanding is that these allied members meet only during annual PPHSN meetings that include all countries. So, this kind of role of both the Secretariat, but more generally, the structure and the organisation and project of the PPHSN are only discussed in very, very large fora, and not like workshops with just a number of experts that know the PPHSN and the PPHSN history, strengths and weaknesses. And maybe this could be a first step before reverting and consulting countries – which are also members, for sure. This is not something I deny. But so sometimes the meetings bring together too many people to be very effective in proposing or driving changes.” (P1, FGD7)

Active engagement not only strengthens the network's collaborative fabric but also promotes a culture of shared responsibility and contribution. The ongoing participation of individuals through meetings ensures a continuous exchange of ideas, experiences, and expertise. Issues and recommendations raised by PPHSN members, and the Coordinating Body are presented to the Director of Public Health/Directors of Health for their consideration and endorsement. This engagement, in turn, fortifies the network's ability to address evolving public health challenges in the Pacific region.

Participants also noted the importance of the network to evolve to address the growing challenges brought by the environment and climate change. This includes a greater focus on one health and working together with non-health agencies:

“It would be upon us to expand, to animal, and to keep that one health approach in the future, and not just specific to human disease, but also include other key people, especially from the animal health and the environment as well given that at the moment we have a lot of impact through the climate change. (P3, FGD3)”

“Echoing what participant #3 said. I really think that one health is where we should be heading in. Last year we had a one health workshop here in Palau, is supported in part by some US. Military that was here for Pacific partnership. And it allowed us to, you know, engage with other non-health agencies in the country that are important for those discussions.” (P2, FGD1)

Training

To help with retention of in-country staff, training was another strategy mentioned by participants, with capacity building being viewed as an investment in the next generation of public health professionals within countries, particularly in light of staff turnover challenges:

“Sustainability is always a challenge, especially in the Pacific where we have small populations. And we have difficulties in building capacity and then sometimes keeping that capacity, because there's a brain drain. I mean, people tend to go to places where they can find more opportunities. So having systems in place that are easily accessible, where we can create a – I think we need to be making a constant investment in the next generation.” (P3, FGD7)

Recognising the importance of knowledge transfer, peer-to-peer training emerged as a potential approach. Participants emphasised on the significance of learning from each other, with one participant describing an inter-country peer-to-peer approach:

“I thought of an idea of like intercountry peer to peer learning. You know someone from CNMI helping out Palau. Or vice versa, or Guam, or you know, whoever to assist and training, you know.” (P1, FGD3)

This approach emphasises collaborative knowledge exchange amongst member countries, allowing professionals to learn from the experiences, practices, and successes of their counterparts in the Pacific. In strengthening human resources in the region, meeting an IHR Core competency, the network’s collective capacity to address public health challenges is increased.

Pacific Syndromic Surveillance System data analyses

An analysis of the number of sentinel sites reporting cases into the PSSS was conducted. The analysis included case reports from epiweek 31, 2018- epiweek 34 2023. Aggregate data from the PSSS was provided by the WHO Division of Pacific Technical Support. The dataset contained limited data fields, was incomplete and inconsistent and therefore a robust analysis of timeliness could not be undertaken. Data on the number of sentinel sites in each PICT was not available. For the purposes of this analysis, data on numbers of sentinel sites was used from that provided by SPC from a few years ago and was seemingly outdated.

At a regional level, it is critical that the PSSS maintains accurate datasets to monitor timeliness and completeness of reporting as well as high quality data to support PICTs in achieving their surveillance goals and meeting targets.

We estimated that for epiweek 31, 2018 – epiweek 34, 2023, 20 PICTs reported at least once. Two (Nauru and PNG) submitted zero reports. During the same period, Guam submitted two weekly reports (epiweek 31 of 2018 and epiweek 34 of 2022). PICTs with >80% of sites reporting to PSSS included Cook Islands, and RMI with proportions of sites reporting ranging from 80% to 100% in epiweeks 10, 20, and 30 from 2019 to 2022. Niue, Samoa, and Wallis & Futuna also had proportions of sites reporting to the PSSS, but some had missing data. While these results should be interpreted with caution, and likely do not represent the real on the ground situation, it nonetheless highlights the variability and poor quality of the data.

Tables 19 - 22 present data on proportion of sites reporting for epiweeks 10, 20, 30, 32 from 2018 to 2022 using the data variable on “Number of sites that reported”. The numbers of sentinel sites per 10,000 of the population varied across PICTs. Numbers of sentinel sites reported varied in comparison to those reported by the survey respondents highlighting the need for central repositories and standardised protocols and procedures for each PICT.

Using the data provided, we also examined if there were any apparent impact on reporting of syndromes across PICTs during the COVID19 pandemic. Specifically, we looked at trends of diarrhoeal disease (acute watery diarrhoea) (Figure 4) and influenza-like illness (Figure 5). The total number of cases reported suggests that reporting for non-COVID-19 like syndromes did not completely cease during the pandemic, but it also highlights the limited ability to interpret data using count data. The gradual increase in reporting is likely a greater reflection of the increased number of cases due to population growth as opposed to “outbreaks” – and calls for reviews in how and what data is collected and reported in the PSSS.

Figure 4: Reported cases of diarrhoeal syndromes (acute watery diarrhoea) in Pacific Island Countries and Territories, Aug 2018 – Aug 2023

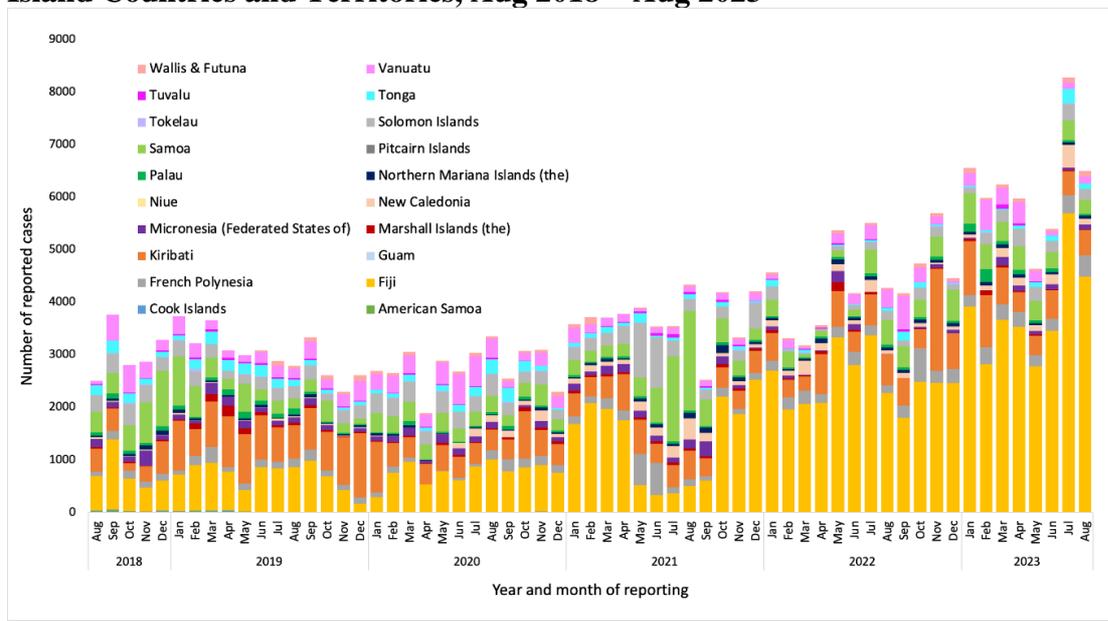
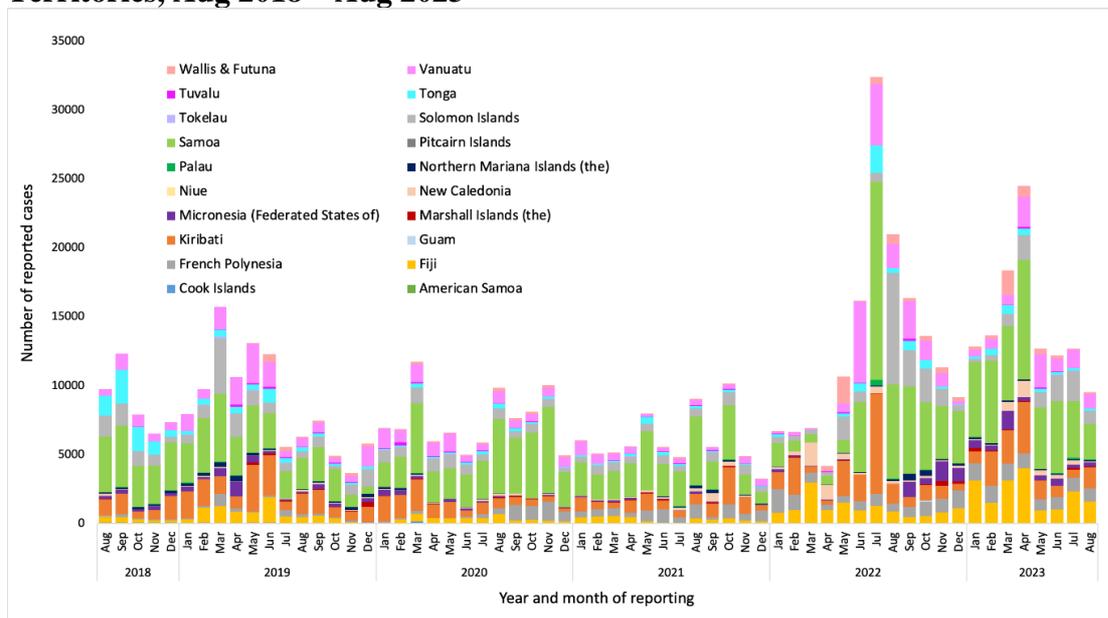


Figure 5: Reported cases of influenza-like illnesses in Pacific Island Countries and Territories, Aug 2018 – Aug 2023



LabNet data analyses

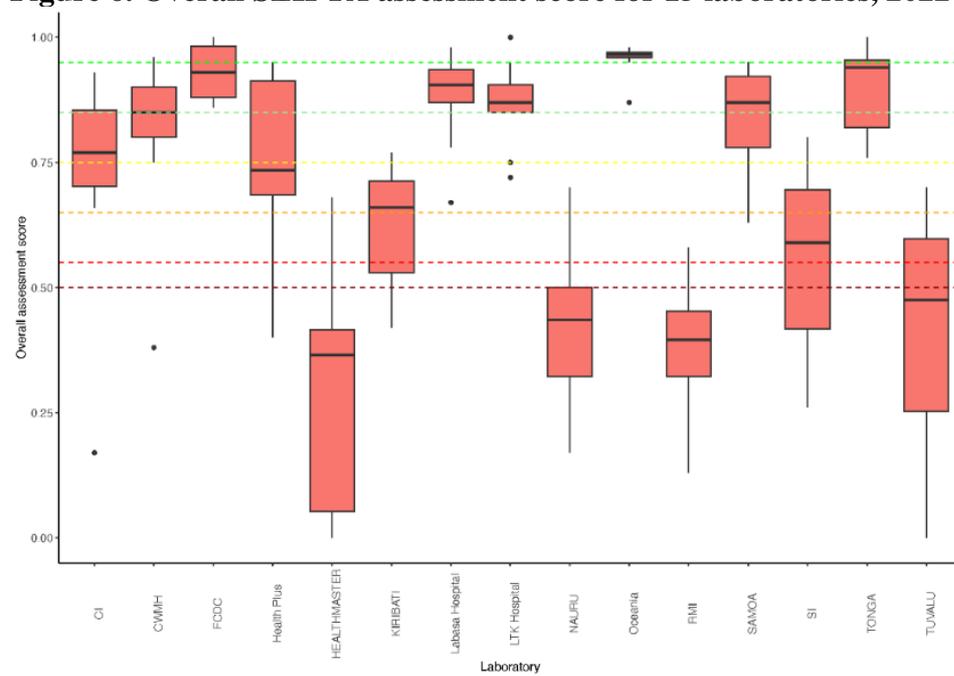
PICT laboratories within LabNet are in various stages of implementing quality management systems, most commonly utilising SLIPTA. Ongoing training in quality management is also being undertaken largely using a WHO developed Laboratory Quality Management System Training Toolkit. The implementation of LQMS and demonstrating continuous improvements in quality management is of key importance to individual laboratories, LabNet, and PPHSN.

SLIPTA assessment results for each of the key LQMS components for 15 laboratories in 2022-2023 were reviewed. Sixty percent (9/15) of laboratories had an overall rating of 3-stars or

greater with only four laboratories that did not pass the SLIPTA assessment (Figure 6). This result highlights laboratories that could be targeted by LabNet to provide additional LQMS support. When scoring for each of the key competencies was assessed it demonstrated that the laboratories internal audit and management review processes had the lowest median scores, therefore LabNet could target additional support in these areas (Figure 7). Additionally, customer service and occurrence management had the largest interquartile range of SLIPTA assessment scores, indicating that some laboratories need additional assistance in improving these quality parameters.

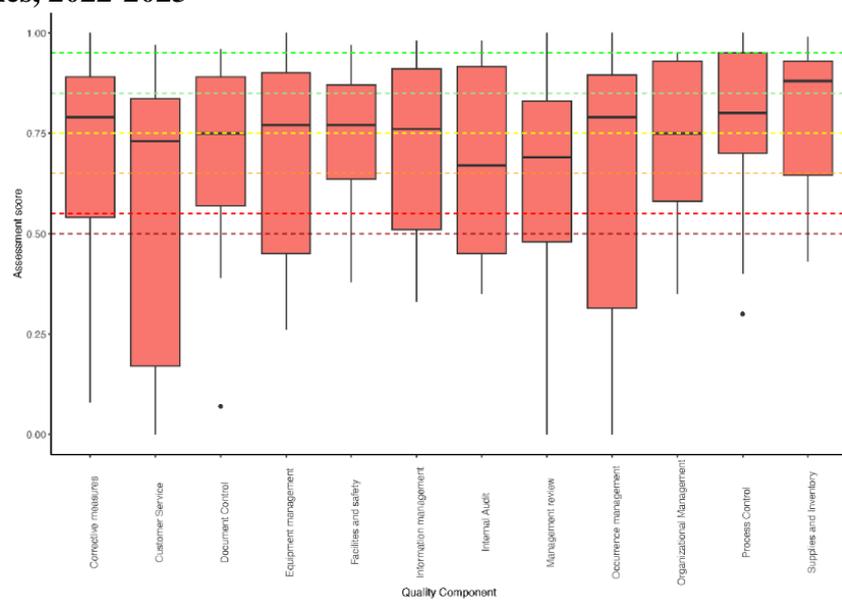
LQMS assessment data was referred from multiple streams and was inconsistent in terms of assessment intervals in individual laboratories and between LabNet members. In addition, the LQMS assessment type also varied across time and between different laboratories. Although the LQMS data collected is inconsistent, LQMS scores are a key performance indicator as it quantifies if laboratories are maintaining and improving accuracy, timeliness and reliability of test results. Improvement in overall LQMS assessment is seen in 6 of 9 Laboratories between 2010 – 2022, demonstrating the networks commitment to increasing laboratory capacity (Figure 8). However, LQMS data is only consistently available for 9 of 22 laboratories within LabNet and the consistent collection and monitoring of LQMS data could provide strategies in efficient and targeted training and infrastructure deployment to LabNet laboratories struggling to develop and maintain the reliability, accuracy and timeliness of test results.

Figure 6. Overall SLIPTA assessment score for 15 laboratories, 2022-2023 *



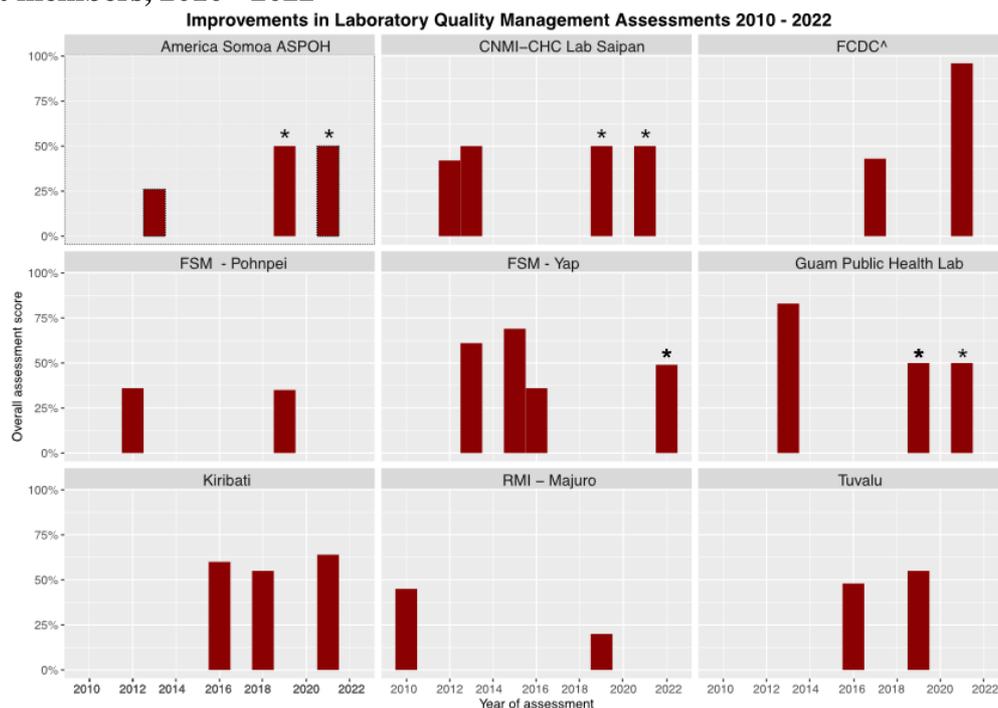
*The overall laboratory SLIPTA assessment scores 2022-2023 for 15 different laboratories in LabNet. Green dashed lines indicate minimum overall score to obtain 5-star rating, light green dashed lines indicate the minimum to obtain a 4-star rating, yellow dashed lines indicate the minimum score to obtain a 3-star scoring rating, orange dashed lines indicate the minimum score to obtain a 2-star rating, red dashed lines indicate the minimum score to obtain a 1-star scoring rating and dark red lines indicate a below standard score.

Figure 7. Overall SLIPTA assessment for key components of the quality framework for 15 laboratories, 2022-2023**



** Presents scores of the 12 key components of the SLIPTA quality assessment framework these scores were available for 15 different members of LabNet in 2022-2023. Green dashed lines indicate minimum overall score to obtain 5-star rating, light green dashed lines indicate the minimum to obtain a 4-star rating, yellow dashed lines indicate the minimum score to obtain a 3-star scoring rating, orange dashed lines indicate the minimum score to obtain a 2-star rating, red dashed lines indicate the minimum score to obtain a 1-star scoring rating and dark red lines indicate a below standard score.

Figure 8. Improvements in Laboratory Quality Management Assessments from nine LabNet members, 2010 - 2022 ***



***Overall LQMS assessment scores for nine LabNet laboratories collected from 2010 to 2022. Although LQMS assessment types have varied both across laboratories and years of assessment. Improvement in overall LQMS assessment is seen in 6 of 9 Laboratories between 2010 – 2022. FCDC used the WHO LQMS assessment tool in both 2017 and 2021, whereas many laboratories used the SLIPTA assessment tool for assessment conducted after 2019. Asterisks (*) above bars indicate when data was recorded as “pass” in these instances the result was recorded in the graph as 50%.

Discussion

In this review of the PPHSN, we present findings from a mixed-method study to assess governance, performance and perceived acceptability and usefulness of the PPHSN to support surveillance and response activities in the Pacific region. The findings present implications for future activities of the PPHSN. Throughout the discussion, we compare the three domains of early warning surveillance, laboratory referral systems and infection, prevention and control from the WHO Joint External Evaluation (JEE) tool and International Health Regulations (2005) (29).

Governance of PPHSN

Overall, from the focus group discussions and survey, participants felt that the PPHSN was effective at implementing the core strategies of developing surveillance systems, dissemination of information, training in applied epidemiology and surveillance and extending communication network to other networks and partners. Through implementation of these strategies, the PPHSN continues to support the development of key IHR2005 core capacities to support health security strengthening in the region.

The Coordinating Body was identified through the desktop review as central to steering PPHSN activities and objectives. The Coordinating Body develops and executes action plans for the PPHSN, and monitors and evaluates these activities, as well as communicating the status to members and external entities. SPC, as the Coordinating Body Focal Point, provided secretariat function including providing administrative assistance and maintaining the PPHSN website. The main governance structure of the Coordinating Body is also supported by advisory bodies within each of the PPHSN service arms to provide guidance and oversight on key activities.

The desktop review revealed an attempt in creating a cohesive and inclusive network that covers large geographical and cultural areas, by ensuring Coordinating Body members had geographical and linguistic representation via a staggered rotation of membership. However, geographical segregation among the network, particularly between US-Affiliated Pacific Islands and countries in the South Pacific was raised as an issue in the focus group discussions. The regional isolation had impacted on the frequency and depth of information exchange, insufficient information and data sharing, and differences in capacities. This isolation must be recognised and acknowledged and must be reflected in strategic planning and documentation.

Whilst the flexible nature of the network was noted as a positive in some focus group interviews, findings from all three data collection tools revealed a lack of clear and well-defined structure within PPHSN. The voluntary and non-obligatory nature of reporting for surveillance data (through PSSS and LabNet), though a measure of flexibility, raised concerns about potential for variations in commitment levels among participating entities.

Increasing the number of in-person meetings was raised as a strategy that may help to facilitate better engagement, discussions and streamlining of responsibilities. Clarity around responsibilities and reporting particularly between SPC and WHO and other permanent Coordinating Body members (e.g. PIHOA and FNU) was considered crucial for enhancing governance and reducing redundant efforts amongst in-country network members already stretched thin. The lack of clarity can impact the network's overall effectiveness in responding to public health challenges, emphasising the need for a more structured framework to ensure cohesion and coordination. This was also evident in the analyses of the PSSS and LabNet data which revealed inadequate reporting on key performance indicators, challenges in accessing

surveillance data for review, and inconsistencies in shared databases. These findings emphasise the need for clear and updated terms of reference for each service network. As demonstrated by the desktop review, despite the existence of terms of references, many were outdated or failed to accurately reflect current roles and responsibilities, with few exceptions like PICNet, which were updated more recently. For a coordinating network like the PPHSN, it is imperative that terms of reference reflect the contemporary roles, responsibilities, and obligations of individual members and PICTs to the network.

Discussions in focus groups, particularly amongst the permanent Coordinating Body members, highlighted the critical issue of sustainable funding for the PPHSN. The reliance on multiple donors within the current funding model raised concerns. Notably, project-based funding from various donors across SPC, WHO, and PIHOA (Appendix 3) was evident, reflecting a tendency to finance PPHSN activities as projects rather than core services. Participants also indicated a lack of knowledge and clarity regarding funding mechanisms, emphasising the necessity for enhanced transparency with external stakeholders. This transparency is crucial for effective monitoring, evaluation, and allocation of resources. Moreover, this lack of transparency surrounding funding hampers the Coordinating Body and other partners' ability to advocate for and secure funding for the PPHSN, a key responsibility of the Coordinating Body. Ensuring the network's effectiveness and sustainability necessitates a shift towards a more robust, longer-term, and transparent funding structure, a priority for the Coordinating Body.

Communication

The function of PacNet and the broader PPHSN in facilitating information sharing emerges as a distinct strength and agreed-upon role within the network. PPHSN plays a pivotal role in supporting and establishing communication channels for the dissemination of information and initiatives, fostering rapid sharing and transmission of health-related data. This exemplifies PPHSN's commitment to fostering interconnectedness and a more coordinated approach in addressing public health challenges in the Pacific. The development of PacNet aligns with the PPHSN development strategy, extending the electronic communication network to new partners.

However, despite PacNet and the PPHSN's strengths in information sharing, there were some notable challenges. Language barriers for e.g. between English and French speaking members, were raised in the focus groups, highlighting the importance of contextualising PPHSN materials. Further, the survey identified that a diverse range of communication tools were used for sharing of information and data, including the use of social media, creating a mixed landscape with no standardised reporting procedures. Notably, whilst most respondents of the survey received PacNet alerts, dissatisfaction with the current email-based format was noted. While listservs and emails were seen somewhat effective, their relevance was questioned. There was a repeated desire by participants to modernise communication methods and suggestions included the use of social media platforms (Facebook, WhatsApp etc), real-time visualisation dashboards, or even a dedicated application as alternative methods. However, ensuring information and data provided is from a secure and reputable source is an important consideration in the use of multiple communication tools.

Disease surveillance

The PPHSN, particularly through partners investment in the PSSS, has played a crucial role in improving early warning disease surveillance across the Pacific. This support has facilitated the implementation of a standardised system to track diseases and syndromes that are indicative of outbreaks and has led to the establishment of a dedicated position for surveillance officers

at national and sub-national levels and surveillance units in each PICT. While initially established to support the IHR core capacity on early warning surveillance function (JEE indicator D2.1), there were limited efforts to review its currency and performance in the context of advancements in the Pacific across laboratory capacity, digital innovations, increasing number of pathogens under surveillance, and enhanced workforce (29).

Pragmatically, the PSSS was designed to be as simple as possible to allow PICTs with little limited infrastructure or experience in to conduct routine surveillance to participate and establish and maintain national surveillance mechanisms. This inclusive approach to health system development was considered appropriate in previous reviews of the PSSS and was acknowledged as fundamental to the development of surveillance infrastructure across the islands. However, despite advancements in surveillance knowledge and capacity over the past two decades, the PSSS model has remained largely unchanged, with known limitations. While no formal analyses of its performance was conducted as part of this review, modeling suggests it is not effectively meeting its outbreak detection objectives (30) and hence not suitable – if applied as a stand-alone or heavily relied upon - early warning outbreak surveillance strategy.

Interviewees highlighted the need for a comprehensive review of the structure and performance of the PSSS, and the framing of it within a broader set of outbreak surveillance strategies. Further, they suggested utilising emerging data interpretation tools to enhance intelligence generation for public health decision-making and use new technologies, such as multi-pathogen serosurveillance and remote sensing, to improve efficiency and coverage, and overcome logistical challenges. There was also encouragement for greater emphasis on event-based surveillance methods alongside indicator-based approaches and fostering closer collaboration between surveillance and response functions of government to ensure timely investigation and action in response to surveillance signals.

Regarding the status of the PSSS, the review identified inconsistencies in reporting practices resulting in incomplete and somewhat unstable data on which signals rely. There were suggestions that case definitions are inconsistently applied and that the growth in number of similar definitions (e.g., dengue-like illness and zika-like illness) likely led to misclassification. This, compounded with small baseline numbers, poses challenges for reliable analysis and intelligence generation. Focus group participants advocated for addressing these issues through transparent dialogue grounded in evidence. This could involve establishing a dedicated working group, organising a themed session at an upcoming PPHSN meeting, or tapping into expertise within and around the Pacific region.

The PSSS has a close tie with PacNet and SHIP-DDM service arms of the PPHSN in that results of data analyses are shared across PICTs via PacNet and the epidemiological skills on which analysts draw are often the result of SHIP-DDM training. There was a call that these three arms be more obviously linked with strategies to develop capacity considering the benefits across the services. This, of course, may be extended to consider the role of LabNet in the development of the capacity to diagnose infectious diseases.

Concerns were also raised about the timeliness of event reporting with several interviewees noting that they often learnt of outbreaks through means other than PacNet. Given that timely reporting of data is very important for outbreaks (30) this prompted suggestions that epidemiology workforce development initiatives emphasise and support swifter National MOH reporting of regionally significant public health events and, hence, less of a reliance on SPC and WHO-led analysis. Reflecting on these points raised during interviews, the authors' note that recent research found that, regarding arboviral disease outbreaks, PacNet outperformed other global ID/outbreak notification systems including *WHO's Disease Outbreak News and*

ProMed Mail, in terms of timeliness and completeness of reporting events affecting in the islands(31).

Laboratory systems

The review findings indicate that PPHSN contributes to supporting lab referral systems, aligning with IHR (criteria (JEE D1.1). However, survey results highlighted issues with laboratory result turnaround times, averaging 3-4 weeks in some PICTs, hindering timely responses to public health threats in the Pacific region. Although referral pathways exist for some priority pathogens in LabNet, the lack of standardised procedures and data on referral times posed challenges. Addressing these issues, including capacity building for laboratories, particularly in information management and supply, can enhance PPHSN's role in meeting IHR core capacities for improved referral pathways. The contribution of PPHSN in supporting the development and establishment of quality laboratory systems, especially in recent years, was notable and emerged as a key strength. Activities used to conform quality standards also aligned closely with criteria “Laboratory quality system” of the IHR (D1.2). However, infrastructure challenges within the PPHSN are underscored by survey findings that only 40% of respondents reported having an electronic LIMS in place, with only two participants indicating that their LIMS reported into the PPHSN. The establishment of electronic laboratory reporting systems with an emphasis of enabling electronic notification to other PPHSN surveillance databases would significantly improve the timeliness, result quality and inter-connectedness of PPHSN. This fragmentation was echoed in LQMS data analysis where assessment metrics are only sporadically available for 9 out of 22 laboratories. Collation and yearly review of LQMS data by LabNet would enable targeted support to LabNet members requiring additional support to improve overall and specific laboratory quality issues. Infrastructure issues extend beyond data management, as outdated or inadequate laboratory infrastructure poses a significant obstacle to efficient and accurate testing, particularly during critical situations, as the desktop review revealed. The importance of proper laboratory capacity was recognised through training personnel and investing in more laboratory equipment in some Pacific Island countries since the pandemic (32–34). It is evident that more work and support is still needed in supporting laboratory systems in the Pacific.

Infection prevention and control

In contrast, to other services, PICNet recently renewed its commitment to infection prevention and control (IPC) efforts, notably establishing a dedicated Focal Point since 2020. (IHR core capacity of Infection Prevention and Control (JEE indicator R4.1-4.3) (29). National IPC programmes (JEE Indicator R4.1) were supported by several activities such as the development, dissemination, and contextual adaptation of the PPHSN IPC Guidelines, re-establishment of the PICNet steering committee with updated terms of reference, assisting in the creation of national IPC workplans, and IPC staff capacity building (29). These efforts have yielded tangible improvements in IPC practices and policies, particularly in program effectiveness, hand hygiene compliance, and surveillance mechanisms. Supporting PICTs to establish and strengthen hospital-acquired infection surveillance (JEE indicator R4.2) has been facilitated through establishing regional definitions and methodologies for sentinel surgical site infections, bloodstream infection, and hand hygiene (29). Coupled with this, is the capacity development of IPC staff within the region to engage in surveillance activities and contribute to patient safety and quality improvement strategies. The focus on building IPC capacity and programmatic activities all is pivotal for fostering a safer environment in health facilities (JEE indicator R4.3) (29). The PPHSN IPC guidelines are key in this endeavour, providing adaptable guidance to Member States to meet the WHO Minimum Requirements for IPC Programme.

Health workforce

Capacity building, notably facilitated through the PPHSN, emerged as a pivotal strength. This encompassed skill enhancement and competency-based training, primarily via the SHIP-DDM program but also through other services such as LabNet and PICNet. Given the shortage of proficient public health personnel across the PICTs, the PPHSN's role in bolstering and empowering this workforce for readiness and response efforts was highlighted. However, the subpar response rates from various PICTs to the SHIP-DDM survey segment indicated either a lack of engagement in several member states or invitations to participate not reaching the past graduates. The latter was might have been influenced by the absence of a comprehensive list of graduates and their contact details from the PPHSN Focal Point. Whilst overall satisfaction was expressed, identified areas for enhancement included consistent and more frequent training, sustained mentoring, ongoing professional development, establishment of alumni networks, and initiatives to retain trained healthcare personnel within the PICTs.

Recruiting and retaining skilled personnel in PICTs poses a significant challenge for the effective operation of PPHSN and for preparedness and response activities in the Pacific region. This concern, highlighted in the survey, focus groups, and desktop review, emphasised the network's recognition of the need to enhance career advancement opportunities in a tiered approach. Whilst this strengthens professional development, the challenge lies in effectively integrating trained personnel into health services and utilising their enhanced skills, particularly for SHIP-DDM graduates. The critical issue of retaining skilled personnel, amidst potential attrition to other ministries, persists despite efforts to enhance skills and career progression. Without systemic changes, individuals trained within the PPHSN may seek alternative opportunities, jeopardising institutional knowledge continuity and hindering sustained capacity-building impact. Whilst the responsibility for health workforce resourcing lies beyond the PPHSN's sole purview, the network and the Coordinating Body play a crucial role in advocating for the retention of skilled personnel via the Heads of Health forum. Implementing sustained training initiatives and establishing clearer career pathways are crucial steps to alleviate this systemic challenge. This report, alongside previous publications by the review team's authors (35,36) and the 2023 Heads of Health recommendations, highlights the timely imperative to comprehensively review the public health workforce in the PICTs.

Strengths and limitations

This review of the PPHSN provides much needed evidence and data on the effectiveness of the network in meeting its aims and objectives and areas for improvement to guide the development of a new strategic plan. Key strengths include the use of a mixed methods approach (desktop review, surveys, focus groups and data analyses of routinely collected data) to triangulate and provide a comprehensive view of the current state of the PPHSN. Grouping participants in focus groups based on peer relationships facilitated open dialogue and minimised hierarchical barriers, enhancing the richness of the data obtained. This approach allowed for the capture of diverse viewpoints and contributed to the robustness of our findings. The review design and implementation were also guided by a Pacific-based technical advisory group who were able to provide critical input into the context and nuances for the results. Throughout the results, we were able to engage 22 PICTs along with allied partners who have worked closely with the PPHSN. Whilst a small number, it represents a significant proportion of the network workforce engaged in the operations of PPHSN.

There were also some limitations. For some sections of the survey, we only received a small number of responses. There was inconsistency in responses provided by members within the same PICT for some questions making it difficult to interpret the data. For example, the number

of sentinel sites in each PICT or mode of reporting used was unable to be determined. Most respondents for the online survey were captured from national level PPHSN members, this could introduce bias into the data as perspectives of other stakeholders may not be represented. However, by triangulating the data with the desktop review and focus group discussions the report covers perspectives from the Coordinating Body, core and allied members limiting the impact of measurement bias. We used focus groups over key informant interviews; some participants' opinions may be biased or incomplete due to the presence of other members in the discussion. However, participants were grouped among their peers to limit hierarchical differences that may impede on the comfort of participants to voice their opinions. Focus groups also offered the advantage of allowing and enabling "piggy backing" from the respondents. Focus groups also enabled capture of opinions from a larger number of stakeholders that would not have been feasible through key informant interviews. Further, as the focus groups were conducted in English, only English-speaking French territory representatives were identified as stakeholders that are eligible to participate. For SHIP-DDM, we were unable to obtain a comprehensive picture as data on the numbers of graduates to date, and updated contact lists, were not available. This is information that will be important for future planning of the programme. For both PSSS (maintained by the WHO) and LabNet (maintained by SPC), complete databases were not made available to the review team, and while data may not accurately represent the situation at the country-level, it highlights issues in data records maintained by the PPHSN permanent members.

Despite these limitations, the report offers crucial contemporary evidence on the PPHSN from key stakeholders, encompassing all 22 PICTs. This evidence will prove invaluable in shaping the development of a new vision and a 5-year strategic framework for the network.

Conclusions

The review found that the PPHSN has been critical for communication and coordination of surveillance and outbreak response activities across the PICTs. Many of its activities aligned with supporting PICTs achieve the International Health Regulations (IHR) 2005 core capacities of detect, assess, notify, and report events, and respond to public health risks and emergencies. However, there were some persistent challenges with the governance and funding structures which would require strategic planning in the next phase. Many of the individual service arms achieved their objectives but were unable to meet their full potential or the needs of the region to maintain relevance in the future. An in-depth evaluation of the individual service arms could improve the understanding of the enablers and bottlenecks to effective service implementation. The issues of the public health and emergency response workforce continue to be one of the major challenges in the PICTs that requires innovative approaches. Each service arm raised the issues capacity, capability, and ongoing professional development to prevent attrition from Ministries of Health to other organisations and clear career pathways.

Recommendations

Here we propose some activities based on the findings from the 2023 PPHSN review to support its future direction and five-year strategy.

- The PPHSN governance should be revised by the Coordinating Body to reflect its current role and functions. This should include revising the terms of reference, roles

and responsibilities for the Coordinating Body, Focal Point, permanent members, core and allied members and each of the service arms. Governance review may also consider how to promote active participation and accountability amongst members. A specific focus should also be placed on ensuring there is a strong mechanism to attract ongoing, stable funding for the PPHSN and that all operations are managed with transparency.

- As part of the development of the PPHSN's next five-year strategy, there should be greater alignment between the PPHSN's core objectives and implementation of the new International Instrument on Pandemic Prevention, Preparedness and Response, the Asia Pacific Health Security Action Framework, and other relevant frameworks.
- The network should consider a focus on One Health in the design of its new strategy. The collaboration between existing human, animal and environmental networks would help to address the complex health challenges facing the region. There are many ways to explore this including the use of WHO's collaborative surveillance framework, cross-disciplinary meetings and building principles of One Health into training programs such as the SHIP-DDM.
- An indicator-based performance monitoring framework is recommended to foster improvement in the quality and performance of the PPHSN and the six service arms. The framework should collect baseline data and set achievable, time-bound performance targets with reference to the baseline.
- The Coordinating Body should establish a coordinated mechanism to provide technical support and assistance to PICTs. SPC has a clear and central role in this, and the impact would be greater if efforts of donors and partners were coordinated to avoid duplication and ensure resources are maximised. It will be critical to ensure all technical working groups across the services and partners are brought together with equal opportunity to promote cohesiveness and prevent fragmentation and siloed delivery of services.
- The PPHSN-Coordinating Body should consider an in-depth evaluation of the service arms. This evaluation should:
 - Consider how best to increase the impact of PacNet in providing a communication and coordination mechanism in the region, with a greater focus on real-time relay of information. Some strategies could include the use of visualisation dashboards on the PPHSN website, the creation of online communities of practice or forums using social media platforms like Discord or Yammer.
 - Provide advice on the suite of feasible surveillance strategies that ought to be in place to meet outbreak detection needs. As part of this, the syndromes under surveillance, reporting mechanisms and methods for signal generation should be reviewed. Furthermore, there is a clear need for multi-source surveillance in the PICTs and for collaborative surveillance more broadly to address the issues of coordination, resource management and decision-making. There is a need to link organisations across different sectors and teams within organisations to bring together data from various types of surveillance (case-based, syndromic, laboratory and genomic) and for different vaccine-preventable diseases, and specialised surveillance programmes such as malaria, tuberculosis. Use of collaborative surveillance approaches is likely to enhance data sharing, resources and expertise and therefore enable faster and more effective public health response.
 - Provide advice to PICNet on a comprehensive mechanism for end-to-end surveillance for infection prevention and control throughout the region. This includes the development of guidelines, implementation at the health facility level

a systematic approach to collecting, analysing, and reporting of hospital-acquired infections and finally closing the feedback loop with the focal points in each PICT.

- Establish a list of priority diseases and clear protocols for surveillance through LabNet beyond diagnostics and training. While both diagnoses and training of staff are critical, effective laboratory surveillance is critical for timely detection and public health response. Considering the advancements made during COVID-19 in the region, this should be prioritised. Consider the establishment of interoperable LIMS in all PICTs.
- Consider and review the SHIP-DDM programme to examine how best to ensure its relevance in the region, especially with the emergence of other field epidemiology training programs. Some of these include the potential for online training and building operational research capacity in the PICTs which would ultimately provide local data and actional evidence to improve policies and practices in PICTs.
- Consider ongoing professional development and systematic training of EpiNet teams, for example through simulation exercises to ensure response teams are maintaining their skills and agility to respond in a timely manner.

Considerations for PPHSN 5-year Strategic Plan

Focus area	Short term (up to 2 years)	Medium-long term (3-5 years)
PPHSN governance and coordination	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should review aims and objectives of the PPHSN and service arms. • The PPHSN-Coordinating Body should update terms of reference for the coordinating body and each service arm in line with the above. Through this they should examine if the current governance structure of the coordinating body is relevant. • The PPHSN-Coordinating Body should articulate roles and responsibilities of each member/ stakeholder in line with the above. • The PPHSN-Coordinating Body should identify key priorities for the next PPHSN strategic plan. • The PPHSN-Coordinating Body should develop a monitoring, evaluation and learning framework to review the performance of PPHSN and its service arms to monitor progress on a regular basis (could be developed as part of the new strategic plan). Some proposed indicators that can be considered are provided in the next section by the review team. 	<ul style="list-style-type: none"> • The PPHSN-Focal Point should develop a transparent process for allocation of funds for PPHSN related activities. • The PPHSN-Coordinating Body should identify opportunities to align PPHSN activities with global and regional health security and one health frameworks for e.g. through establishment of collaborative disease surveillance, meetings, and training. • The PPHSN-Coordinating Body should identify areas/gaps within each of the service arms which could be supported/ addressed through operational research by smaller technical working groups. • PPHSN permanent allied members should encourage and provide technical support to each PICT to undertake in-depth evaluations of each service arm (e.g. PSSS, LabNet) to assess performance and identify gaps or challenges for future improvement. • The PPHSN-Coordinating Body should consider how best to ensure ongoing professional development for its members.
PacNet	<ul style="list-style-type: none"> • The PPHSN-Focal Point should consider the use of visualisation platforms and social media platforms for timely communication between PICTs. 	<ul style="list-style-type: none"> • The PPHSN-Focal Point should review existing approaches for communication within the region and

		<p>identify the best approaches in relation to coordination and dissemination of PPHSN data and information.</p> <ul style="list-style-type: none"> • The PPHSN-Focal Point should review PacNet in relation to the types of information shared to ensure the service remains fit-for-purpose for dissemination of public health surveillance data and information across PICTs and the broader network.
PSSS	<ul style="list-style-type: none"> • The PPHSN- Focal Point should review processes and databases used for monitoring PSSS at a regional level. • The PPHSN-Coordinating Body should review the usefulness of PSSS and examine how it can be used for integrated and multi-source surveillance systems for epidemic preparedness. • The PPHSN-Coordinating Body should establish guidelines and collect completeness and timeliness indicators across the network. 	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should review if PSSS is the best system for epidemic response considering the growing needs and expanded capacity in the PICTs (for e.g. laboratory capacity, infection prevention and control. • The PPHSN-Coordinating Body should consider the role for more collaborative (including disease integration e.g. VPD and NTD surveillance) surveillance in the PICTs to maximise the limited resources and workforce.
LabNet	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should clearly define a set of outbreak prone diseases to enable uniform laboratory test development across each PICT. • The PPHSN-Coordinating Body should develop and implement guidelines to collect and analyse LQMS assessments across the network. • The PPHSN- Coordinating Body should establish guidelines and collect timeliness indicators across the 	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should conduct a needs-based assessment based on individual laboratories LQMS scoring to target training and laboratory development provided by PPHSN. • PPHSN should consider the implementation of digital laboratory information management systems throughout the network with pathways for electronic reporting into other PPHSN service arms. • To mitigate the increasing risk of zoonotic transmission due to climate change, the PPHSN-Coordinating Body

	<p>network, specifically to capture referral turnaround times for priority pathogens.</p>	<p>should consider establishment of rapid and sustainable methods of communication between animal and human health systems, particularly LabNet and Pacific Animal Health Laboratory network (PAHLNet).</p> <ul style="list-style-type: none"> • The PPHSN-Coordinating Body should establish guidelines on resource maintenance to ensure critical laboratory infrastructure is maintained, replaced and updated.
PICNet	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should support the implementation of the 2021 infection prevention and control guidelines at health facility level in all PICTs 	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should consider comprehensive mechanism for end-to-end surveillance for infection prevention and control in each PICT. • The PPHSN-Coordinating Body should consider how best to conduct surveillance for healthcare associated infections and its potential integration with epidemic disease surveillance (see section under PSSS).
EpiNet	<ul style="list-style-type: none"> • The PPHSN- Focal Point should develop an agile repository of team members within EpiNet. This is particularly important due to movement of staff from ministries of health internally as well as to technical partners in the region. 	<ul style="list-style-type: none"> • The PPHSN- Coordinating Body should continue to provide regular simulation-based exercise to EpiNet teams. • The PPHSN-Coordinating Body should consider the role of deployable EpiNet teams within the PICTs to enhance local surge capacity. • The PPHSN-Coordinating Body should consider ongoing professional development and systematic training of EpiNet teams

SHIP-DDM	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should develop a complete database of graduates and their contact details 	<ul style="list-style-type: none"> • The PPHSN-Coordinating Body should review how to ensure field epidemiology training provided through SHIP-DDM is relevant for PICTs. • The PPHSN-Coordinating Body should consider the role of online and remote learning for their graduates.
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Suggested Indicators

Suggested indicators that can be used as part of monitoring and evaluation efforts. These indicators are suggestions only but should be co-designed and agreed upon by the Coordinating Body in terms of relevance and feasibility.

PPHSN Governance

- [governance and strategy; stewardship] Publication of a reviews strategic plan that lays out the aims and objectives of the network, and the theory of change to achieve them. When: by Dec 2025.
- [governance and strategy; stewardship] As an appendix to the strategic plan, develop a comprehensive time-bound indicator-based MEL framework to help tracking and reporting of PPHSN's impact over time. When: By Dec 2025.
- [quality assurance] A formal review of the PSSS (and more broadly, an optimal mix of early warning outbreak surveillance strategies) be conducted by Dec 2026. When: By Dec 2026.
- [transparency; data; info sharing] The PPHSN website incorporate (or link to) regional dashboards that provide data on the progress in PPHSN priority areas. When: By Dec 2028.
- [quality assurance] Opportunities to link DDM with TEPHIN programs be explored. When: By December 2028.

PacNet

- [use; timeliness] $\geq 80\%$ of significant outbreaks identified in the Pacific are reported on PacNet within 5 days of their detection (or confirmation). When: By Dec 2026.
- [use; coverage] At least two users from $\geq 80\%$ of PICTs access PacNet posts monthly. When: By Dec 2027.
- [use] On average, the number of new topics (threads) 'discussed' on PacNet increases by $\geq 10\%$ per year from 2025-2030. When: By Dec 2030.

PSSS

- [timeliness] $\Rightarrow 80\%$ of PICTs report data are reporting surveillance data from ALL sentinel sites ALL weeks. When: By Dec 2025.
- [coverage] Over a 5-year timeframe, the number of sentinel sites reporting data to each PICT SSS increase by 25%. When: 2025-2030.
- [data quality] Formal evaluation of PSSS data quality be conducted in at $\Rightarrow 25\%$ of PICTs by Dec 2026, $\Rightarrow 50\%$ by Dec 2027, and 100% by Dec 2029. When: By 2029.
- [integration] Integrated surveillance is routinely practiced as part of outbreak intelligence generation in $\Rightarrow 25\%$ of PICTS by Dec 2029. When: By December 2029.
- [integration; diversification] Event-based surveillance mechanisms are operational in 50% of PICTs by Dec 2027. When: by Dec 2027.

LabNet

- [Define priority diseases and guidelines for testing]: develop and implement testing in 50% of PICTs by Dec 2028 and 75% by Dec 2030.
- Molecular method used as a routine part of ID tracking and/or diagnostics in X% of PICTs by Dec 2028 and x% by 2030. When: By Dec 2030.
- [LQMS] Yearly collation of LQMS data from 50% of LabNet members by Dec 2026, 75% by Dec 2028. Transparent needs-based assessment of LQMS completed by Dec 2027 to target laboratory training by 2028.

PICNet

- [IPC Workforce] 75% of all designated IPC focal points in the region have completed the Foundations of IPC course via ACIPC by end 2027.
- 75% of all designated IPC focal points are credentialled with ACIPC at least at a Primary level by end 2028.
- 100% of health curricula across the region have IPC core content embedded in programs of study by end 2027.
- [Communication] Regional dashboard is established for the benchmarking of surveillance data for hand hygiene, surgical site infections, healthcare associated blood stream infections, and multi-resistant organisms by end 2022.
- 100% of member states have an IPC workplan with key performance indicators by end 2025.
- 100% of all national IPC workplans include at least one healthcare associated infection surveillance priority by end 2025.
- 75% of outbreak alerts posted by PICT members comply with PPHSN's reporting guidelines (include information about time, place and person) by end 2027.

SHIP-DDM

- $\geq 75\%$ of relevant staff operating at the national levels have completed at least two DDM modules. When: By Dec 2028.
- $\geq 50\%$ of relevant staff operating at the subnational levels have completed at least two DDM modules. When: By Dec 2028.
- By Dec 2028, ≥ 3 people from each South Pacific and $\Rightarrow 4$ people from each North Pacific Island working in outbreak disease surveillance and/or response roles have a formal field-epidemiology qualification (including that obtained by completing all DDM modules and assessment tasks). When: By Dec 2028.
- DDM pedagogy is assessed and acknowledged (and accredited) as being on-par with global best practice in field epi training. When: By Dec 2028.

Tables

Table 1. List of PPHSN Allied Members

Permanent Allied Members	Other Allied Members
World Health Organization (WHO)	*United States Centres for Disease Control and Prevention (USCDC)
The Pacific Community (SPC)	UNICEF
Fiji National University (FNU)	*New Zealand Institute of Environmental Science and Research (ESR)
Pacific Island Health Officer Association (PIHOA)	Communicable Diseases Network Australia (CDNA)
	Fiji Centre for Communicable Disease Control (FCDC) (formerly Mataika House)
	Pacific Pathology Training Centre (PPTC)
	Hawaii State Department of Health
	Hunter New England Health, Australia
	James Cook University (JCU)
	Institut Louis Malardé (ILM), Tahiti
	Micronesian Human Resources Development Centre
	National Centre for Epidemiology and Population Health/Australian National University (ANU)
	Institut Pasteur de Nouvelle-Calédonie (IPNC)
	Pacific Basin Medical Association (PBMA)
	Pacific Pathology Training Center (PPTC)
	TEPHINET
	Western Pacific HealthNet

* Current members of the PPHSN Coordinating Body (for 2022-2024)

Table 2: Number of survey respondents by survey section, 2023, N=149

Survey Section	N (%)
Demographics	149 (100)
PPHSN	149 (100)
PacNet	60 (40)
LabNet	30 (20)
EpiNet	47 (32)
PICNet	16 (11)
PSSS	63 (42)
SHIP-DDM	39 (26)

Table 3: Demographics and characteristics of survey respondents, 2023, N=149

Characteristic	N (%)
Age (years)	
≤34	29 (19)
35 - 54	86 (58)
≥55	34 (23)
Sex	
Female	89 (60)
Male	57 (38)
Prefer not to say	3 (2)
Highest level of education	
High school	7 (4.7)
Tertiary education	142 (95)
Country of current workplace	
<i>Polynesia</i>	37 (25)
American Samoa	5 (3)
Cook Islands	6 (4)
French Polynesia	2 (1)
Niue	6 (4)
Pitcairn Islands	1 (1)
Samoa	6 (4)
Tokelau	4 (3)
Tonga	5 (3)
Tuvalu	1 (1)
Wallis and Futuna	1 (1)
<i>Micronesia</i>	59 (40)
Federated States of Micronesia	20 (13)
Guam	10 (7)
Kiribati	12 (8)
Marshall Islands	6 (4)
Nauru	3 (2)
Commonwealth of the Northern Mariana Islands	3 (2)
Palau	5 (3)
<i>Melanesia</i>	43 (29)
Fiji	16 (11)
New Caledonia	7 (5)
Papua New Guinea	2 (1)
Solomon Islands	10 (7)
Vanuatu	8 (5)
Other (Australia, New Zealand, Philippines)	10 (7)
Current organisation	
Ministry of Health	110 (74)
Non-Government Organisation	23 (15)
Hospital	6 (4)
Other Government Department	5 (3)
Academic institution	2 (1)

Independent consultant	1 (1)
Private clinic	1 (1)
Other	1 (1)
Primary role	
Health facility worker	24 (16)
Public health officers	77 (52)
Laboratory officers	9 (6)
Health leadership	23 (15)
Research/data analysts	5 (3)
Health educator	4 (3)
Other	7 (5)
Jurisdiction	
Community level	15 (10)
National level	76 (51)
Provincial/ Divisional level	22 (15)
Regional/multi-jurisdictional	36 (24)
Years of experience in public health	
1-4	21 (14)
5-9	26 (17)
≥10	102 (68)
Years of experience with PPHSN	
<1	24 (16)
1-5	54 (36)
6-10	30 (20)
11-15	28 (19)
≥16	13 (9)
From a current coordinating body member country¹	
Yes	29 (20)
No	119 (80)

¹ *Less people responded to these questions due to the survey's logic. There were also some non-responses.*

Table 4: Main purpose of the PPHSN as reported by survey respondents*, 2023, N=149

Response	N (%)
Communication platform for surveillance and response	42 (28)
Strengthening outbreak detection and response	34 (23)
Strengthening health systems	27 (18)
Advancing regional approaches to public health security	21 (14)
Strengthening laboratory capacity in the pacific	9 (6)
Capacity building on epidemiology and data management	7 (5)
Syndromic surveillance	7 (5)
Other	2 (1)

**Multiple response question*

Table 5: Responses to survey questions related to involvement in PacNet, N=60, 2023

Response	N (%)
Receive PacNet alerts	
Yes	53 (88)
No	7 (12)
Use PacNet to send outbreak/public health emergency alerts	
Yes	41 (68)
No	9 (15)
Don't know	10 (17)
Usefulness of the weekly outbreak map shared on PacNet	
Extremely useful	21 (35)
Very useful	27 (45)
Moderately useful	7 (12)
Slightly useful	4 (7)
Not useful	1 (2)
Participants perceptions on whether PacNet is meeting its objective of facilitating communication between PPHSN members and partners	
Yes	45 (75)
No	3 (5)
Don't know	12 (20)
Ways in which PacNet has been useful to respondents and their organisations	
Alerts about potential threats	56 (93)
Supports preparedness and planning	41(68)
Outbreak response	43 (72)
Public health prevention and control measures	42 (70)
Support accessing laboratory testing	22 (37)
Accessing technical expertise	19 (32)
Accessing materials (e.g., vaccines, diagnostic test kits, bed nets)	11 (18)
Funding support	14 (23)
Supports updating of materials and guidelines	2 (3)

Table 6: Respondents perception on whether PacNet is meeting its objective of facilitating communication between PPHSN members and partners, N=60, 2023

Country/Territory	Yes N (%)	No N (%)	Don't know N (%)
American Samoa	3 (7)	0 (0)	0 (0)
Cook Islands	4 (9)	0 (0)	0 (0)
Federated States of Micronesia	3 (7)	1 (33)	2 (17)
Fiji	5 (11)	0 (0)	1 (8)
French Polynesia	0 (0)	1 (33)	0 (0)
Guam	1 (2)	0 (0)	1 (8)
Kiribati	3 (7)	0 (0)	3 (25)
Nauru	0 (0)	0 (0)	1 (8)
New Caledonia	4 (9)	0 (0)	2 (17)
Niue	3 (7)	0 (0)	0 (0)
Commonwealth of the Northern Mariana Islands	2 (4)	0 (0)	0 (0)
Palau	1 (2)	0 (0)	0 (0)
Samoa	3 (7)	0 (0)	0 (0)
Solomon Islands	2 (4)	0 (0)	0 (0)
Tokelau	1 (2)	0 (0)	0 (0)
Tonga	1 (2)	0 (0)	0 (0)
Tuvalu	1 (2)	0 (0)	0 (0)
Vanuatu	3 (7)	1 (33)	1 (8)
Wallis and Futuna	1 (2)	0 (0)	0 (0)
Other (Australia, New Zealand, Philippines)	4 (9)	0 (0)	1 (8)
Total	45	3	12

Table 7: Responses to survey questions related to the Pacific Syndromic Surveillance System (PSSS), N=63, 2023

Response	N (%)
Number of sentinel sites (health facilities) conducting syndromic surveillance	
<5	20 (32)
5-10	19 (30)
>10	15 (24)
Don't Know	9 (14)
Type of surveillance conducted at sentinel sites¹	
Both indicator-based surveillance and event-based surveillance	47 (78)
Only event-based surveillance	3 (5)
Only indicator-based surveillance	5 (8)
None	5 (8)
Where sentinel sites (health facilities) collect syndromic data that they report¹ *	
Extracted from a clinic/hospital logbooks or patient registers	37 (62)
Weekly paper tally sheets	28 (47)
Electronic patient records	25 (42)
Event reporting and assessment forms	14 (23)
Other	5 (8)
Completeness of reporting¹	
Always complete	14 (50)
Sometimes complete	13 (46)
Don't know	1 (4)
Have there been times when PSSS weekly reports could not be submitted on time?¹	
Yes	42 (70)
No	8 (13)
Don't know	10 (17)
Most common challenges for timely reporting¹	
Tally sheets not received on time	33 (79)
No internet (no signal)	20 (48)
No internet (no credit)	15 (36)
No phone or computer access	12 (29)
Not enough time	11 (26)
Don't know	3 (7)
Number of times the PSSS has provided an alert that enabled identification of an outbreak	
0	10 (17)
1-5	28 (47)
6-10	9 (15)
>10	12 (20)
Effectiveness of the PSSS in providing early warning alerts and supporting responses to emergencies¹	
Extremely	22 (37)
Very	26 (44)
Moderately	7 (12)

Slightly	4 (6.8)
Not effective	0 (0)
How information captured by the syndromic surveillance system is used	
Identify outbreaks	48 (81)
Disease monitoring and analysis	48 (81)
Trigger investigations and verify alerts	45 (76)
Raise awareness and educate staff about the importance of infectious diseases and significant public health event surveillance	36 (61)
Community health promotion	32 (54)
Informs health systems planning	26 (44)
Other	4 (7)
Did the PSSS support early warning surveillance and response in your country during the COVID-19 pandemic?	
Yes	43 (73)
No	6 (10)
Don't know	10 (17)

¹ Less people responded to this question due to the survey's logic or non-response.

*This is a multiple response question.

Table 8: Modes of data transfer between sentinel sites and the Ministry of Health surveillance officer, N=63, 2023 *

Response	N (%)
Email	52 (87)
Phone call	28 (25)
Paper-based	24 (40)
SMS text message	15 (22)
Phone app	13 (22)
Other	13 (22)

*This is a multiple response question.

Table 9: Responses to survey questions related to involvement in LabNet, N=30, 2023

Response to survey question	N (%)
Laboratory level that participants work with/in	
L1	10 (33)
L2	13 (43)
L3	4 (13)
Work across different levels	3 (10)
Member of the LabNet Technical Working Group	
Yes	11 (37)
No	19 (63)
Changes in laboratory capacity during COVID-19	
Capacity has increased	26 (87)
Capacity has decreased	0 (0)
Don't Know	4 (13)
How helpful LabNet has been in advancing/sustaining new capacities¹	
Extremely	6 (23)
Very	6 (23)
Moderately	7 (27)
A little	5 (19)
Not helpful	2 (8)
Average time to receive confirmation on specimens from reference laboratories	
<1 week	7 (23)
1-3 weeks	18 (60)
4 weeks	3 (10)
Don't know	2 (7)
Does your laboratory use PacNet-Lab for communications, recommendations and support for shipping and testing of specimens	
Yes	12 (40)
No	12 (40)
Don't know	6 (20)
Does your laboratory use an Electronic Laboratory Information Management System (LIMS)	
Yes	12 (40)
No	15 (50)
Don't know	3 (10)
Does this Laboratory Information Management System report into the PPHSN surveillance systems¹	
Yes	2 (17)
No	9 (75)
Don't know	1 (8)
Perceived effectiveness Of LabNet on health laboratory service strengthening across PICTs	
Extremely	6 (20)
Very	12 (40)
Moderately	10 (33)
Slightly	1 (3)

Not effective	1 (3)
Perceived effectiveness of the LabNet network in facilitating access to Laboratories able to test for PPHSN priority diseases	
Extremely	5 (17)
Very	13 (43)
Moderately	10 (33)
Slightly	1 (3)
Not effective	1 (3)
Types of laboratory training received from PPHSN partners *	
Testing methodologies	22 (73)
Laboratory equipment	17 (57)
Management systems	12 (40)
Procurement and stock management	10 (33)
Sample referral networks	9 (30)
Occupational health and safety	8 (27)
Other	6 (20)
Areas where laboratories need additional support in*	
Laboratory information management systems	21 (70)
Supply management	20 (67)
Molecular testing	18 (60)
Whole genome sequencing	18 (60)
Microbiology	14 (47)
Specimen preparation and shipping	10 (33)
Other	1 (3)
Modality of information sharing between private laboratories and the LabNet network*	
Reporting notifiable diseases and routine sharing of data	11 (37)
PacNet-Lab	5 (17)
LabNet meeting and workshops	5 (17)
Encrypted emails or secure online portals	5 (17)
Electronic health records	5 (17)
Other	10 (33)
Other lab networks/organisations that respondents communicate with*	
WHO Collaborating Centre at the Doherty Institute (VIDLR)	19 (63)
Institute of Environmental Science and Research, New Zealand (ESR NZ)	10 (33)
Fiji Centres for Disease Control (FJ CDC)	8 (27)
Institut Pasteur de Nouvelle-Caledonie (IPNC)	5 (17)
Animal Health Laboratories and Pacific Animal Health Laboratory Network (PAHLNet)	3 (10)

¹ Less people responded to this question due to the survey's logic or non-response.

*This is a multiple response question

Table 10: Average confirmation time on specimens from reference laboratories by subregion¹, N=27, 2023

Timeframe	Melanesia, N = 7	Micronesia, N = 12	Polynesia, N = 8
<1 week	3 (43)	2 (17)	1 (13)
1-2 weeks	2 (29)	8 (67)	1 (13)
3-4 weeks	1 (14)	1 (8)	6 (75)
Don't Know	1 (14)	1 (8)	0 (0)

¹ *Less people responded to this question due to the survey's logic or non-response.*

Table 11: Responses to survey questions related to involvement in PICNet, N=16, 2023

Response	N (%)
Member of the PICNet steering committee	
Yes	3 (19)
No	13 (81)
Effectiveness of PICNet in strengthening partnerships towards addressing infection prevention and control priorities in PICTs	
Extremely effective	2 (13)
Very effective	8 (50)
Moderately effective	4 (25)
Slightly effective	1 (6)
Not effective	1 (6)
Effectiveness of PICNet in supporting capacity building for infection prevention and control professionals	
Extremely effective	2 (13)
Very effective	6 (38)
Moderately effective	5 (31)
Slightly effective	2 (13)
Not effective	1 (6)
Effectiveness of PICNet in raising awareness about infection prevention and control issues	
Extremely effective	1 (6.3)
Very effective	9 (56)
Moderately effective	4 (25)
Slightly effective	1 (6)
Not effective	1 (6)
Availability of trained infection prevention and control professionals in country/territory	
Yes	12 (75)
No	4 (25)
Surveillance of Healthcare Associated Infections conducted	
Yes	11 (69)
No	5 (31)
Use of the PPHSN Infection Prevention and Control Guidelines 2021¹	
Often	3 (27)
Sometimes	7 (64)
Never	1 (9)
Infection prevention and control practice has been modified in my place of work to be consistent with the PPHSN Infection Prevention and Control Guidelines 2021¹	
Yes	9 (82)
No	2 (18)
Areas where organisation/health facility infection prevention and control practices/protocols have changed	
Management of the IPC programme	9 (56)
Hand hygiene	8 (50)
Monitoring of IPC practice	8 (50)

Outbreak management situations	7(44)
Application of standard and transmission-based precautions	7 (44)
Principles of personal protective equipment	7 (44)
Safe handling and disposal of sharps	7 (44)
Airborne precautions	7 (44)
Droplet precautions	7 (44)
Environmental cleaning	6 (38)
Contact precautions	6 (38)
IPC in special care areas	6 (38)
Vaccine preventable diseases for staff health	6 (38)
Environmental management practices	6 (38)
Safe handling of laundry	4 (25)
Management of occupational exposure	4 (25)
Safe reprocessing of reusable medical equipment	3 (19)
Food safety	3 (19)
Other	1 (6)
Usefulness of PICNet during COVID-19 pandemic¹	
Extremely useful	3 (27)
Very useful	3 (27)
Moderately useful	2 (18)
Slightly useful	2 (18)
Not useful	1 (9)

¹ Less people responded to this question due to survey's logic or non-response.

Table 12: Responses to survey questions related to involvement in EpiNet, N =47, 2023

Response	N (%)
Team designated to detect and respond to public health alerts	
Yes	43 (91)
No	2 (4.3)
Don't know	2 (4.3)
Team is known as a 'EpiNet'	
Yes	27 (63)
No	16 (37)
Number of people in response (EpiNet) team¹	
3	2 (4.7)
4	8 (19)
>5	33 (77)
In the last 5 years, number of times the response (EpiNet) team has been mobilised to investigate or respond to a public health event¹	
0	5 (11)
<10	29 (63)
≥10	12 (26)
Response (EpiNet) team has adequate resources and skills to respond to outbreaks¹	
Yes	33 (72)
No	13 (28)

¹ Less people responded to this question some questions due to the survey's logic.

Table 13: Response/EpiNet teams' area of expertise N =46, 2023*

Expertise	N (%)
Field Investigation	40 (87)
Data management	37 (80)
Public Health Management/Supervision	34 (74)
Laboratory	31 (67)
Health policy	31 (67)
Health promotion and communication	31 (67)
Infection control	30 (65)
Clinical medicine	26 (56)
Immunisation	26 (56)
Disaster Management	25 (54)
Other	4 (9)

**This is a multiple response question*

Table 14: Communication and tools and procedures used by EpiNet response teams for public health emergencies and/or outbreaks, N =46, 2023

Communication tools used by EpiNet response teams for public health emergencies and/or outbreaks*	N (%)
Pacific syndromic surveillance system	31 (67)
PacNet	29 (63)
Social media posts (e.g. Facebook page)	29 (63)
Report through IHR national focal point	26 (56)
Informal notification to key partners	18 (39)
Internal reporting only	16 (35)
No standard reporting process established	3 (7)
Other	7 (15)
Procedures used by EpiNet response teams for public health emergencies and/or outbreaks*	
Guidelines	41(89)
Standard operating procedures (SOPs)	35 (76)
Surveillance and response training	33 (72)
Simulation exercises	25 (54)
Scenario-based planning	14 (30)
Pandemic playbook	13 (28)
Other	5 (11)

**This is a multiple response question*

Table 15: Responses to survey questions related to involvement in Strengthening Health Interventions in the Pacific – Data for Decision Making (SHIP-DDM) by sex, N=36, 2023

Characteristic	Female, N =31 (%)	Male, N = 5 (%)
Number of SHIP-DDM trainees/graduates		
Postgraduate Certificate in Field Epidemiology Trainee	16 (52)	1 (20)
Postgraduate Certificate in Field Epidemiology Graduate	12 (39)	3 (60)
Postgraduate Diploma in Applied Epidemiology Trainee	2 (6.5)	1 (20)
Postgraduate Diploma in Applied Epidemiology Graduate	1 (3)	0 (0)
Year completed/due to complete SHIP-DDM training¹		
2016	1 (3)	0 (0)
2018	2 (7)	0 (0)
2019	4 (13)	0 (0)
2020	0 (0)	2 (40)
2021	1 (3)	0 (0)
2022	2 (7)	1 (20)
2023	20 (67)	2 (40)
Able to network with other health professionals regionally and in-country¹		
Yes	24 (80)	4 (80)
No	6 (20)	1 (20)
Received supportive mentoring by faculty during the SHIP program Workplace Support		
Yes	26 (84)	5 (100)
No	5 (16)	0 (0)
Have been involved in outbreak response		
Yes	26 (84)	5 (100)
No	5 (16)	0 (0)
Involved in the COVID-19 response		
Yes	25 (81)	5 (100)
No	6 (19)	0 (0)
How helpful the SHIP-DDM training was¹		
Extremely helpful	17 (63)	3 (60)
Very helpful	9 (33)	1 (20)
Moderately helpful	0 (0)	1 (20)
Not helpful	1 (4)	0 (0)
Satisfaction with the SHIP-DDM Program		
Extremely satisfied	16 (52)	4 (80)
Very satisfied	14 (45)	1 (20)
Slightly satisfied	1 (3)	0 (0)
Training relevant to work role		
Strongly agree	28 (90)	4 (80)
Somewhat agree	2 (7)	0 (0)

Strongly disagree	1 (3)	1 (20)
Intention to pursue further training		
Yes	22 (71)	4 (80)
Maybe	8 (26)	1 (20)
Not applicable to me	1 (3)	0 (0)

¹ *Less people responded to this question due to survey's logic or non-response.*

Table 16: Number of trainees and graduates, by country and programme N=36, 2023

Course	Country	Trainees	Graduates
Postgraduate Certificate in Field Epidemiology n=32	Cook Islands	3	-
	Federated States of Micronesia (FSM)	-	3
	Fiji	-	1
	Guam	1	-
	Kiribati	4	3
	Marshall Islands	-	1
	Nauru	2	-
	New Caledonia	1	-
	Commonwealth of the Northern Mariana Islands	-	1
	Palau	-	2
	Solomon Islands	2	1
	Tokelau	1	2
	Vanuatu	2	1
	Wallis and Futuna	1	-
Postgraduate Diploma in Applied Epidemiology n=4	Fiji	1	-
	Guam	2	-
	Solomon Islands	-	1
Total		20	16

¹ Less people responded to this question due to survey's logic or non-response.

Table 17: SHIP-DDM topics participants found the most relevant to their work, N=39, 2023*

Topics	N (%)
Epidemiology and field epidemiology	31 (80)
Investigation and management of disease outbreaks	28 (72)
Health information systems (his)	23 (59)
Management and analysis of data	21(54)
One Health concepts as they relate to disease surveillance and response	14 (36)
Operational research	8 (21)
Biostatistics	5 (13)
Climate issue impact public health	5 (13)

*This is a multiple response question

Table 18: Number of reporting sites per PICT in 2022 (data source SPC)

Member State	Number of sites	Population	Sites per 10000 persons
American Samoa	2	57 085	0.35
Cook Islands	14	15 406	9.09
Fiji	29	901 603	0.32
French Polynesia	30	280 855	1.07
Guam	1	179 900	0.06
Kiribati	9	122 735	0.73
Marshall Islands (the)	2	54 446	0.37
Micronesia (Federated States of)	4	105 987	0.38
New Caledonia	26	274 330	0.95
Niue	1	1 532	6.53
Commonwealth of the Northern Mariana Islands	9	56 986	1.58
Palau	7	17 976	3.89
Pitcairn Islands	Not available	50	-
Samoa	11	200 999	0.55
Solomon Islands	14	744 407	0.19
Tokelau	3	1 497	20.04
Tonga	11	99 283	1.11
Tuvalu	Not available	10 778	-
Vanuatu	19	307 941	0.62
Wallis & Futuna	2	11 302	1.77
Nauru	Not available	11 928	-
Papua New Guinea	Not available	9311 874	-

Table 19: Number of sites that reported to PSSS, Epidemiological week 10, 2019-2022*

Member State	EPIDEMIOLOGICAL WEEK 10							
	2019		2020		2021		2022	
	N	(%)	N	(%)	N	(%)	N	(%)
American Samoa	2	100%	0	0%	0	0%	0	0%
Cook Islands	12	86%	13	93%	13	93%	13	93%
Fiji	10	34%	12	41%	29	100%	29	100%
French Polynesia	20	67%	19	63%	18	60%	14	47%
Guam	0	0%	0	0%	0	0%	0	0%
Kiribati	7	78%	8	89%	9	100%	8	89%
Marshall Islands (the)	2	100%	2	100%	2	100%	2	100%
Micronesia (Federated States of)	4	100%	2	50%	2	50%	0	0%
New Caledonia	1	4%	1	4%	24	92%	18	69%
Niue	1	100%	0	0%	1	100%	1	100%
Commonwealth of the Northern Mariana Islands	7	78%	6	67%	8	89%	8	89%
Palau	1	14%	1	14%	1	14%	1	14%
Pitcairn Islands	1	-	1	-1	-1	-		
Samoa	11	100%	9	82%	11	100%	0	0%
Solomon Islands	10	71%	11	79%	10	71%	5	36%
Tokelau	1	33%	2	67%	3	100%	3	100%
Tonga	11	100%	10	91%	10	91%	1	9%
Tuvalu	1	-	1	-	3	-	3	-
Vanuatu	10	53%	9	47%	9	47%	2	11%
Wallis & Futuna	0	0%	2	100%	0	0%	2	100%
Nauru	0	0%	0	0%	0	0%	0	0%
Papua New Guinea	0	0%	0	0%	0	0%	0	0%

* Red shows no data recorded, blue presents blank reporting, and green presents double reporting

Table 20: Number of sites that reported to PSSS, Epidemiological week 20, 2019-2022*

Member State	EPIDEMIOLOGICAL WEEK 20							
	2019		2020		2021		2022	
		(%)	N	(%)	N	(%)	N	(%)
American Samoa	4	200%	0	0%	0	0%	0	0%
Cook Islands	12	86%	12	86%	13	93%	13	93%
Fiji	7	24%	14	48%	15	52%	28	97%
French Polynesia	18	60%	11	37%	41	137%	8	27%
Guam	0	0%	0	0%	0	0%	0	0%
Kiribati	7	78%	9	100%	9	100%	8	89%
Marshall Islands (the)	2	100%	2	100%	2	100%	2	100%
Micronesia (Federated States of)	4	100%	3	75%	0	0%	3	75%
New Caledonia	0	0%	1	4%	15	58%	16	62%
Niue	1	100%	1	100%	0	0%	1	100%
Commonwealth of the Northern Mariana Islands	6	67%	5	56%	8	89%	8	89%
Palau	1	14%	1	14%	1	14%	1	14%
Pitcairn Islands	1	-	1	-	1	-	1	-
Samoa	11	100%	10	91%	0	0%	10	91%
Solomon Islands	11	79%	0	0%	8	57%	7	50%
Tokelau	3	100%	3	100%	3	100%	3	100%
Tonga	11	100%	11	100%	9	82%	9	82%
Tuvalu	1	-	1	-	3	-	3	-
Vanuatu	8	42%	10	53%	2	11%	6	32%
Wallis & Futuna	4	200%	2	100%	2	100%	2	100%
Nauru	0	0%	0	0%	0	0%	0	0%
Papua New Guinea	0	0%	0	0%	0	0%	0	0%

* Red shows no data recorded, blue presents blank reporting, and green presents double reporting

Table 21: Number of sites that reported to PSSS, Epidemiological week 30, 2019-2022*

Member State	EPIDEMIOLOGICAL WEEK 30							
	2019		2020		2021		2022	
	N	(%)	N	(%)	N	(%)	N	(%)
American Samoa	2	100%	0	0%	0	0%	0	0%
Cook Islands	12	86%	13	93%	14	100%	13	93%
Fiji	14	48%	14	48%	20	69%	28	97%
French Polynesia	18	60%	19	63%	10	33%	17	57%
Guam	0	0%	0	0%	0	0%	0	0%
Kiribati	7	78%	9	100%	9	100%	0	0%
Marshall Islands (the)	2	100%	2	100%	2	100%	2	100%
Micronesia (Federated States of)	3	75%	2	50%	2	50%	0	0%
New Caledonia	1	4%	16	62%	22	85%	13	50%
Niue	1	100%	1	100%	0	0%	1	100%
Commonwealth of the Northern Mariana Islands	7	78%	7	78%	8	89%	8	89%
Palau	1	14%	1	14%	1	14%	1	14%
Pitcairn Islands	1	-	1	-	1	-	1	-
Samoa	9	82%	10	91%	11	100%	11	100%
Solomon Islands	11	79%	6	43%	11	79%	5	36%
Tokelau	3	100%	3	100%	3	100%	3	100%
Tonga	6	55%	11	100%	6	55%	15	136%
Tuvalu	1	-	1	-	3	-	3	-
Vanuatu	6	32%	6	32%	7	37%	26	137%
Wallis & Futuna	2	100%	2	100%	2	100%	2	100%
Nauru	0	0%	0	0%	0	0%	0	0%
Papua New Guinea	0	0%	0	0%	0	0%	0	0%

* Red shows no data recorded, blue presents blank reporting, and green presents double reporting

Table 22: Number of sites that reported to PSSS, Epidemiological week 32, 2019-2022*

Member State	2018		2019		2020		2021		2022		2023	
	N	(%)										
American Samoa	0	0%	2	100%	0	0%	0	0%	0	0%	0	0%
Cook Islands	12	86%	12	86%	13	93%	13	93%	13	93%	13	93%
Fiji	10	34%	12	41%	14	48%	22	76%	27	93%	29	100%
French Polynesia	14	47%	17	57%	20	67%	13	43%	19	63%	35	117%
Guam	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
Kiribati	7	78%	7	78%	9	100%	9	100%	8	89%	0	0%
Marshall Islands (the)	2	100%	2	100%	2	100%	2	100%	0	0%	2	100%
Micronesia (Federated States of)	3	75%	2	50%	3	75%	0	0%	0	0%	0	0%
New Caledonia	1	4%	1	4%	13	50%	17	65%	14	54%	11	42%
Niue	1	100%	0	0%	0	0%	1	100%	1	100%	1	100%
Commonwealth of the Northern Mariana Islands	6	67%	6	67%	7	78%	8	89%	8	89%	9	100%
Palau	1	14%	1	14%	1	14%	1	14%	1	14%	7	100%
Pitcairn Islands	1	-	1	-	1	-	1	-	1	-	1	-
Samoa	5	45%	11	100%	8	73%	11	100%	11	100%	9	82%
Solomon Islands	12	86%	8	57%	8	57%	12	86%	9	64%	6	43%
Tokelau	2	67%	3	100%	3	100%	3	100%	3	100%	0	0%
Tonga	0	0%	10	91%	11	100%	6	55%	8	73%	12	109%
Tuvalu	0	-	1	-	1	-	3	-	3	-	0	-
Vanuatu	6	32%	7	37%	9	47%	5	26%	12	63%	13	68%
Wallis & Futuna	0	0%	2	100%	2	100%	2	100%	2	100%	2	100%
Nauru	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Papua New Guinea	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

* Red shows no data recorded, blue presents blank reporting, and green presents double reporting

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Contact

Associate Professor Meru Sheel
Sydney School of Public Health
Faculty of Medicine and Health
The University of Sydney
E: meru.sheel@sydney.edu.au

CRICOS 00026A

