Prevalence of sexually transmitted infections and positive treponemal serology in Solomon Islands guest workers in Australia

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Abstract

Objectives: The burden of sexually transmitted infections (STIs) in Pacific guest workers in Australia is currently unknown. Our study determined the prevalence of chlamydia, gonorrhoea, HIV and treponemal infection in a group of predominately Solomon Islands guest workers in Australia in 2023. In addition, we sought to understand the effect of sex, age and type of sexual activity on the risk of STIs in this population group.

Methods: Workers under one employer were offered chlamydia and gonorrhoea urine polymerase chain reaction testing, treponemal serology with reflex rapid plasma reagin testing, and HIV testing via antibody/antigen detection. Descriptive analyses identified population characteristics and infection frequencies. Logistic regression was used to estimate the likelihood of diagnosis, reported as odds ratios.

Results: The participation rate was 93% (n=391). The median age was 31.9 years (interquartile range: 22.9–40.9) and 86.5% were male. Chlamydia (18.5%) and gonorrhoea (1.8%) were common among guest workers. No cases of HIV were diagnosed. Treponemal-specific reactive tests (48.5%) suggested yaws or syphilis exposure despite being asymptomatic, with 37.1% of these having an rapid plasma reagin titre equal to or exceeding 1:16. Women were 3.71 times more likely to have chlamydia [95% confidence interval (CI) 1.97-6.93].

Conclusion: High rates of chlamydia and positive treponemal serology may reflect high rates of untreated STIs.

Implications for Public Health: This unique dataset guides potential screening programs for Pacific guest workers to complement existing education programs.

Key words: PALM, Pacific Island, sexual health, guest worker

Introduction

The Pacific Australia Labour Mobility Scheme (PALM) hosts Pacific Island workers with temporary rights to work in Australia.[1,2] The PALM program was instituted in response to critical worker shortages in Australia and growing youth unemployment in Pacific Islands.[1,3,4] The PALM scheme hosts more than 30,000 workers annually, making invaluable contributions to the Australian economy in agriculture, meat processing, hospitality and aged care.[1,3,5,6] This number has grown since its inception in 2012, with a >300% rise in participants since 2019.[1,5]

Qualitative studies within Australia identify sexual and reproductive health as the second highest concern for PALM workers and employers, following employment conditions.[1] This concern is reflected in the Queensland PALM program, where employers contacted North

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Queensland public health units requesting assistance with sexually transmitted infection (STI) screening in response to demand from workers. Although community STI screening, especially in remote Aboriginal communities, is well established, this screening required a novel approach as the workers had no access to the national insurance scheme, Medicare.[7] Without Medicare coverage, an innovative approach to coordinating private insurers, pathology services and clinicians was required (see supplement 2 for the program report). Planning for the screen identified limited existing information on STI prevalence among PALM workers and STIs within their countries of origin. This is concerning as previous studies in China have identified that international guest workers are more likely to have new partners, engage with sex workers and have lower access to condoms when away from home[8,9]; they may also have higher STI rates than permanent populations.[9] Furthermore, guestworkers in Canada were identified as requiring gender and culturally specific sexual health care services that were not met by the current programs,[10] an issue that is likely to be replicated in the PALM cohort in Australia.

The limited information on sexual health in the Pacific Islands hinders the planning and implementation of STI management programs for PALM workers. The introduction of HIV to the Western Pacific region saw an increase in funding to mitigate its spread, decreasing prevalence to <1% ,[11–13] whilst surveillance of other STIs such as chlamydia, gonorrhoea, syphilis and viral hepatitis remains overlooked.[14,15] STI control in resource-limited settings, such as the Pacific Islands, remains challenging due to resource constraints, poor sexual health literacy, and low engagement with mitigation strategies.[16]

Limited laboratory testing for STIs in the Pacific Islands is reflected in the World Health Organization's recommendation to implement syndromic management, where all patients presenting with urogenital symptoms receive antibiotics for presumed STIs.[14,15,17] Whilst practical in a resource-limited setting, this results in inadequate testing rates and poor identification of asymptomatic cases. Despite the limitations in identifying STIs, low-income countries such as the Pacific Islands carry a disproportionately higher burden of the 374 million known cases of the global chlamydia, gonorrhoea and syphilis diagnosed per annum.[8,12]

For example, it is estimated that one-third of women in the Pacific Islands are infected with chlamydia.[13,18–20] Complications of chlamydia and gonorrhoea vary from pelvic inflammatory disease, ectopic pregnancy and infertility in women to prostatitis and epididymitis in men.[11,21,23] Further, chlamydia infection of the newborn can cause conjunctivitis and pneumonia.[13]

Syphilis, caused by *Treponema pallidum subspecies pallidum*, affects between 1 and 12% in the Pacific Islands, but testing predominantly occurs in women attending antenatal clinics.[11,22,23] The early stage of syphilis is infectious and commonly manifests as a painless chancre ulcer, usually on the genitals. Syphilis can cross the placenta and cause dire health consequences, including stillbirth and neonatal complications.[21,24] Untreated, the late stages of syphilis manifest neurologically with vision and hearing loss, meningitis, dementia, and degenerative tabes dorsalis.[21]

Diagnosis of syphilis in the Pacific Islands is complicated by the presence of endemic yaws (*Treponema pallidum subspecies pertenue*).[18] Conventional tests do not distinguish between the subspecies, and those exposed previously to yaws or syphilis have lifelong positive treponemal-specific tests.[25,26] Yaws primarily affects the lower limbs of children, causing skeletal and subcutaneous disability, but rarely results in congenital, cardiovascular or neurological sequelae.[26,27] However, increasing evidence suggests that these complications likely exist in yaws but are largely undiagnosed in the developing settings where this infection is pervasive.[26,27]

Given the high burden of STIs in PALM-origin countries and the potential for onward transmission in Australia, it is imperative to understand and respond to STIs and treponemal positivity in this population. Broader review of the prevalence of STIs in the Solomon Islands' population is important as previous work has focused only on antenatal clinics and female sex workers.[11] This paper provides contemporary data on STI prevalence and stratifies disease by gender, which has previously been unknown.

Aim

This cross-sectional study aimed to determine the prevalence of STIs and treponemal positivity in a group of mainly Solomon Island PALM workers based in Australia in September 2023. In addition, we sought to understand the effect of sex, age and type of sexual activity on the risk of STIs in this population group.

Methods

Study design

This observational study used data from an STI screening campaign conducted among PALM workers in Queensland between September and October 2023. All workers employed by a specific approved employer were invited to voluntarily participate in STI screening. Guided by the labour program guidelines, all workers were aged 21–49 years and had self-declared they were healthy enough to conduct robust agricultural labour. There were no exclusion criteria for the screening. Workers were mainly from the Solomon Islands; however, three workers from other countries were present for the screen, and their countries were not listed due to the likely identification of these individuals if included.

Data collection

An independent Solomon Islander doctor provided workers with information about sexual health and the screening event in English and Pijin as part of the TRUE Relationships and Reproductive Health, Health in My Language program. Written consent was obtained before participation in the screening.

The screening event involved both sample collection and testing, as well as the completion of a case report form. This form contained data on risk factors, including age, sex, length of stay, previous treatment for a treponemal disease, current signs and symptoms, treatment required, contact tracing, sex worker status, sexual activity (regular partner, casual, other), sexual partner (same sex, opposite sex, both) and location of meeting their partner (community, mobile app, brothel, internet, or regular partner). It also included data on whether participants had experienced domestic violence whilst in Australia or coercion to engage in sexual activity and the likely location where the STI was acquired (Supplement 1: Case Report Form).

Cases were classified following the Communicable Disease Network of Australia (CDNA) guidelines.[30] Where cases could not be classified

using the CDNA definitions, they were defined in consultation with Sexual and Public Health Physicians.

Descriptive analysis

Population characteristics and the frequencies of STIs or treponemal positivity, previous treatment, type of sexual partner, and sexual activity were calculated. Participants who identified any casual sexual encounters were included in the category 'sexual activity–casual', even if they had a concurrent regular partner. Only participants who identified exclusive intercourse with one partner, for example their spouse, prior to and during their current visa period were included in the 'sexual activity–regular' group.

Statistical analysis

Data analysis was conducted using R version 4.3.2. We report odds ratios (ORs) to test the direction and magnitude of associations and associated 95% confidence intervals (95% CIs). We chose to do a forced entry modelling approach, which means all available variables with complete data and sufficient events were included in the final multivariable model.[31] We left out gonorrhoea as there were only seven events.

Results

Study Participants

Figure 1 presents an overview of the participation in the STI screening event. The overall response to the screening event was high, with a 98% participation rate (n=394). Urine samples (386/394, 98%) and serology (391/394, 99%) were collected from participants.

Demographic data

The sociodemographic characteristics of the study participants are presented in Table 1. The median age of the participants was 31 years (interquartile range: 9.0), and 86.5% were male (n=340).

STI prevalence

There was a high prevalence of STIs and/or positive treponemal serology, with 59.3% of participants testing positive to at least one condition (234/394). Prevalence rates of positive results among female participants (38/54, 70.3%) were higher than their male counterparts (196/340, 57.6%).

Table 1 stratifies the laboratory findings. All 391 serological samples tested for HIV were negative. Positive treponemal-specific serology was identified in 190 (48.7%) individuals, indicative of exposure to syphilis or yaws. Among those with a reactive TPPA, 37.1% (n=23) had a nonspecific treponemal test (RPR) titre greater than or equal to 1:16, suggesting active disease. When considering the workers with a reactive treponema pallidum particle agglutination, chlamydia was detected in 28 (15.8%) of these workers and gonorrhoea in 3 (1.6%). All workers were questioned regarding signs and symptoms during the clinical review and those with symptoms were examined. Of those undergoing clinical examination by the physicians, none had lesions consistent with syphilis or yaws; therefore, no swabs were sent. The prevalence of gonorrhoea and chlamydia among the 386 urine samples received were 1.8% (n=7) and 18.4% (n=71), respectively.

Figure 1: Flowchart of PALM workers who participated in a screening campaign for Sexually Transmitted Infections, Queensland, Australia, September–October 2023. PALM = Pacific Australia Labour Mobility Scheme.

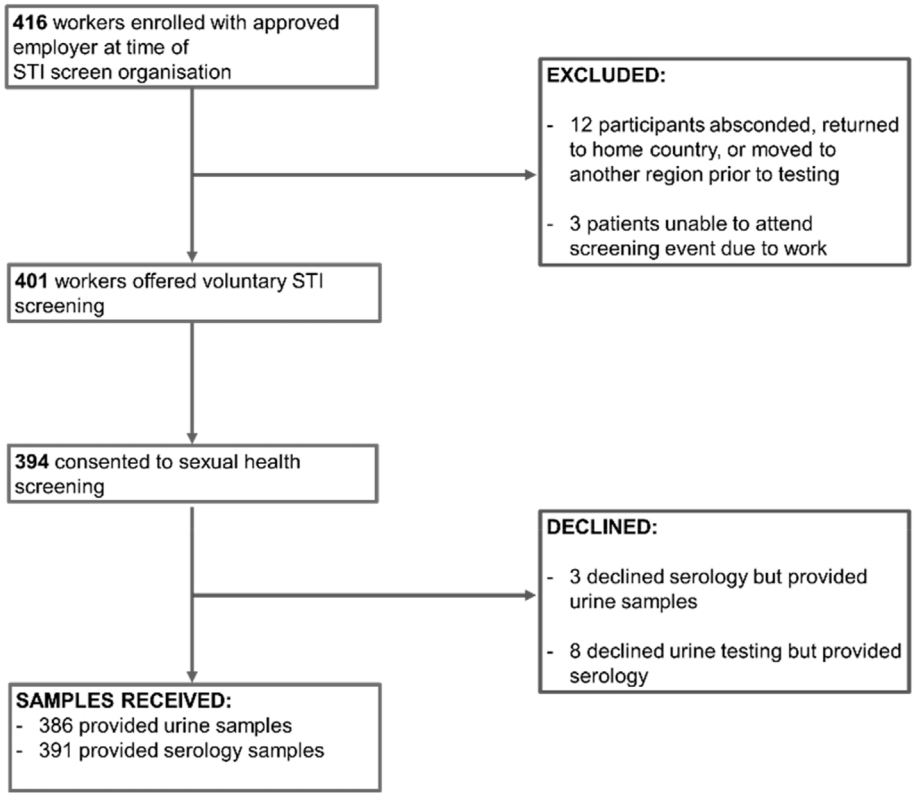

Table 1: Cohort demographics and sexual behaviours, by gender, among PALM workers who consented to participation in a screening campaign in Queensland, Australia, September–October 2023.

Characteristic	Overall, n=394	Female, n=54	Male, n=340	*p* value[a]
Age (years)				
<=25	52 (13%)	8 (15%)	44 (13%)	N/A[2]
>25	342 (87%)	46 (85%)	296 (87%)	
Chlamydia				
Detected	71 (18%)	21 (40%)	50 (15%)	**<0.001**
Not detected	315 (82%)	32 (60%)	283 (85%)	
Unknown	8	1	7	
Gonorrhea				
Detected	7 (1.8%)	3 (5.7%)	4 (1.2%)	0.05
Not detected	379 (98%)	50 (94%)	329 (99%)	
Unknown	8	1	7	
Treponemal infection				
Likely infectious	23 (5.8%)	2 (3.7%)	21 (6.2%)	0.49
Likely latent	167 (42%)	21 (39%)	146 (43%)	
Not detected	196 (50%)	28 (52%)	168 (49%)	
Unknown	8 (2.0%)	3 (5.6%)	5 (1.5%)	
Type of sexual partner				
Casual	54 (29%)	12 (50%)	42 (26%)	0.1
Regular	134 (71%)	12 (50%)	122 (74%)	
Unknown	206	30	176	
Location of meeting sexual partner				
In community	54 (29%)	14 (58%)	40 (25%)	**<0.001**
Regular partner	130 (71%)	10 (42%)	120 (75%)	
Unknown	210	30	180	

[2] Not applicable.
PALM = Pacific Australia Labour Mobility Scheme.
[a]Fisher's exact test; Pearsons Chi-squared tests.

Table 2: Univariate and multivariate analysis of presence of chlamydia with variable age, gender and treponema coinfection status. There was a total of 71 individuals testing positive for chlamydia.

Characteristic	Univariable		Multivariable	
	OR[a]	95% CI[a]	OR[a]	95% CI[a]
Age				
>25 Years	0.25	0.13, 0.48	0.25	0.13, 0.49
Gender				
Female	3.71	1.97, 6.93	3.31	1.65, 6.52
Syphilis status				
Active	1.37	0.47, 3.54	1.33	0.43, 3.69
Latent	0.60	0.33, 1.05	0.72	0.39, 1.31
Not tested	3.87	0.88, 17.0		

[a]OR = odds ratio, CI = confidence interval

A univariate and multivariate analysis, adjusted for age, sex and coinfection status. Only chlamydia outcomes were modelled as there was a paucity of events for other illnesses to warrant modelling.

Assessment of risk factors

One participant reported sex work in the last 12 months; however, it is unknown if this was in Australia or their country of origin. Only one worker reported intercourse with a partner of the same gender (male-to-male intercourse). The remainder reported opposite sex sexual partners. Among those testing positive who responded to the questions on sexual partners, exclusive intercourse with regular sexual partners was reported by 57.6% (n=134), with 28.7% (n=54) reporting any casual intercourse. Among those testing positive for any STI, only 17.5% (n=41) reported having intercourse in the local community. It is unknown if this reflects Australian residents or other Pacific workers outside their employer. There were no self-reported incidents of domestic violence or coercive pressure to engage in intercourse. Eight people with a positive treponemal result reported previous treatment for syphilis. All these cases were treated in Australia as part of the PALM program. No participants could recall if they had been diagnosed with yaws or received treatment previously in the Solomon Islands.

Analysis of the risk factors identified statistically significant associations between chlamydia diagnosis and sex. Chlamydia was three times as likely diagnosed among females than males, regardless of coinfection status (OR=3.71, 95% CI: 1.97–6.93) (see Table 2). No other associations were statistically significant.

Discussion

Key results and interpretation

The infection rates among PALM workers were substantial, with a high prevalence of both chlamydia (18.4%) and treponemal exposure (48.5%). The chlamydia prevalence among women (39.6%) exceeded the comparative rate in Australian females (6–20%).[28] However, these findings aligned with previous prevalence estimates in the Solomon Islands, demonstrating no difference in rates in this population inside and outside their home country.[11,18,20,29]

The similarity between the STI prevalence among the PALM workers and previous studies based in the Solomon Islands was unexpected as international studies suggested guest workers engage in different sexual activity when travelling and might be at greater risk of STIs than the general population.[9,10] These results did not document higher chlamydia rates than expected within this group of predominantly Solomon Islanders, suggesting these guest workers may not be at higher risk.

Differing rates of chlamydia between the sexes were also noted, with women having a three times higher risk than men. Previous surveillance surveys in the Solomon Islands have focused on antenatal clinics, resulting in a paucity of STI prevalence data in men for comparison. Traditionally, women were believed to have higher chlamydia rates given their anatomical predisposition to maintaining infection while men were able to clear infection more easily.[30] However, the recent literature suggests comparable infection rates of chlamydia between men and women.[30,31] In this study, the small number of women compared with men in the PALM worker cohort would make concurrent partners for women more likely, increasing their risk of chlamydia. Further, women often experience asymptomatic chlamydia infection and thus they would not seek out treatment, possibly accounting for the increased rates among women at the time of screening.[30] Further, qualitative work completed by Kanan et al. 2023[1] found that PALM women can experience sexual violence, coercive sexual pressure and/or engage in transactional sex, which would increase their risk. Without prior prevalence data on male STI infection in the Solomon Islands, it is impossible to extrapolate whether the PALM worker burden of disease is beyond baseline for the population.

The absence of HIV infections and the small number of gonorrhoea cases was reassuring. Auchus et al.[11] demonstrated urine polymerace chain reaction gonorrhoea prevalence in the Solomon Islands of <1%, consistent with the current screening findings of 1.8%.[11] The study findings are further supported by the Solomon Islands reporting a HIV prevalence of <1% in their national UNAIDS report.[32–34]

The high rates of positive treponemal-specific tests in this group warrants discussion. Almost half of the study group (48.7%) had evidence of prior treponemal infection. It is often not possible to differentiate yaws infection from syphilis. Among those with a reactive treponemal-specific test, 18.5% had an RPR exceeding 1:16. If this cohort came from a yaws nonendemic area, this would be interpreted as infectious syphilis. The Solomon Islands' clinical guidelines define a syphilis diagnosis as a positive Venereal Disease Research Laboratory (VDRL) test or clinical signs and symptoms consistent with syphilis.[35] Whilst VDRL was not used in this study, TPPA/chemiluminescent microparticle immunoassay (CMIA) could be considered its equivalent, and therefore, almost half our group would have been diagnosed with infectious syphilis usingthe Solomons guidelines.

Other STI studies in the Solomon Islands have faced the issue of yaws endemicity; however, they defined a positive treponemal-specific test and an elevated RPR as diagnostic of syphilis without addressing the influence of each *T. pallidum* subspecies on the results. Marks et al.[18] surveyed women attending outpatient clinics in Honiara using methods similar to this study; however, using treponemal pallidum haemagglutination assay (TPHA) rather than TPPA/CMIA, and RPR serology. The researchers defined syphilis as a positive TPHA and RPR >1:8, with an estimated prevalence of 4.1%. If the same RPR criteria of >1:8 was used, 7.6% of this group would be defined as positive for infectious syphilis, higher than the rate found by Marks et al.[18]

This increase in prevalence may reflect the international trend of rising syphilis infections.[36] Another plausible explanation is that the PALM scheme favours workers from rural and remote settings to avoid the brain drain from formal urban workforces.[4] Therefore, this cohort may have had less access to health care than their urban counterparts who were screened by Mark et al.[18] and; therefore, have higher yaws or syphilis prevalence.[37–39]

The absence of reported lesions, clinical signs and symptoms and follow-up nucleic-acid amplification testing confirming subspecies of infection, made it difficult to infer which treponema subspecies was implicated in this group. One of the authors (LH) has extensive experience in sexual and reproductive health in the Solomon Islands, and via application of clinical equipoise believes this most likely reflects syphilis, rather than yaws. Furthermore, there was no statistical difference between those <25 years and older. Extensive eradication efforts involving mass drug administration in recent decades likely reduced the yaws exposure for the younger generation of workers, and therefore should result in negative treponemal serology in the younger age group, but this was not reflected in our analysis, supporting the theory that might be syphilis rather than pertenue.[38,39]

It is likely participants with reactive CMIA/TPPA and elevated RPR that may be true infectious syphilis cases. This is supported by the high proportion of other STIs identified in this group, suggesting there are opportunities for transmission. Clinically, all treponeme infections require antibiotic treatment due to potential severe sequelae of infection. In this study, all treponemal-positive cases were treated with antibiotics covering both syphilis and yaws (azithromycin and doxycycline, or benzylpenicillin long-acting). The distinction is more relevant for public health interventions that require different prevention strategies.

Limitations

This study had several limitations. Firstly, migrant workers are not representative of the greater Solomon Islands population; therefore, the results demonstrated may not be generalisable. However, the high participation rate in the STI screen by this group limits the effect of selection bias within this group. Second, whilst serological testing for HIV and syphilis were robust, urine sampling for chlamydia and gonorrhoea were less sensitive than vaginal swabbing in women. Therefore, using urinary samples could increase false negative results among some female participants. Chlamydia was more prevalent in females; however, this was a comparatively small proportion of

participants relative to their comparison group, which may have reduced the reliability of prevalence estimates.

The enhanced surveillance survey used to collect information on syphilis cases was based on the Australian standardised national case report form. Adjustments were made to reflect the population, but further tool refinement could have yielded more information. For example, explicitly questioning whether participants' sexual partner was a guest worker from their cohort, from another employer or an Australian resident would help define any risk to host communities. Recall bias likely also affected the data, with most participants unlikely to remember treatment for childhood sores, which may indicate historic yaws.[40]

In addition, cultural differences between Australia and the Pacific Islands may influence self-reported data. Information collected in case report forms could not be independently verified and relied on the answers provided by participants. For example, some participants denied having symptoms despite elevated RPRs and, therefore, did not have a genital examination and swabbing. It is possible some participants withheld sensitive information on sexual health due to stigma.[16] Furthermore, participants might be reluctant to disclose same-sex intercourse due to the illegality of homosexuality in the Solomon Islands.[41] Language and cultural barriers may have also caused a misunderstanding when asking about 'partners' with participants describing their long-term spouses rather than recent casual sex encounters. In addition, guest workers might be fearful of the consequences to their employment if they were to report instances of sexual assault, coercion or transactional sex in the workplace and, therefore, would be reluctant to report these.

Generalisability

This research is novel as it provides a snapshot of STI and treponemal positivity in a Solomon Islands population, including both men and women, the likes of which have not previously been published. However, generalisability is limited by the selection bias of having fit, healthy, manual labourers aged 21–49 years eligible for employment. Nonetheless, this study is likely generalisable to PALM workers in Australia and thus an important consideration as the numbers joining this program continue to grow.

Further qualitative research to better understand the sexual behaviours and risk profiles of PALM workers would be useful to target risk mitigation strategies. Using a service such as TRUE Relationships and Reproductive Health, Health in My Language, to use culturally appropriate and trained health care workers to conduct interviews would likely yield the most meaningful results.

Conclusion

In conclusion, this study has demonstrated a high rate of STIs and treponemal positivity in a group of mainly Solomon Islands guest workers based in Australia. These results are novel and contribute significantly to the literature as they provide a surveillance sample from a cohort of men and women in a community setting. The high rates of both chlamydia and treponemal positivity indicate these conditions remain problematic in the Solomon Islands. This study may provide data to guide Solomon Island Health authorities in managing these conditions and could inform Australian PALM authorities on priority health interventions, such as STI screening on entry to Australia. Australian public health units must work collaboratively with the Department of Employment and Workplace Relations to establish risk mitigation and treatment pathways to manage the burden of STIs and treponemal positivity in the PALM workforce and minimise any risk of propagation of infections to host communities.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics

Ethics exemption was received from the Townsville Hospital Health Service Human Research Ethics Committee's Audit, Quality and Innovation Review Panel, THHSACQUIRE1666.

References

1. Kanan L, Putt J. *Safety and wellbeing in Australia's Pacific labour mobility scheme*. 2023 Oct 31 [cited 2024 Jan 29]; Available from: https://openresearch-repository.anu.edu.au/handle/1885/305641.
2. Petrou K, Dun O, Farbotko C, Kitara T. Pacific labour mobility on pause: consequences of temporary immobility during the pandemic. In: Campbell Y, Connell J, editors. *COVID in the Islands: a comparative perspective on the caribbean and the pacific [Internet]*. Singapore: Springer Nature; 2021. p. 299–319. Available from: https://doi.org/10.1007/978-981-16-5285-1_17. [cited 2024 Mar 11].
3. Australian Government Department of Foreign Affairs and Trade [Internet]. [cited 2024 Jan 29]. Pacific labour mobility – discussion paper. Available from: https://www.dfat.gov.au/about-us/publications/pacific-labour-mobility-discussion-paper.
4. Department of Worker Employment Relations CC. *Optimising PALM scheme delivery in Australia Discussion paper [Internet]*. 2022 [cited 2024 Jan 29]. Available from: https://www.dewr.gov.au/pacific-australia-labour-mobility-scheme/resources/optimising-palm-scheme-delivery-australia-discussion-paper.
5. Expanding and improving the PALM scheme - August 2022.pdf [Internet]. [cited 2024 Jan 29]. Available from: https://www.palmscheme.gov.au/sites/default/files/2022-09/Expanding%20and%20improving%20the%20PALM%20scheme%20-%20August%202022.pdf.
6. PALM scheme data | PALM scheme [Internet]. [cited 2024 Oct 17]. Available from: https://www.palmscheme.gov.au/palm-scheme-data.
7. Health insurance | PALM scheme [Internet]. [cited 2024 Jan 29]. Available from: https://www.palmscheme.gov.au/resources/health-insurance.
8. Wang W, Wei C, Buchholz ME, Martin MC, Smith BD, Huang ZJ, et al. Prevalence and risks for sexually transmitted infections among a national sample of migrants versus non-migrants in China. *Int J STD AIDS* 2010 Jun;**21**(6):410–5.
9. Zou X, Chow EP, Zhao P, Xu Y, Ling L, Zhang L. Rural-to-urban migrants are at high risk of sexually transmitted and viral hepatitis infections in China: a systematic review and meta-analysis. *BMC Infect Dis* 2014 Dec;**14**(1):490.
10. Narushima M, McLaughlin J, Barrett-Greene J. Needs, risks, and context in sexual health among temporary foreign migrant farmworkers in Canada: a pilot study with Mexican and caribbean workers. *J Immigr Minority Health* 2016 Apr 1; **18**(2):374–81.
11. Auchus IC, Kama M, Bhuiyan RAK, Brown J, Dean D. Chlamydial and gonorrheal neglected sexually transmitted diseases among Pacific Islanders of the Western Pacific Region—a narrative review and call to actionFoster GM, editor. *PLoS Neglected Trop Dis* 2023 Mar 16;**17**(3):e0011171.
12. Cousins S. The fastest growing HIV epidemic in the western Pacific. *Lancet HIV* 2018 Aug;**5**(8):e412–3.
13. Cliffe SJ, Tabrizi S, Sullivan EA, Pacific Islands Second Generation HIV Surveillance Group. Chlamydia in the Pacific region, the silent epidemic. *Sex Transm Dis* 2008 Sep;**35**(9):801–6.
14. Details for: Second generation surveillance surveys of HIV, other STIs and risk behaviours in six Pacific island countries (2004-2005) / 〉 WHO HQ Library catalog [Internet]. [cited 2024 Feb 11]. Available from: https://kohahq.searo.who.int/cgi-bin/koha/opac-detail.pl?biblionumber=30360.
15. Taylor MM, Wi T, Gerbase A, Thwin SS, Gottlieb S, Babovic MT, et al. Assessment of country implementation of the WHO global health sector strategy on sexually

transmitted infections (2016-2021). In: Dionne-Odom J, editor. *Plos one*, vol. 17; 2022 May 4. p. e0263550. 5.
16. Tukuitonga DC. Pacific sexual health and well-being shared agenda 2015-2019.
17. Riddell MA, Vallely LM, Mengi A, Badman SG, Low N, Wand H, et al. Point-of-care testing and treatment of sexually transmitted and genital infections to improve birth outcomes in high-burden, low-resource settings (WANTAIM): a pragmatic cluster randomised crossover trial in Papua New Guinea. *Lancet Global Health* 2024 Apr;**12**(4):e641–51.
18. Marks M, Kako H, Butcher R, Lauri B, Puiahi E, Pitakaka R, et al. Prevalence of sexually transmitted infections in female clinic attendees in Honiara, Solomon Islands. *BMJ Open* 2015 Apr 28;**5**(4):e007276–e007276.
19. Chan R. Sexually transmitted infections in Asia and the Pacific–an epidemiological snapshot. *Sex Transm Infect* 2011 Dec 1;**87**(Suppl 2):ii14–5.
20. Stokes JET, Evans KE, Linton CL. Incidence of asymptomatic gonorrhoea in antenatal patients, auki, Solomon Islands. *Trop Doct* 1982 Jul;**12**(3):114–6.
21. Hicks Charles B, Clement Meredith. Syphilis: treatment and monitoring. In: *Syphilis [internet]. Up to date*; 2023. Available from: https://www.uptodate.com/contents/syphilis-treatment-and-monitoring.
22. Chen T, Wan B, Wang M, Lin S, Wu Y, Huang J. Evaluating the global, regional, and national impact of syphilis: results from the global burden of disease study 2019. *Sci Rep* 2023 Jul 14;**13**(1):11386.
23. Lifigao M, Nasi T, Titiulu C, Lumasa S, Duke T. Congenital syphilis in Honiara, Solomon Islands. *J Trop Pediatr* 2020 Dec 1;**66**(6):583–8.
24. Korenromp EL, Wi T, Resch S, Stover J, Broutet N. Costing of national STI program implementation for the global STI control strategy for the health sector, 2016-2021. Barnabas RV. *PLoS One* 2017 Jan 27;**12**(1):e0170773.
25. Marks M, Katz S, Chi KH, Vahi V, Sun Y, Mabey DC, et al. Failure of PCR to Detect Treponema pallidum ssp. pertenue DNA in blood in latent yawsSmall PLC, editor. *PLoS Neglected Trop Dis* 2015 Jun 30;**9**(6):e0003905.
26. Giacani L, Lukehart SA. The endemic Treponematoses. *Clin Microbiol Rev* 2014 Jan;**27**(1):89–115.
27. Gill H, Danesh-Meyer HV, Sims JL, Nisbet M, Niederer RL. Ocular syphilis in Pacific peoples-are we making misdiagnoses secondary to yaws? *N Z Med J* 2020 Apr 24;**133**(1513):53–60.
28. Infectious and communicable diseases - Australian institute of health and welfare [Internet]. [cited 2024 Jan 29]. Available from: https://www.aihw.gov.au/reports/australias-health/infectious-and-communicable-diseases.
29. Lucas RE. A survey to gather sexually transmitted disease epidemiological and management data in the Solomon Islands. *Trop Doct* 2000 Apr;**30**(2):97–9.
30. Dielissen PW, Teunissen DA, Lagro-Janssen AL. Chlamydia prevalence in the general population: is there a sex difference? a systematic review. *BMC Infect Dis* 2013 Nov 11;**13**:534.
31. *HIV, viral hepatitis and sexually transmissible infections in Australia: annual surveillance report*. 2023 [Internet]. [cited 2024 Jan 29]. Available from: https://www.kirby.unsw.edu.au/research/reports/asr2023.
32. Kaldor JM, Effler P, Sarda R, Petersen G, Gertig DM, Narain JP. HIV and AIDS in Asia and the Pacific: an epidemiological overview. *AIDS Lond Engl* 1994;**8**(Suppl 2):S165–72.
33. Zhang L, Tao Y, Woodring J, Rattana K, Sovannarith S, Rathavy T, et al. Integrated approach for triple elimination of mother-to-child transmission of HIV, hepatitis B and syphilis is highly effective and cost-effective: an economic evaluation. *Int J Epidemiol* 2019 Aug 1;**48**(4):1327–39.
34. MacLaren D, Redman-MacLaren M, Timothy-Harrington R, Asugeni R, Muse E, Jimuru E, et al. Strengthening capacity for local evidence to inform local responses to HIV in a remote Solomon Islands health service. *West Pac Surveill Response J WPSAR* 2015 May 6;**6**(2):58–65.
35. Solomon Islands guideline host - apps on google play [Internet]. [cited 2024 Jan 29]. Available from: https://play.google.com/store/apps/details?id=com.tgl.guidelines.solomonislands&hl=en.
36. Tao YT, Gao TY, Li HY, Ma YT, Li HJ, Xian-Yu CY, et al. Global, regional, and national trends of syphilis from 1990 to 2019: the 2019 global burden of disease study. *BMC Public Health* 2023 Apr 24;**23**(1):754.
37. Marks M, Esau T, Asugeni R, Harrington R, Diau J, Toloka H, et al. Point-of-care tests for syphilis and yaws in a low-income setting – a qualitative study of healthcare worker and patient experiencesRicaldi JN, editor. *PLoS Neglected Trop Dis* 2018 Apr 19;**12**(4):e0006360.
38. Marks M, Vahi V, Sokana O, Puiahi E, Pavluck A, Zhang Z, et al. Mapping the epidemiology of yaws in the Solomon Islands: a cluster randomized survey. *Am J Trop Med Hyg* 2015 Jan 7;**92**(1):129–33.
39. Marks M, Sokana O, Nachamkin E, Puiahi E, Kilua G, Pillay A, et al. Prevalence of active and latent yaws in the Solomon Islands 18 Months after azithromycin mass drug administration for trachoma. Vinetz JM. *PLoS Neglected Trop Dis* 2016 Aug 23;**10**(8):e0004927.
40. Sarkodie F, Owusu-Dabo E, Hassall O, Bates I, Bygbjerg IC, Ullum H. Recall of symptoms and treatment of syphilis and yaws by healthy blood donors screening positive for syphilis in Kumasi, Ghana. *Int J Infect Dis* 2016 Sep;**50**:72–4.
41. Curtis J, Dickson A, Gadd E, Robinson T. *House of commons library* [cited 2024 Jan 29]. *LGBT+ rights and issues in Pacific islands*. 2022. Available from: https://researchbriefings.files.parliament.uk/documents/CBP-9502/CBP-9502.pdf.

Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anzjph.2025.100241.