# Hawai‘i Journal of Medicine & Public Health

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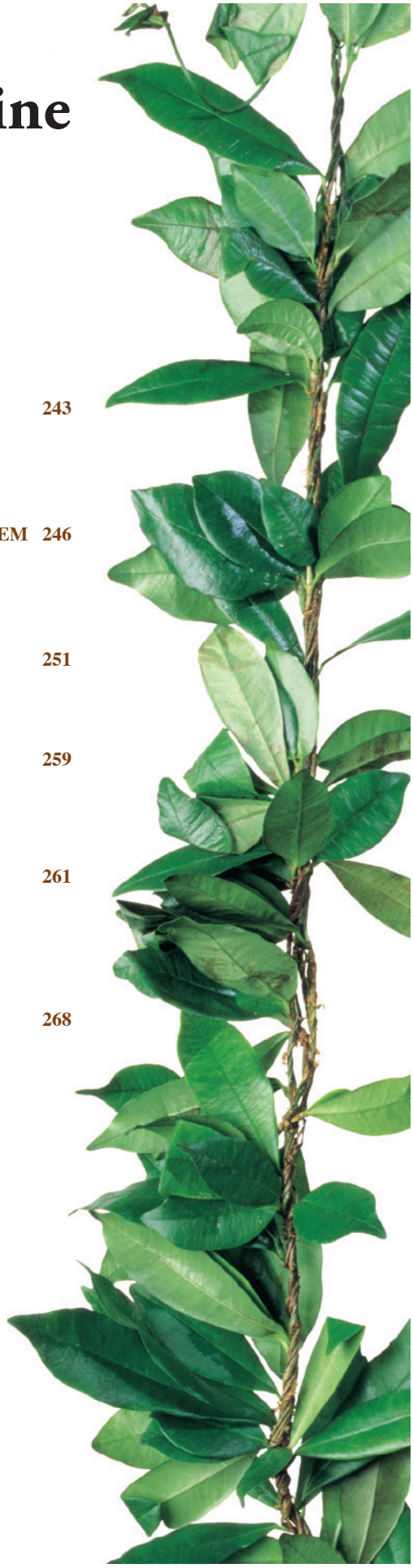

# Hawai‘i Journal of Medicine & Public Health

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*D. Varez*

# Adult Onset Henoch-Schonlein Purpura associated with a Metastatic Malignancy of Unknown Primary Origin

Therese Posas-Mendoza MD; Dayna Lucuab-Fegurgur MD; and Jefferson Roberts MD

## Abstract

*The cause of Henoch-Schonlein purpura, or IgA vasculitis, is largely unknown. It has been associated with infections, other rheumatologic triggers, and adverse drug reactions. Rarely, adult Henoch-Schonlein purpura is also associated with solid-tumor malignancies. We present the case of a 66 year-old woman who presented with Henoch-Schonlein purpura associated with a metastatic malignancy of unknown primary origin. We recommend that adult patients presenting with Henoch-Schonlein purpura, especially those with no identifiable trigger, receive age-appropriate work-up for potential malignancy.*

## Keywords

*Adult Henoch-Schonlein purpura; malignancy*

## Introduction

Henoch-Schonlein Purpura (HSP), or immunoglobulin A vasculitis, is an immune-mediated small-vessel vasculitis with unknown underlying etiology. It is the most common form of vasculitis in children aged 3-15 years, with an annual incidence of 3-26.7 cases per 100,000 children. It is less common in adults, with an incidence of 0.8-1.8 cases per 100,000 adults.[1] The classic tetrad of HSP includes renal insufficiency, abdominal pain, arthritis/arthralgia, and palpable purpura. Arthritis/arthralgias are more frequently observed in children. Anemia, diarrhea, and more severe renal insufficiency are more frequently observed in adults.[2] Findings on routine blood tests are non-specific, and diagnosis is often based on clinical manifestations alone particularly in children. Biopsies may be necessary in adults given the lower incidence of the disease in this population. The characteristic finding of HSP is leukocytoclastic vasculitis with IgA immune complexes.[3] The prognosis of IgA vasculitis is excellent in children, but the risk of persistent renal disease is increased in adults.[4]

Though no definitive cause for HSP has been found, many infectious and chemical triggers have been identified. A rare association has been found between malignancy and HSP. Thirty-one cases of adult-malignancy associated HSP have been reported worldwide. Patients were mostly male and over 60 years old with solid tumors. [5]

We present the case of a patient presenting in a rural setting with acute dyspnea, ascites, and palpable purpura. She was found to have biopsy proven HSP and malignancy of unknown primary with peritoneal carcinomatosis.

## Case Presentation

A 66 year-old woman with a past medical history significant for insulin-dependent type 2 diabetes mellitus, hypertension, and heart failure with preserved ejection fraction presented to a rural Pacific Island hospital with a chief complaint of altered mental status and dyspnea. She was found to have severe hypoglycemia and community acquired pneumonia, and she was subsequently admitted. During her hospitalization, she developed acute onset ascites and worsening hypoxia and dyspnea despite broad-spectrum antibiotics. Computed tomography (CT) angiogram of the chest revealed a subsegmental pulmonary embolism that was treated with anticoagulation. CT of the abdomen and pelvis as well as pelvic ultrasound did not reveal any significant abnormalities. The patient was then transferred to a slightly larger facility on a neighboring island 16 days after her initial admission. During her hospitalization at this facility, her dyspnea progressed and her ascites persisted. She developed palpable purpura and petechiae on her abdomen and lower extremities. At this time, her laboratory studies were notable for worsening renal function with a creatinine of 3.9 mg/dL, lactic acidosis, a normal platelet count, and a SAAG (serum albumin ascites gradient) of 1.1 with no evidence of spontaneous bacterial peritonitis on ascitic fluid analysis. Due to the limitations of the second hospital, she was transferred to a tertiary facility on Oahu for further management. She continued to have persistent ascites, acute kidney injury, and palpable pupura. On admission to the tertiary facility, she also began to complain of intermittent abdominal pain. Rheumatologic work-up was unremarkable with the exception of an elevated ESR (erythrocyte sedimentation rate) of 54 mm/hr. Creatinine had improved slightly to 1.76 mg/dL. Urinalysis revealed >182 dysmorphic RBCs (red blood cells) and 2+ protein. CBC (complete blood count) revealed mild leukocytosis 12.9 x $10^9$ cells/liter (normal 4.0-14.5 x $10^9$ cells/liter) and thrombocytosis 477 x $10^9$ cells/liter (normal 150-400 x $10^9$ cells/liter). Dermatology was consulted and a skin biopsy revealed leukocytoclastic vasculitis with IgA deposition by immunofluorescence consistent with a diagnosis of HSP (Figures 1 and 2). An MRI (magnetic resonance imaging) of the abdomen was remarkable for gallbladder distention with a 3cm stone at the neck of the gallbladder, and omental caking suggestive of peritoneal carcinomatosis. She was later found to have an elevated CEA (carcinoembryonic antigen) of 83.9 mcg/L, CA 19 9 of 9160 U/mL, and CA 125 of 79.7 IU/mL. The patient's hospital course was complicated by intermittent upper and lower GI bleeding prompting discontinuation of anticoagulation for her pulmonary embolism. Esophagogastroduodenoscopy (EGD) and colonoscopy were negative for malignancy or evidence of mucosal compromise. Magnetic resonance cholangiopancreatography (MRCP) was limited by the patient's body habitus. Omental biopsy results and cytology of subsequent peritoneal fluid samples were consistent with

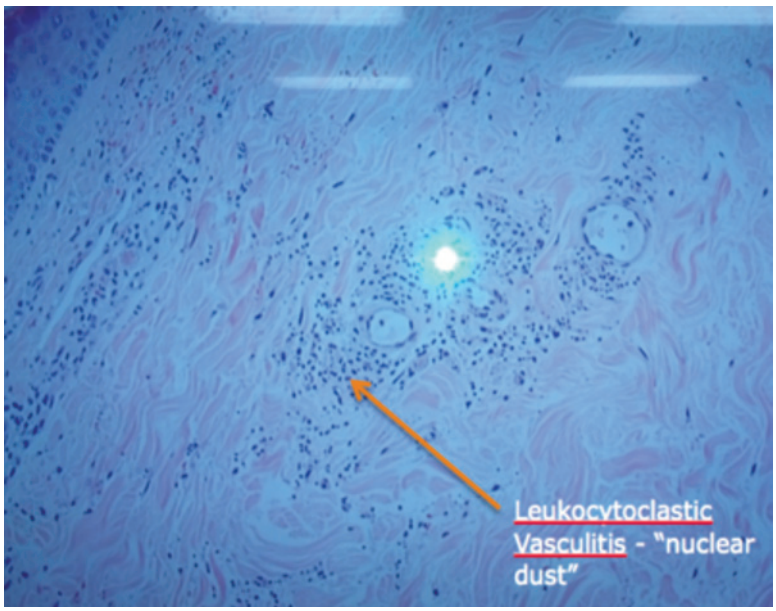


Figure 1. Low power view of the skin biopsy revealing leukocytoclastic vasculitis.

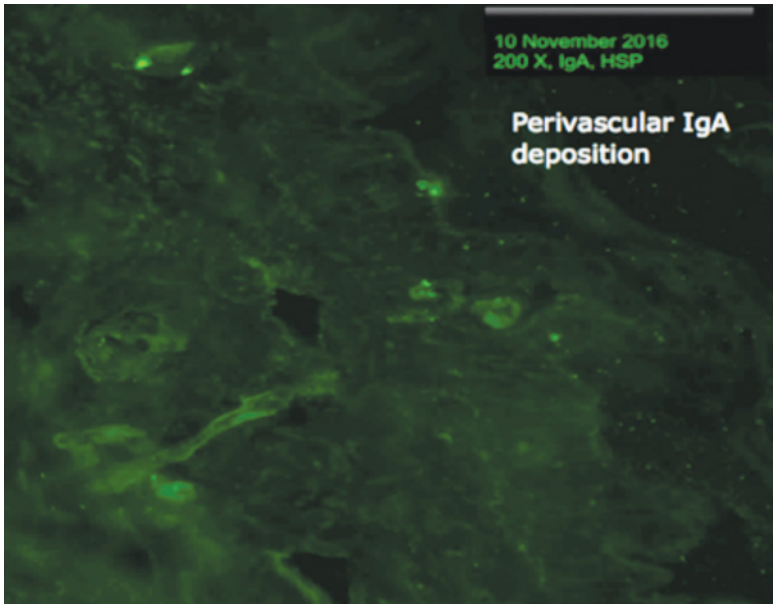


Figure 2. Immunofluorescence of the skin biopsy revealing pervascular IgA deposition.

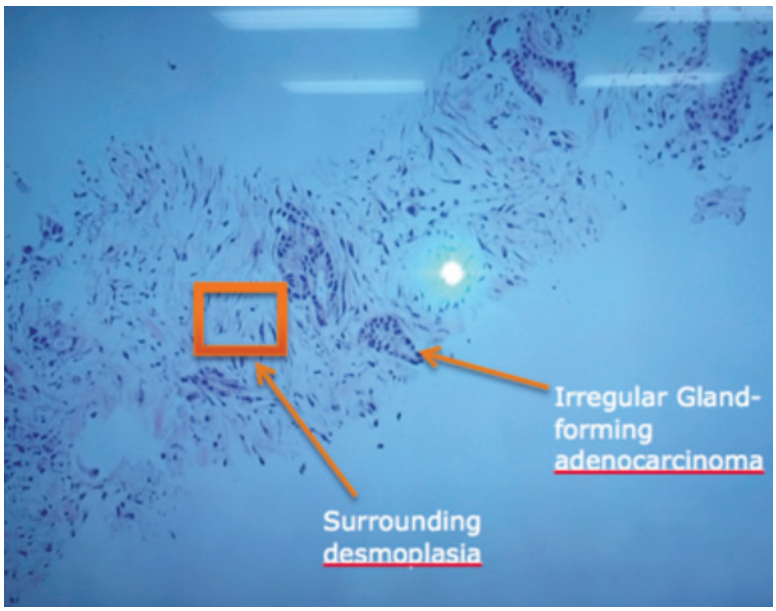


Figure 3. Low power view of the omental biopsy revealing irregular gland-forming adenocarcinoma with surrounding desmoplasia.

adenocarcinoma (Figure 3). Given the severity of her diagnosis, the patient made an informed decision to transition to hospice and return to her native island in the Pacific.

## Discussion

We present a case of malignancy-associated Henoch-Schonlein purpura, which presented with palpable purpura, abdominal pain, renal insufficiency, and biopsy proven IgA mediated leukocytoclastic vasculitis. Most commonly, HSP is associated with infections of mucosal sites. Other reported triggers include ankylosing spondylitis, systemic lupus erythematosus, inflammatory bowel disease, rheumatoid arthritis, cryoglobulinemia, and adverse drug reactions.[6] Rarely, adult HSP is associated with malignancy. Solid tumors are more commonly associated with HSP than hematologic malignancies, and lung cancer is the most common solid malignancy associated with HSP. The exact correlation is unclear, but may be related to the expression of tumor-associated antigens triggering an aberrant antibody reaction, and subsequently immune complex deposition within vessel walls. Tumor-associated antigens also reduce the clearance of circulating immune complexes and may lead to shifting of immunoglobulin subtypes from IgM to IgA leading to vascular inflammation. The treatment of tumors may also cause HSP, due to the release of tumor-associated antigens during tumor cell destruction.[7] Review of the literature shows that patients with malignancy associated HSP tend to have a partial response to immunosuppressive therapies, including prednisone, hydroxychloroquine, dapsone, topical calcineurin inhibitors, and topical glucocorticoids. Many patients may require treatment of the underlying malignancy to achieve complete remission of HSP.[6] Our patient chose to pursue hospice, and therefore did not receive treatment for her malignancy of unknown primary or of HSP.

We recommend that adult patients presenting with HSP, especially those with no identifiable trigger and with only partial response to immunosuppressive therapy, receive age-appropriate work-up for potential malignancy.

## Conflict of Interest

None of the authors identify any conflicts of interest.

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# Assessing the Accuracy of Physician Self-disclosed PID Reporting: A Comparison of Data from a Physician Survey and Actual PID Case Reports from a State Surveillance System

Misty Y. Pacheco DrPH and Alan R. Katz MD

## Abstract

*Pelvic inflammatory disease is a state-mandated notifiable disease in Hawai'i. A survey assessing pelvic inflammatory disease (PID) reporting to the Hawai'i Department of Health (HDOH) PID surveillance system, was administered to physicians in Hawai'i in April 2012. To measure the accuracy of self-disclosed PID reporting, data from the survey were compared to HDOH PID surveillance system case reports. Concordance between the two data sources was assessed using Cohen's kappa statistic. We first linked data by physician name. An adjusted kappa was also calculated to minimize prevalence and bias effects. A second analysis linked data according to physician name or practice setting. In the name-based analysis, the HDOH PID surveillance database successfully matched only ten of 118 physicians (8.5%) who self-disclosed reporting a PID case. Only "slight agreement" (k= 0.09, 95% confidence interval [CI]: 0.02-0.16) was demonstrated between the two databases. The prevalence-adjusted, bias-adjusted kappa demonstrated "moderate agreement" (κ=0.53, 95% CI: 0.45-0.60). In the second (name or practice-based setting) analysis, 77 physicians with linkages were found in the HDOH surveillance database, reflecting "moderate agreement" (κ=0.52, 95% CI 0.43, 0.61). Our findings provide evidence that individual physicians are submerging their case reports into group practice/HMO aggregate reports and not reporting individually as legally mandated and hence are compromising PID surveillance quality.*

## Keywords

*Concordance, Pelvic inflammatory disease, surveillance*

## Abbreviations

*CDC: Centers for Disease Control and Prevention*
*CT: Chlamydia trachomatis*
*HDOH: Hawai'i Department of Health*
*HMO: Health Maintenance Organization*
*NG: Neisseria gonorrhoeae*
*OB/GYNs: Obstetrician/Gynecologists*
*PABAK: Prevalence-Adjusted Bias-Adjusted Kappa*
*PID: Pelvic Inflammatory Disease*

## Introduction

Pelvic Inflammatory Disease (PID) is a spectrum of inflammatory disorders of the upper female reproductive tract. Many cases are related to sexually transmitted bacteria, most notably *Neisseria gonorroheae* and *Chlamydia trachomatis*. These bacteria can move from the cervix to the uterus, fallopian tubes, and ovaries.[1] Serious consequences, such as chronic pelvic pain, ectopic pregnancy, and infertility can occur. Prompt detection of PID and treatment with antibiotics are important to prevent further damage. However, it is difficult to achieve early detection because symptoms of PID are often mild, vague, or unrecognized and any damage that has already occurred is irreversible.[1]

Sexually transmitted disease (STD)-related infertility is a major health issue in the United States (US). In 1998, the Centers for Disease Control and Prevention (CDC) collaborated with the Office of Population Affairs of the Department of Health and Human Services to create the Infertility Prevention Project (IPP), an effort to prevent STD-related infertility.[2] Infertility itself is difficult to diagnose and track on a population level. "PID is a more proximal outcome associated with STD-related infertility, making it a more suitable marker in measuring successes in reducing infertility."[3] Hence accurate surveillance for PID occurrence is an important public health objective. The CDC estimates that approximately one million women in the United States are diagnosed with PID annually.[4] Although PID is a serious disorder, it is "notifiable" in only 19 states, as well as the District of Columbia and Puerto Rico. These states and territories legally require reporting of PID diagnoses, however, reporting is not consistent or complete.[5] PID is a state-mandated notifiable disease in Hawai'i. The Hawai'i Department of Health (HDOH) started collecting PID case reports as a component of its infectious disease surveillance activities since the late 1980s in conjunction with the CDC's IPP. It became an official notifiable disease in 2001. Data obtained from surveillance are disseminated to entities to plan and evaluate programs, develop policy, and appropriately allocate resources. More specifically, a surveillance system is important to describe trends and define the natural history of a disease, detect epidemics, reveal disease occurrence-pattern details, track changes in health practices, and evaluate control and prevention measures. The HDOH administers a "passive" surveillance system, which puts responsibility of reporting PID on the diagnosing physician. Hawai'i physicians who practice in inpatient settings (hospitals, emergency departments), health maintenance organizations (HMO) or physician groups, can submit their case report forms under the facility or physician group/HMO. A physician can either complete the case report form themselves or have another designated person complete and submit the form on their behalf. However, the state statute asks for the diagnosing physician's name on the case report form. Therefore, if the form is not submitted under the diagnosing physician's name, it will be found in the data base but without the diagnosing physician's name.

A study was conducted to analyze the severity of the problem of under-reporting of PID in Hawai'i.[6] Data on PID hospitalizations from 2007-2010 was extracted from the Hawai'i Health Information Corporation (HHIC) database (based on International Classification of Diseases – 9th revision – Clinical Modification [ICD-9] codes to identify PID). Diagnosed PID hospitalized cases were identified and compared to data from the HDOH PID surveillance system for the same time period. From 2007 – 2010, a total of 240 unique cases of PID were

reported through the HDOH PID surveillance system. During the same period 828 unique cases of PID were diagnosed in Hawai'i hospitals. This analysis confirmed that PID is under-reported in the state of Hawai'i.

To further assess threats to the accuracy of PID surveillance in Hawai'i, a survey was administered to physicians in Hawai'i.[8] One of the questions asked if they had ever reported a case of PID in the past 11 years (since 2000). Research on the validity of self-reported data from surveys suggests that misreporting is a common source of error, especially when questions are sensitive in nature.[7] Question sensitivity is a concern when disclosure could be threatening or is socially undesirable. Threats of disclosure refer to concern about one's answer becoming known to a third party and/or leading to negative consequences.[7] Answers given about an attitude or behavior that deviates from the norm are considered to be socially undesirable.[7] Since PID reporting is mandated in the State of Hawai'i, questions relating to PID reporting may be perceived as sensitive. A threat of disclosure exists because if a PID case is not reported, the State of Hawai'i could impose a fine on the physician. In addition, abiding by the law and disease reporting, which benefits the health of the public, could very well be considered a social norm. A strategy used by researchers to address the accuracy of self-reported data involving sensitive questions in surveys is to triangulate self-reported data with data from another source, such as a database, register, or administrative data set.[8] Data from these sources provide a validity check for the self-reported data. A study from Quebec, Canada examined the validity of survey data on the use of mental health services, since the topic is sensitive.[8] Data from a community health survey was linked to a government-managed health services register. The study revealed that 75% of people did not report their use of mental health services. Authors concluded that social desirability was a factor in the observed discordance between the two data sources. Bertalli, et al, (2011) linked electronic records from a national blood donation service to self-reported donation history to examine the agreement between the two. There was 87% concordance between the data sources and a high level of agreement (kappa statistic: 0.74).[9] Similar to reporting diseases for public health benefit, giving blood to possibly save a life, is socially desirable.

The main objective of this study was to examine the accuracy of physicians' self-reported PID data by measuring the concordance between physicians' self-reported data in a survey and the HDOH PID surveillance data. By assessing the accuracy of self-reported data with the surveillance system, we could also assess the adherence of reporting per state regulations. This is important, because it could provide us with further insight into what factors may be further threatening the accuracy of PID case reporting. Two separate analyses were done in this study. In the first analysis, data linkage was by individual physician name. To address the issue of physicians submitting case reports by facility/provider group/HMO, a second analysis was also done, which linked data by physician name or practice setting.

## Methods

### Analysis I

*Survey Study:*

A PID-reporting survey developed by the San Francisco Department of Public Health was modified for this study.[10] The revised one-page survey was piloted in a convenience sample of five physicians practicing family medicine, obstetrics and gynecology, and internal medicine to ensure clarity and validity. The final survey took approximately 5-10 minutes to complete.

The HDOH uses a list compiled by The Hawai'i Department of Commerce and Consumer Affairs (DCCA), comprised of physicians from specific specialties, to conduct mailings. Important notifications on disease outbreaks or updated treatment guidelines are sent to physicians on this list.

For this study, we used the DCCA list, which included all licensed obstetrician/gynecologists, internal medicine physicians, family practice physicians, pediatricians, and emergency medicine physicians in the state of Hawai'i with a local Hawai'i address (N=1,202).

A packet, which included the survey, a stamped addressed return envelope, and a cover letter endorsing the study, was mailed to each physician in April 2012. The endorsement letter was signed by HDOH and the presidents of the Hawai'i chapters of the targeted medical specialty organizations (American College of Obstetricians and Gynecologists, American Academy of Family Physicians, and American Academy of Pediatrics). The letter also stated that their confidential and voluntary response was very important to the scientific validity of this study. One week later, a reminder/thank-you postcard was mailed to each physician. Non-respondents were sent a second packet two weeks after the postcard.

The University of Hawai'i Committee on Human Subjects as well as the HDOH Institutional Review Board (IRB) approved this research.

The survey asked physicians if they reported any cases of PID to the HDOH in the previous 11 years (January 1, 2000 through December 31, 2011), and if so, they were asked to give the number of diagnosed cases (they could approximate if unsure). One of the demographic questions on the survey asked physicians to identify their practice setting. The practice settings were categorized into inpatient (private hospital, public hospital), HMO/outpatient (private practice, community health center, HMO), and other (military, other).

*HDOH PID Surveillance System Linkage:*

Physician's self-reported information was compared to HDOH PID surveillance data over the same time period (2000 through 2011). According to Hawai'i State law, once a physician diagnoses a case of PID, they have three business days to complete the case report form and submit it to the HDOH via phone, mail, or fax. The reporting form is available online at the HDOH website or can be ordered (at no charge) by fax. Once the form is received, the information from the form is entered into a database.[11]

For confidentiality, HDOH linked the physician names from the survey to the surveillance database. Each physician was assigned a unique ID number. Each physician who self-reported that he/she had reported a case of PID from 2000 through 2011 was compared with the surveillance database to determine concordance.

*Data Analysis:*
Analysis was conducted using StatXact version 4.0.1 (Cytel Software, Cambridge, MA). Concordance between the two data sources was assessed in 2 x 2 contingency tables using the Cohen's Kappa (κ) statistic. The κ statistic indicates the level of agreement between two sources beyond that attributable to chance alone.[12]

The magnitude of the kappa is affected by a prevalence or bias effect. The prevalence index, is reflected in the difference between the cells of agreement in the 2 x 2 contingency table ("a" and "d" cells) [See Tables 1-3]. If the prevalence index is high, chance agreement is high, resulting in a low kappa. The extent to which two sources disagree on the proportion of cases (positive or negative) is reflected in the difference between the cells of disagreement, "b" and "c," and is called the bias effect. When kappa is small, the effect of bias is greater.[13] To determine if any prevalence or bias effects exist, the prevalence index and bias index were calculated by taking the absolute value of the differences of the paired cells over "n." The adjusted kappa was calculated and is presented alongside the obtained value of kappa to show the possible effects of prevalence and bias. The adjusted kappa is obtained by computing the average of the diagonal concordant cells (of the 2 x 2 contingency table) then substituting that average value for the actual values in the concordant cells.[13] The kappa coefficient that is then calculated with these new values is called the PABAK (prevalence-adjusted bias-adjusted kappa).

The number of cases of PID that a physician self-reported was then compared to the number of actual cases reported by that physician found in the HDOH PID surveillance database.

**Analysis II**
*Survey Study:*
Data for analysis II were collected from the same survey as described in analysis I. In addition to physician name-based reports, the practice setting variable was also used in this analysis.

*HDOH PID Surveillance System Linkage:*
Self-reported data from the survey study were compared to the HDOH PID surveillance database described in analysis I. Practice setting (inpatient, HMO/outpatient, other) was also a component of the HDOH PID surveillance database. In analysis II, HDOH identified PID case reports from 2000-2011 were compared by physician name and practice setting.

*Data Analysis:*
The same data analysis conducted in analysis I was done with the data in analysis II. However, in analysis II, in addition to focusing on linked named-based reports, we attempted to link non-name-based reports with practice settings.

## Results

Of the total 1,202 surveys that were mailed, 140 (11.6%) were determined to be ineligible, including 58 that were returned unopened because of change of address, 31 associated with physicians who were retired, 17 related to physician no longer at that specific facility, 12 associated with physicians no longer practicing medicine, 11 duplicates, 8 from respondents who said that the survey did not apply to them, and 3 sent to physicians who were deceased. The remaining 1,062 were deliverable, of which 486 were returned completed for a response rate of 45.8%. Comparing the 486 respondents against the 576 non-respondents, there was a significant association between the groups by specialty, $X^2 = 26.819$ (df=4, n=1.063), $P$=.001. With highest response rates for OBGYNs.

Of the 486 physicians who returned and completed the survey, 118 (24.3%) answered that they reported at least one case of PID to the HDOH from 2000 to 2011. There were a total of 652 unique cases of PID reported to the HDOH surveillance database during this same time period. The HDOH PID surveillance database successfully matched 10 physicians (8.5%) who self-disclosed that they reported a case of PID to the HDOH during this interval. Concordant reporters were mostly all OB-GYNs from private practice (outpatient) settings. A little less than half of the physicians (4) self-reported the same number of PID cases as were found associated with them in the database.

**Analysis I**
Of 368 physicians who self-reported that they did not report a case of PID to the HDOH from 2000-2011, seven (1.9%) were found in the HDOH PID surveillance database as having reported a case. These physicians were considered to be the discordant group of physician reporters. Again, the majority of these physicians were OBGYNs, from private practice (outpatient) settings.

Table 1 is a cross-tabulation of the number of reported cases of PID during 2000 to 2011 from both data sources. There was "slight agreement" (κ=0.09, 95% confidence interval [CI]: 0.02-0.16, $P$=.001) between the name-based self-reported survey data and the HDOH PID surveillance database.[11] The prevalence index was calculated to be 0.72 and the bias index, 0.21. The adjusted κ, or PABAK, was 0.53, 95% CI: 0.45-0.60, $P$<.001 (Table 2), which is considered to be "moderate agreement."[12]

**Analysis II**
Of the remaining 108 physicians who completed the survey and identified themselves as having reported a case of PID from 2000-2011, 64 physicians practiced in either inpatient, HMO/outpatient, or other group settings: 12 were from inpatient settings, 25 were from HMO/outpatient settings and 27 were in the "other" group, which includes military, prison and other group facilities. Aside from the concordant (n=10) and discordant (n=7) physicians who had name-based matches to

reported PID cases in the HDOH PID surveillance database, an additional 42 inpatient, 41 HMO/outpatient and 23 "other" reporting entities (106 total) were identified by practice setting only in the HDOH PID surveillance database from 2000-2011. It is possible that any of the 60 physicians (12 inpatient, 25 HMO/outpatient, 23 Other) that self-reported that they reported a case of PID from 2000-2011 are counted in the database as one of those entities. If this is correct, a total of 77 physicians (17 name-based concordant and discordant physicians already found in the database plus 60 physicians who reported [theoretically] under an inpatient, HMO or Other entity) would have been found in the database. These 77 physicians would now be in the "a" box, and 46 physicians (106 minus 60) would be in the "c" box resulting in a kappa statistic of 0.52, 95% CI: 0.43-0.60, *P*<.001; reflecting a moderate level of agreement with virtually the same level of agreement as was found with the PABAK calculation (Table 3).

Table 1. Name-based PID Case Reports Comparing Physician Self-report withHawai'i Department of Health (HDOH) Database (κ= 0.09, 95% confidence interval: 0.02-0.16, *P*<.001)

| | | HDOH Database | | Total |
|---|---|---|---|---|
| | | Found | Not found | |
| Self Report | Reported | 10 | 108 | 118 |
| | Did not report | 7 | 361 | 368 |
| Total | | 17 | 469 | 486 |

Table 2. Name-based PID Case Reports Comparing Physician Self-report with Hawai'i Department of Health Database with Cell Frequencies Adjusted to Minimize Prevalence and Bias Effects, Giving a Prevalence-adjusted, Bias-adjusted Kappa (PABAK) (κ= 0.53, 95% confidence interval: 0.45-0.60, *P*<.001)

| | | HDOH Database | | Total |
|---|---|---|---|---|
| | | Found | Not found | |
| Self Report | Reported | 185 | 58 | 243 |
| | Did not report | 57 | 186 | 243 |
| Total | | 242 | 244 | 486 |

Table 3. Name-based or Practice Setting-based PID Case Reports Comparing Physician Self-report with Hawai'i Department of Health Database (κ= 0.52, 95% confidence interval: 0.43-0.61, *P*<.001)

| | | HDOH Database | | Total |
|---|---|---|---|---|
| | | Found | Not found | |
| Self Report | Reported | 77 | 41 | 118 |
| | Did not report | 46 | 322 | 368 |
| Total | | 123 | 363 | 486 |

## Discussion

The purpose of this study was to examine concordance between physicians' self-reported data in a survey and the HDOH PID surveillance data. The results of analysis I indicated poor agreement between the physicians' self-reported data and the HDOH PID surveillance database looking only at name-based reporting. However, the possible explanation for this low level of concordance is that case reports from physicians practicing in inpatient settings (hospitals, emergency departments), HMOs or physician groups, are being submitted to the HDOH surveillance system under the facility or physician group/HMO, as shown in study II. When we calculate the PABAK, the level of agreement is significantly higher.

If the diagnosing physician or clinician is filling out the form using their facility or physician group name instead of their own name on the reporting form, or if a designated person from the physician group is reporting all cases seen without identifying the diagnosing physician, this potentially poses a number of problems. If the HDOH needs to follow up on a certain case for epidemiologic and control purposes, they would need to call the facility, HMO, or physician group and the latter would need to retrieve the medical record or case report for that patient, then search for the identity of the diagnosing physician, and try to contact that physician. This inefficiency could be eliminated if the physician's name was already on the form. Also, if one wanted to identify a "best practice" group of physicians who are reporting PID or a group of non-reporting physicians to target, it would be difficult without the identity of the physician. Conducting studies to analyze physician attributes for reporting and not reporting PID would be challenging. Furthermore, if different strategies for improving reporting among physicians were implemented, such as reimbursement of screening costs by insurance carriers, as is done for chlamydia screening by a main insurance carrier in Hawai'i, the physician's name would need to be on the reporting form.[14] There is a space on the current PID reporting form for the name of the diagnosing physician; apparently it is not being completed correctly. The HDOH may want to have a mechanism or policy in place where if all parts of the reporting form are not completed, the form is returned or not accepted.

The PABAK showed a substantially higher level of agreement than the non-adjusted value of kappa. Since the diagonal cells of agreement and disagreement were both asymmetrical, the prevalence and bias indices were high, resulting in a low kappa value. The magnitude of the kappa is affected by the prevalence of the attribute under consideration.[12] If this attribute is rare, the kappa statistic alone may not be a valid measurement of agreement, and a prevalence effect may exist.[13] In this study, the attribute is PID reporting. The PABAK was virtually identical to the kappa value calculated by estimating concordance using either name-based or practice based data. Previous analysis of PID case reports established that PID reporting is incomplete.[6] Furthermore, many barriers, such as the issue surrounding diagnosing PID (no gold standard, unclear PID definition, unclear diagnostic guidelines) deter physicians from diagnosing

PID, making it a rare attribute.[15] The much higher PABAK of 0.53 compared to the unadjusted kappa of 0.09, coupled with the rare attribute of PID reporting, supports the possibility of prevalence or bias effects.

There are substantial limitations to this study. Two study limitations, threat of disclosure and social desirability, were explained at the beginning of this paper. Some consequences of these limitations include responders not completing the survey (which would result in a low response rate), and responders skipping the sensitive question(s) altogether or not answering truthfully.[7] With any survey gathering historical self-reported data, there is potential for recall or memory bias.[15] We are asking physicians to disclose whether they have reported a PID case to HDOH during an 11-year period. Physicians may not remember whether or not they have reported PID within this time period. Also, some physicians who did report PID may no longer be practicing medicine in Hawai'i or may be deceased. Furthermore, according to Hawai'i Revised Statutes Section 622-58, medical records need only to be retained for seven years, so if physicians reported a case of PID more than 7 years ago, they would not be able to access that data through their records.[16] The results may not be generalizable outside of Hawai'i, and as the study included an 11-year period, the findings may not reflect current reporting practices in Hawai'i. Another major limitation is the HDOH surveillance database. Previous studies have shown that the database is incomplete due to under and/or non-reporting, so we are already working with a very small and limited sample.[6] Evidence that case reports are being submitted by groups (eg, HMOs, physician groups or hospitals) rather than individual physicians not only helps to explain the compromised kappa, but highlights an area where intervention may improve the accuracy of the current PID surveillance system.

## Conclusion

Despite these limitations, the two different analyses, as well as the additional calculation of the PABAK, suggest discordance. Further research is needed to address this systematic issue. It is also possible that a physician may have completed a case report form but it was not submitted because it was perceived to be another staff member's responsibility or because disease reporting may be handled by another physician, department, or health professional. The main problem that needs to be addressed is that individual physicians who are submerging their reports into group practice/HMO aggregate reports and not reporting individually are not following the legal mandate and compromising PID surveillance. In order to improve the accuracy of PID reporting, future studies could be conducted with physicians and key informants to obtain more information about the PID reporting process within their facilities.

## Conflict of Interest

None of the authors identify a conflict of interest.


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# Physical Activity, Nutrition, and Obesity among Pacific Islander Youth and Young Adults in Southern California: An Exploratory Study

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## Abstract

*This exploratory study aimed to assess obesity, physical activity, and nutrition among Pacific Islander youth and young adults in Southern California. A total of 129 Tongan, Samoan, and Marshallese participated in the study, including relatively similar proportions of males and females and age groups. We calculated Body Mass Index (BMI), dietary intake by a food frequency questionnaire (FFQ), and 7-day physical activity levels with accelerometers. Overall, 84% of Tongan, 76% of Samoan, and 24% of Marshallese participants were overweight or obese, with mean BMI of 31.2 and 34.3 kg/m$^2$ (for Tongan males and females), 32.3 and 33.4 kg/m$^2$ (Samoan males and females), and 25.3 and 22.1 kg/m$^2$ (Marshallese males and females). We found moderate- and vigorous-intensity physical activity (MVPA) fell below current guidelines at 38 min/day, with over 87% engaging in light-intensity PA and large sedentary times. Daily percent of energy from saturated fat, fiber/1,000 kcal and dairy intake were higher in Tongans compared to Samoans and Marshallese. Despite promising outcomes from this study, high prevalence of overweight, low physical activity levels, and high caloric intake put Pacific Islander youth and young adults at risk for a variety of health concerns and future efforts should focus on further research as well as community-wide prevention and amelioration efforts.*

## Keywords

*physical activity, nutrition, Pacific Islanders, community-based participatory research, health disparities, obesity*

## Introduction

Obesity continues to be an increasingly important risk factor for populations worldwide, yet relatively little is known about obesity prevalence to inform prevention in ethnically diverse populations, including Pacific Islanders (PIs). In 2010, there were over 1.2 million PIs (alone or in combination with one or more races) in the United States (U.S.), encompassing a wide diversity of over 20 distinct ethnic groups, each with their own culture, language, traditions, and political and migration history.[1] Compared to nearly all other ethnic groups, PIs suffer from higher prevalence of leading obesity-related health problems, including Type II diabetes,[2,3] hypertension,[4,5] and cancer.[6] For instance, a study of 80 PI adolescents found that 86% of overweight youth had at least one component of metabolic syndrome, compared to 11% of healthy-weight participants.[7] High waist circumference (> 90th percentile) and low levels of high-density lipoproteins (≤ 10th percentile) were the two most common components of metabolic syndrome in the sample. As with other groups, obese U.S. PI youth are also substantially more likely to be diagnosed with Type-II diabetes than their normal-weight peers.[8]

Obese youth are more likely to become obese adults, and rates are of considerable concern for PIs. Worldwide among youth less than 20 years of age, overweight and obesity prevalence in the Federated States of Micronesia (29.7% among boys and 61.4% among girls), Samoa (42.2% and 50.0%, respectively), and Tonga (34.5% and 52.6%) were higher than in the U.S. (28.8% and 29.7%).[10] Data from the Hawai'i School Health Survey (2015) found that 15.3% of adolescents were overweight (BMI between 85th to 94th percentile) and 12.9% were obese (BMI equal to or greater than 95th percentile), with higher proportions of overweight or obese youth who were Native Hawaiian (33.5%) and other Pacific Islander (59.3%).[9] Existing health data on PI youth in Southern California are variable. One study reported 20% of PI children as overweight in Los Angeles,[11] while another study reported disaggregated overweight prevalence of 48.6% for Samoans, 27.8% for Tahitians, 22.1% for Native Hawaiians, 17.2% for Guamanians, and 31.3% for other PIs.[12]

PI cultures often view obesity as a mark of high social status,[13] and PI youth may be more likely than other ethnicities to view obesity as more culturally acceptable and even desirable. Thus, community-based, culturally appropriate research should take into consideration the norms and traditions of this diverse ethnic group.[14] Furthermore, to inform the development of intervention strategies, assessment of obesity should include measures of physical activity (PA) and nutrition,[15] as these are two of the most important modifiable risk factors for disease. This exploratory study aimed to use a community-based participatory research (CBPR) approach to estimate overweight/obesity prevalence, PA levels, and dietary intake among PI youth and young adults in Southern California.

## Methods

### Study Design and Team

This cross-sectional, CBPR study involved a collaborative partnership between one university and two community-based organizations. The study team included university researchers with backgrounds in behavioral science, nutritional epidemiology and kinesiology, and community leaders from the Marshallese, Samoan, Tongan communities with extensive experience in adolescent programs and/or health education. Following CBPR approaches developed in previous studies, we employed CBPR principles throughout the study period, includ-

ing equal partnership of community and university researchers and shared participation in all aspects of the research design, implementation, and evaluation.[16] Quarterly CBPR meetings among the research team and community leaders occurred throughout the entire two-year study period for: planning (six months), youth recruitment (6 months), two waves of data collection (6 months), data analyses and community report-back (6 months). Community leaders and designated community members (including youth) received training on all aspects of data collection including a training manual on assessment procedures and role playing. Community and university members co-facilitated all data collection activities, with the exception of the dietary assessment spearheaded by university researchers. Please see a previous publication for a full description of the CBPR planning, recruitment and other strategies used in this study.[17] The study was approved by the California State University, Fullerton, Institutional Review Board.

**Participants**

Eligible participants were youth and young adults (13-24 years old) from three ethnicities (Tongan, Samoan, Marshallese) residing in Southern California. During a six-month period, we recruited participants from churches in Los Angeles, Orange and San Diego counties. Churches play a pivotal role in promoting PI culture and community in the continental U.S., taking the place of traditional PI villages (and pastors of village chiefs) from the islands.[18] Community leaders outreached to youth and young adults through multiple churches (three Tongan, three Marshallese, and five Samoan) to maximize diversity with regards to geographic location and denomination (eg, Methodist, Catholic, and the Church of Latter Day Saints). Participants received a $50 gift card for each of two waves of data collection.

**Procedures**

Data collection occurred either at the church or a convenient community setting (eg, local community center) and in groups of 6-20 participants of the same ethnic group. Before assessment, we provided youth with parental consent forms and scheduled them to participate in two visits scheduled seven days apart. During the first visit, participants returned with signed parental consent forms, received instructions on all study procedures, signed youth assent forms and completed a demographic questionnaire. They rotated in small groups to each of three stations where they completed height and weight measures, the Food Frequency Questionnaire (FFQ), and received detailed instructions on proper wear of the accelerometers. During the second visit, participants returned the accelerometers and participated in a short debriefing interview to share their feedback on the assessments (data not reported). The remainder of this paper presents findings from the demographic, height/weight, FFQ and accelerometer data.

**Measures**

*Physical Measures*

We measured height and weight individually at each site. Height was measured to the nearest 0.1 cm using a Seca 214 portable stadiometer (Hanover, MD), and weight was measured to the nearest 0.1 kg using a stand-up Ohaus ES200L bench scale (Pine Brook, NJ). The scale was calibrated before each session. These procedures followed the guidelines provided by the National Health and Nutrition Examination Survey.[19] BMI was calculated as total body weight in kilograms divided by height in meters squared ($kg/m^2$). BMI values were compared to CDC calculations for children and teens (for only participants age less than 21 years old) to determine overweight (≥ 85th percentile to less than the 95th percentile for age and gender) or obesity (≥ 95th percentile) status.[20] Extreme obesity was calculated at BMI values > 99th percentile.

*Physical Activity*

We assessed physical activity levels with the ActiGraph GT1M (ActiGraph, Pensacola, FL), a uniaxial accelerometer that measures and records vertical accelerations ranging in magnitude from 0.05 to 2 g.[21] The GT1M model has been shown to produce similar results to the older 7164 model,[22] and is widely used in PA research. There is extensive evidence establishing the Actigraph as a valid and reliable instrument for assessing adolescent PA measures.[23] Validity of the Actigraph for adolescents has been reported against various criterion measures, including indirect calorimetry ($r = 0.86$)[24] and direct observation ($r = 0.50$).[25] Previous studies have reported intra-instrument reliability ranging from ICC = 0.31 for 1 day of monitoring, to ICC = 0.87 for 7 days of monitoring.[24,25]

Participants received instructions to wear accelerometers during the waking hours for seven consecutive days. Since the accelerometers were not waterproof, the monitors had to be removed during water-based activities (eg, showering, swimming). The ActiGraph recorded activity in 10-second intervals, and we reviewed accelerometer data for valid wear times using MeterPlus v4.0 software (MeterPlus, La Jolla, CA). For this paper, data were reintegrated into 60-second intervals and presented as activity counts. A valid recorded hour was defined as having at least 30 consecutive minutes of activity counts, and a valid recorded day consisted of at least 8 valid hours of counts. Participants with at least 4 valid days of accelerometer data were included in the PA analyses. We converted activity counts to daily duration (min/day) of sedentary (activity count < 101), light- (activity count 101-1951), moderate- (activity count 1952-5724), and hard/very hard-intensity (activity count 5725-10000) activity categories.[26] We calculated average minutes per day in each category by summing daily minutes of each activity category across valid days and dividing by the number of valid days. Total daily moderate-to-vigorous physical activity (MVPA) was calculated by summing the daily totals for moderate and hard/very hard activity categories.

*Dietary Assessment*

We utilized the FFQ that was developed and validated by the Epidemiology Program of the University of Hawai'i Cancer Research Center. The 150-question FFQ was administered to Native Hawaiian and multi-ethnic adults, and found relatively good agreement when compared against 24-hour recall.[27] The food composition database was derived from the U.S. Department of Agriculture, and was supplemented and updated with data from local recipes consumed by the various ethnic groups in Hawai'i. At the first visit, participants completed the FFQ based on their "usual" dietary pattern over the previous seven days. The "usual time frame" to report participant's intake in most studies is over the last year. However, a previous report suggested that most children (8 – 13 years) better recall dietary data over the last week.[28] We also showed photographs of serving sizes and plastic food models to help participants visualize and estimate food portions.

**Data Analyses**

All analyses were conducted using the Statistical Package for Social Sciences (SPSS) for Windows v16.0 (IBM, Chicago, Il) and Statistical Analysis Software (SAS) v9.1 (SAS, Cary, NC). To determine categories of normal weight, overweight, obesity or extreme obesity, participants aged less than 21 years of age were classified according to CDC criteria of BMI values equaling or exceeding the 85th, 95th, or 99th percentile for age and gender.[20] Dietary data were log transformed in order to convert the data from a skewed distribution to an approximated Gaussian distribution. We calculated means and frequencies for daily micronutrients, food group intake, and PA levels, and performed independent *t*-tests to test for gender differences in PA levels and dietary intake within each ethnic group. Analysis of variance (ANOVA) identified differences in PA and dietary intake between ethnic groups. Bonferroni post-hoc tests were run for analyses involving more than two groups. Power calculations using G*Power (Softpedia, Dusseldorf, Germany) determined a total sample size of $N = 84$ necessary to detect differences of moderate effect sizes at $r = .30$ with $P < .05$ and 80% power.

## Results

A total of 129 Tongan, Samoan and Marshallese were recruited into the study, with the following completion numbers: 118 provided basic demographic data; 111 provided usable accelerometer data with 81% (n = 86) meeting the minimum criteria (at least 4 valid days with a minimum of 8 hours per day) for inclusion in PA analyses; and 129 were measured for height, weight, and provided dietary assessments. For the dietary data, we removed outliers based on recommendations from previous research.[34] We excluded the top and bottom 10% of the log transformed energy distribution, then a robust SD (RSD) was calculated. We also excluded energy intakes outside the range (mean ± 3 RSD). Subsequently, four outliers were identified and removed, resulting in analysis of 125 FFQs.

Demographic characteristics and BMI percentages by ethnic group are shown in Table 1, with Marshallese participants presenting much lower prevalence of overweight and extreme obesity compared to Tongans or Samoans. Overall, 84% of Tongan, 76% of Samoan, and 24% of Marshallese youth were overweight (85th-94th percentile) or obese (95th percentile or greater). Average BMIs for Tongan males and females were 31.2 kg/m$^2$ and 34.3 kg/m$^2$ (respectively); 48% of males and 50% of females were extremely obese. Average BMIs for Samoan males and females were 32.3 kg/m$^2$ and 33.4 kg/m$^2$; 50% and 36% were extremely obese. Lastly, average BMIs for Marshallese males and females were 25.3 kg/m$^2$ and 22.1 kg/m$^2$; 20% of males and 0% of females were extremely obese. See Table 2 for BMI by gender and ethnicity.

Accelerometer data found total MVPA at 37.5 ± 27.2 min/day for the entire sample (Table 3). Over 87% of daily activity was classified as light-intensity (266.5 ± 71.0 min/day) and time spent sedentary was 508.1 ± 120.5 min/day. Males had significantly higher levels of moderate-intensity PA compared to females (45.4 ± 25.9 min/day vs 24.7 ± 18.9 min/day; $P < .001$).

Accelerometer data (Table 4) indicated no between-group differences for total daily MVPA, although light-intensity activity was significantly higher in Samoans (308.7 ± 67.5 min/day) compared to Tongans (256.4 ± 68.1 min/day; $P < .01$) and Marshallese (233.9 ± 57.3 min/day; $P < .001$). Tongans and Marshallese also had higher minutes of non-wear time compared to Samoans ($P < .01$). Compared to Samoan females, Samoan males demonstrated significantly higher minutes of moderate-intensity PA (44.9 ± 29.4 min/day vs 14.1 ± 7.0 min/day; $P < .01$). Marshallese males accumulated significantly higher levels of light-intensity (255.2 ± 66.3 min/day vs 208.7 ± 31.3 min/day; $P < .05$), moderate-intensity (57.1 ± 26.8 min/day vs 23.9 ± 14.0 min/day; $P < .01$), and total MVPA (58.6 ± 28.2 min/day vs 25.5 ± 14.9 min/day; $P < .01$), compared to Marshallese females.

Marshallese males reported significantly higher ($P < .05$) consumption of fiber/1,000 kcal (10 ± 4 vs 8 ± 3), vegetables (10 ± 10 vs 5 ± 5 servings), and dairy (4 ± 3 vs 2 ± 1 servings) compared to Marshallese females (Table 5). Tongan males consumed a significantly higher percent of energy from protein compared with Tongan females (16 ± 3, 14 ± 3, respectively; $P < .05$). Between the three ethnic groups, Tongans (7865 ± 5872 calories) had significantly higher energy consumption compared to Marshallese (5503 ± 4620 calories), while both Tongans (35 ± 7%) and Samoans (35 ± 6%) had significantly higher consumption of energy from saturated fat compared to Marshallese (33 ± 7%, $P < .05$). Tongans (5 ± 4 servings) also had a significantly higher consumption of daily dairy servings compared to Marshallese (3 ± 3 servings, $P < .05$), and Tongans (9 ± 3) had significantly higher fiber/1,000 kcal intake compared to Samoans (8 ± 3, $P < .05$).

| Table 1. Demographic Characteristics and Body Mass Index Profile by Ethnicity (n=118) | | | |
|---|---|---|---|
| | **Tongan (n=52)** | **Samoan (n=38)** | **Marshallese (n=28)** |
| **Gender** | | | |
| Male | 25 (48%) | 22 (58%) | 15 (54%) |
| Female | 27 (52%) | 16 (42%) | 13 (46%) |
| **Age Group** | | | |
| 13-14 | 16 (31%) | 11 (29%) | 7 (25%) |
| 15-16 | 22 (42%) | 10 (26%) | 10 (36%) |
| 17-20 | 14 (27%) | 15 (40%) | 11 (39%) |
| 21+ | 0 | 2 ( 5%) | 0 |
| **Parental Education Attainment** | | | |
| Father completed college degree | 3 ( 7%) | 5 (13%) | 3 (17%) |
| Mother completed college degree | 3 ( 6%) | 4 (11%) | 1 ( 5%) |
| **BMI (n=126)*** | | | |
| Normal weight [Total (males/females)] | 16% (23%/11%) | 24% (17%/27%) | 76% (60%/93%) |
| Overweight and obese [Total (males/females)] | 84% (77%/89%) | 76% (82%/73%) | 24% (40%/ 7%) |
| 85th-94th percentile [Total (males/females)] | 13% (11%/14%) | 10% ( 5%/18%) | 14% (20%/ 7%) |
| 95th-98th percentile [Total (males/females)] | 22% (18%/25%) | 22% (27%/19%) | 0% ( 0%/ 0%) |
| > 99th percentile [Total (males/females)] | 49% (48%/50%) | 44% (50%/36%) | 10% (20%/ 0%) |

*To adhere to CDC growth chart categories, only participants under age 21 were included (eliminating 7 participants)

| Table 2. Height, Weight, and Body Mass Index Profile (Mean and Standard Deviation) by Ethnic and Age Groups (n=116) | | | |
|---|---|---|---|
| | **Tongan** | **Samoan** | **Marshallese** |
| **Males** | | | |
| | n = 25 | n = 22 | n = 15 |
| **Ages 13-14** | | | |
| Height (cm) | 175.9 ± 4.9 | 170.7 ± 8.5 | 152.5 ± 8.6 |
| Weight (kg) | 86.1 ± 18.6 | 94.4 ± 31.4 | 45.3 ± 6.8 |
| BMI | 29.8 ± 6.3 | 31.9 ± 9.3 | 19.5 ± 2.2 |
| **Ages 15-16** | | | |
| Height (cm) | 180.8 ± 4.4 | 177.3 ± 5.1 | 171.1 ± 6.0 |
| Weight (kg) | 108.1 ± 26.0 | 102.1 ± 32.4 | 81.0 ± 19.6 |
| BMI | 31.7 ± 7.9 | 34.5 ± 14.5 | 27.5 ± 5.7 |
| **Ages 17-20** | | | |
| Height (cm) | 185.4 ± 7.2 | 170.2 ± 25.7 | 170.5 ± 4.8 |
| Weight (kg) | 110.4 ± 22.4 | 111.4 ± 30.4 | 79.9 ± 22.5 |
| BMI | 28.6 ± 4.0 | 38.2 ± 1.3 | 27.4 ± 7.3 |
| **Total Males** | | | |
| Height (cm) | 108.3 ± 6.2 | 175.7 ± 7.1 | 165.9 ± 10.2 |
| Weight (kg) | 101.6 ± 24.6 | 100.1 ± 25.7 | 80.0 ± 23.8 |
| BMI | 31.2 ± 7.4 | 32.3 ± 7.9 | 25.3 ± 6.6 |
| | | | |
| **Females** | | | |
| | n = 27 | n = 14 | n = 13 |
| **Ages 13-14** | | | |
| Height (cm) | 170.2 ± 4.4 | 163.2 ± 6.2 | 156.4 ± 6.9 |
| Weight (kg) | 92.0 ± 22.7 | 79.4 ± 18.2 | 50.9 ± 7.5 |
| BMI | 32.5 ± 7.4 | 30.4 ± 6.8 | 20.7 ± 1.2 |
| **Ages 15-16** | | | |
| Height (cm) | 168.7 ± 4.6 | 166.5 ± 4.0 | 155.4 ± 7.3 |
| Weight (kg) | 99.0 ± 28.6 | 111.4 ± 36.2 | 53.7 ± 6.6 |
| BMI | 33.9 ± 10.2 | 43.1 ± 1.0 | 22.2 ± 1.5 |
| **Ages 17-20** | | | |
| Height (cm) | 169.9 ± 5.6 | 162.3 ± 8.4 | 156.2 ± 8.6 |
| Weight (kg) | 105.1 ± 32.6 | 84.1 ± 33.7 | 55.8 ± 7.5 |
| BMI | 36.3 ± 10.6 | 39.2 ± 14.5 | 22.9 ± 2.9 |
| **Total Females** | | | |
| Height (cm) | 169.5 ± 4.7 | 163.8 ± 6.6 | 155.9 ± 7.0 |
| Weight (kg) | 98.7 ± 27.7 | 90.6 ± 31.7 | 53.7 ± 6.7 |
| BMI | 34.3 ± 9.4 | 33.4 ± 10.6 | 22.1 ± 2.0 |

| Table 3. Comparison of Accelerometer Data in Minutes Per Day (Mean and Standard Deviation) by Gender (n=86) | | | |
|---|---|---|---|
| **Physical Activity Variable** | **Total (n=86)** | **Males (n=44)** | **Females (n=42)** |
| Valid wear days | 6.1 ± 1.3 | 6.0 ± 1.2 | 6.1 ± 1.4 |
| Valid hours per day | 13.9 ± 2.1 | 14.0 ± 2.1 | 13.8 ± 2.0 |
| Sedentary | 508.1 ± 120.5 | 487.8 ± 95.2 | 529.3 ± 140.4 |
| Light | 266.5 ± 71.0 | 283.4 ± 68.2 | 248.2 ± 70.4* |
| Moderate | 35.3 ± 24.9 | 45.4 ± 25.9 | 24.7 ± 18.9** |
| Hard | 2.1 ± 5.3 | 2.0 ± 3.9 | 2.1 ± 6.4 |
| Very hard | 0.2 ± 0.4 | 0.2 ± 0.4 | 0.2 ± 0.4 |
| Total MVPA | 37.5 ± 27.2 | 47.6 ± 27.3 | 27.0 ± 22.9** |

*$P$ < .05, **$P$ <.001 compared to males. MVPA = moderate-to-vigorous physical activity.

| Table 4. Comparison of Accelerometer Data in Minutes/Day (Mean and Standard Deviation) by Ethnicity (n=86) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Tongan** | | | **Samoan** | | | **Marshallese** | | |
| **Physical Activity Variable** | **Total n = 35** | **Males n = 17** | **Females n =18** | **Total n = 27** | **Males n = 14** | **Females n = 13** | **Total n = 24** | **Males n = 13** | **Females n = 11** |
| **Valid wear days** | 5.8 ± 1.1* | 5.7 ± 1.2 | 5.9 ± 1.1 | 6.7 ± 1.3 | 6.6 ± 1.3 | 6.7 ± 1.5 | 5.7 ± 1.3* | 5.8 ± 0.8 | 5.6 ± 1.7 |
| **Valid hours per day** | 13.5 ± 1.9*** | 13.3 ± 1.9 | 13.4 ± 2.0 | 15.3 ± 2.1 | 15.5 ± 2.1 | 15.0 ± 2.1 | 13.1 ± 1.4*** | 13.2 ± 1.6 | 13.1 ± 1.3 |
| **Sedentary** | 491.9 ± 142.7 | 464.6 ± 104.9 | 517.7 ± 170.0 | 542.0 ± 123.4 | 521.4 ± 94.9 | 564.1 ± 149.0 | 493.4 ± 66.6 | 481.9 ± 77.1 | 507.0 ± 52.0 |
| **Light** | 256.4 ± 68.1** | 272.1 ± 62.0 | 249.5 ± 144.1 | 308.7 ± 67.5 | 323.2 ± 62.5 | 292.8 ± 71.6 | 233.9 ± 57.3*** | 255.2 ± 66.3 | 208.7 ± 31.3* |
| **Moderate** | 34.8 ± 21.4 | 37.0 ± 19.3 | 32.7 ± 23.5 | 30.1 ± 26.4 | 44.9 ± 29.4 | 14.1 ± 7.0** | 41.9 ± 27.3 | 57.1 ± 26.8 | 23.9 ± 14.0** |
| **Hard** | 2.8 ± 7.5 | 3.0 ± 5.8 | 2.7 ± 9.0 | 1.6 ± 3.6 | 1.3 ± 2.1 | 2.0 ± 4.8 | 1.4 ± 1.5 | 1.4 ± 1.5 | 1.4 ± 1.6 |
| **Very Hard** | 0.1 ± 0.3 | 0.2 ± 0.4 | 0.1 ± 0.1 | 0.3 ± 0.6 | 0.2 ± 0.6 | 0.4 ± 0.6 | 0.2 ± 0.3 | 0.1 ± 0.2 | 0.2 ± 0.5 |
| **Total MVPA** | 37.7 ± 26.2 | 40.1 ± 21.9 | 35.5 ± 30.2 | 32.0 ± 27.3 | 46.4 ± 30.9 | 16.5 ± 9.1** | 43.4 ± 28.2 | 58.6 ± 28.2 | 25.5 ± 14.9** |

*$P$ < .05; **$P$ < .01; ***$P$ < .001 compared to male and Samoan participants. MVPA = moderate-to-vigorous physical activity.

| Table 5. Comparison of Daily Macronutrient and Food Group Intakes (Mmean and Standard Deviation) (n=125) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Tongan** | | | **Samoan** | | | **Marshallese** | | |
| **Dietary Variable** | **Total (n = 56)** | **Males (n = 27)** | **Females (n = 29)** | **Total (n = 37)** | **Males (n = 21)** | **Females (n = 16)** | **Total (n =32)** | **Males (n = 18)** | **Females (n = 14)** |
| **Energy (kcal)** | 7865 ± 5872 | 7345 ± 5298 | 8348 ± 6415 | 7440 ± 7085 | 6952 ± 5163 | 8080 ± 9174 | 5503 ± 4620 | 6452 ± 5490 | 4284 ± 2940 |
| **Fiber/1,000kcal** | 9 ± 3 | 9 ± 2 | 10 ± 3 | 8 ± 3 | 7 ± 4 | 8 ± 3 | 9 ± 4 | 10 ± 4 | 8 ± 3* |
| **% energy from fat** | 35 ± 7 | 35 ± 7 | 34 ± 8 | 35 ± 6 | 34 ± 7 | 35 ± 5 | 33 ± 7 | 33 ± 8 | 33 ± 6 |
| **% energy from saturated fat** | 12 ± 2 | 12 ± 2 | 12 ± 3 | 12 ± 2 | 12 ± 3 | 12 ± 2 | 10 ± 2 | 11 ± 2 | 10 ± 2 |
| **% energy from protein** | 15 ± 3 | 16 ± 3 | 14 ± 3* | 14 ± 2 | 15 ± 2 | 14 ± 2 | 17 ± 3 | 16 ± 2 | 17 ± 3 |
| **Vegetable (servings)** | 10 ± 9 | 10 ± 9 | 10 ± 10 | 8 ± 9 | 7 ± 7 | 10 ± 11 | 7 ± 8 | 10 ± 10 | 5 ± 5* |
| **Fruit (servings)** | 12 ± 15 | 11 ± 14 | 13 ± 16 | 5 ± 8 | 6 ± 9 | 4 ± 4 | 7 ± 8 | 8 ± 10 | 5 ± 4 |
| **Total grain (servings)** | 24 ± 18 | 22 ± 17 | 26 ± 19 | 24 ± 23 | 23 ± 15 | 25 ± 30 | 19 ± 15 | 21 ± 19 | 16 ± 9 |
| **Whole grain (servings)** | 5 ± 4 | 4 ± 4 | 5 ± 5 | 4 ± 6 | 3 ± 3 | 4 ± 8 | 2 ± 3 | 3 ± 4 | 2 ± 2 |
| **Dairy (servings)** | 5 ± 4 | 5 ± 4 | 5 ± 4 | 4 ± 4 | 4 ± 3 | 4 ± 5 | 3 ± 3 | 4 ± 3 | 2 ± 1* |
| **Meat (ounces)** | 17 ± 14 | 19 ± 14 | 16 ± 14 | 18 ± 22 | 17 ± 18 | 20 ± 27 | 17 ± 16 | 18 ± 17 | 15 ± 13 |

*$P$ < .05 compared to males

## Discussion

This study aimed to use CBPR to estimate levels of obesity, PA, and dietary intake among PI youth and young adults. In this study, Marshallese participants had substantially lower prevalence of overweight (25%) than Tongan (84%) or Samoan (76%) participants, with prevalence estimates for these latter ethnicities much higher than has previously been reported.[11,29,30] In particular, we found higher prevalence of extreme obesity in the Tongan and Samoan samples than previously described international data (49% and 44%, respectively).[10] Current BMI cutoffs for Pacific Islander adults and youth may overestimate obesity based upon past studies finding higher lean mass compared to Europeans.[31,32] Furthermore, U.S. based Tongan and Samoan youth may be at urgently elevated risk for a variety of future medical complications, and extreme obesity may need to be addressed with more intensive treatment approaches.

CDC physical activity guidelines for youth include 60 minutes or more of activity a day.[33] The findings from this study support the literature that adolescent males are typically more active than females. Low levels of physical activity and high levels of sedentary behavior have been reported for Tongan youth overseas,[34] and findings from the present study highlight similarities for all PI groups. The overwhelming proportion (87%) of daily activity (4-5 hours/day) registered at the low end of the intensity spectrum; approximately 8-9 hours per day were recorded as sedentary. Recent studies report that high levels of sedentary behavior are associated with adverse health effects, even in individuals meeting physical activity recommendations.[35] Modest increases from light- to moderate-intensity PA could help youth reap health benefits associated with sufficient MVPA levels.

U.S. Department of Agriculture dietary guidelines recommend adequate energy intake to support growth and maintain a healthy body weight, and that calories from fat be limited to 35% of total calories.[36] Our study highlighted potentially important ethnic-specific differences between Tongan, Samoan, and Marshallese participants regarding energy, percent energy from fat, fiber and dairy intake, similar to previous calls for understanding ethnic-specific subgroup differences.[37] For instance, we found Tongan participants had higher consumption of energy and other energy-dense food groups compared to the other two groups, underscoring the importance of studies exploring the unique influences in this population.[38] Other studies have assessed dietary intake in PI adults with differing results, however our study focused on youth and thus dietary consumption via FFQ in the respective population may only lend to comparisons of dietary/nutrient intake within and between groups for our study population.[39]

### Limitations

There are several limitations that should be considered when interpreting the study results. First, despite attempts to identify and recruit diverse PI participants, generalizability to the larger youth population is difficult due to our non-probability, community- and church-based sampling.[17] Second, although we found high proportions of overweight and obesity in our sample, this may be an overestimation as specific BMI cutoffs for Pacific Islander youth and adults have not been established, and past research strongly suggests increased BMI thresholds due to higher lean mass compared to Europeans.[31,32] Third, there are several limitations associated with accelerometers. We were unable to estimate many common activities (eg, water-based activities, or activities at extreme ends of the intensity spectrum), although we hope the information in this paper still contributes to the limited literature available for this population. Although we instructed participants to wear the monitors above the right hip, many male youth wore pants much lower than waist level due to current fashion trends.[17] Newer technology that places accelerometers worn around the wrist (eg, Fitbits) could well address such limitations in the future.[40] Lastly, FFQs are considered less burdensome compared with other dietary data assessment methodology. However, FFQs generally provide data on usual intakes rather than exact point estimates of macronutrient and food groups, and therefore dietary/nutrient intake data are more appropriately interpreted via comparisons and/or rankings within group and/or between groups of the respective study population. Also, over-reporting may result in extremely high energy intakes, and therefore energy adjustment of dietary variables, as well as comparison between groups provides for a more appropriate representation of the data. Future studies should build upon this study by considering use of other robust dietary assessment methodology, such as 24-hour dietary recall or food records, and/or development of a self-reported, validated dietary assessment tool for PI adolescents.

### Implications and Recommendations

Following the community report-back to share findings from the study,[17] several of the community leaders created the first-ever Native Hawaiian and Pacific Islander youth fitness day in April 2011 that has subsequently been hosted annually at the University of California, Los Angeles, by PI student and other leaders as well as community organizations. Many of these same leaders also participated in the creation of the Pacific Islander Let's Move! physical activity program for primary prevention among PIs of all ages, inspired by then first-lady Michelle Obama and launched through churches and other community organizations throughout southern California.[41] Despite these outcomes, we recommend further research particularly on appropriate BMI cutoffs for PI youth. In addition, health promotion programs aimed at decreasing caloric intake and sedentary behavior, and increasing time spent in MVPA, appear warranted for PI youth given the high levels of overweight and obesity observed in this study. Although we investigated individual-level nutrition and physical activity, public health prevention research also points to the importance of social and environmental intervention factors. Hawley and McGarvey (2015) describe a number of promising multi-level efforts across the Pacific including banning imports of fatty meats and taxing sugar-sweetened beverages,[5] although youth may present a particularly challenging age group for intervention.[42,43] Lastly, future research should not only confirm

our local findings with other PI populations and in other areas of the U.S., but also explore the larger cultural, community and policy influences on obesity prevention, persistence, and amelioration.

## Conflict of Interest

None of the authors identify a conflict of interest.

## Disclosure

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# The Department of Medical Technology at the John A. Burns School of Medicine, University of Hawai'i at Manoa

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*In 1993, the Medical School Hotline was founded by Satoru Izutsu PhD (former vice-dean UH JABSOM), it is a monthly column from the University of Hawai'i John A. Burns School of Medicine and is edited by Kathleen Kihmm Connolly PhD; HJMPH Contributing Editor.*

Medical laboratory tests performed on blood and other bodily fluids are vital in both the diagnosis and treatment of patients. According to a report by the American Clinical Laboratory Association, more than ten billion lab tests are performed and interpreted by lab professionals across the United States annually, and more than 70% of medical decisions are based on diagnostic test results.[1] Professionals who perform these diagnostic procedures are Medical Laboratory Scientists (MLS) with bachelor's degree, and Medical Laboratory Technicians (MLT) with associate's degree; they are both nationally certified. The duties of MLSs and MLTs include the collection and processing of specimens, analyzing the specimens using sophisticated instruments, verifying results, and reporting the findings to clinicians. MLSs have additional responsibilities of assuring compliance with regulations (eg, CLIA 88) and accreditation standards, supervising others, and managing the lab operations. They are employed by hospitals, independent labs, physician's office labs, reference labs, molecular pathology labs, and others.

The University of Hawai'i at Manoa (UHM) has been graduating medical technologists (now called MLS) since 1946, just a few years after the American Society of Clinical Pathologists began administering the national certification examinations. This was made possible through the efforts of faculty such as Dr. Oswald A. Bushnell (microbiologist and well-known Hawaiiana author) and Dr. Eric Fennel of The Clinic (present day Straub). In 1967, the Division of Medical Technology became a unit, and later formed into the Department of Medical Technology (DMT), within the John A. Burns School of Medicine (JABSOM), UHM. The first medical technologist faculty member was Grace Oishi (Kagawa), who taught in the hematology lab for many years. The program grew under Louise Wulff and Patricia Taylor.

Today, the DMT is staffed by faculty members Dr. Ji Sook Ha, Sheri Gon, Ray Yamaguchi, and Dick Teshima, with Secretary Marsha Kato. Dr. Reginald Ho at Straub Medical Center provides hematology lectures as an adjunct faculty member. Dr. Kenton Kramer and Dr. Willi Gosnell from the JABSOM Department of Tropical Medicine and Medical Microbiology teach the parasitology course.

The program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), while maintaining affiliations with Kaiser Permanente Medical Center (Celeste Matsuo), Tripler Army Medical Center (SSG Jamar Williams), Diagnostic Laboratory Services (Stacia Takeuchi and Jodie Kawamoto), Clinical Laboratories of Hawai'i (Judith Yamada and Alberta Corpuz), Kuakini Medical Center (Ryan Tsuji), and the Adventist Health Castle (Garth Weitzel). These clinical affiliates provide the clinical rotations for graduates which are required in the curriculum.

JABSOM DMT graduates have excellent track records. Student pass rates on the national certification exams are nearly 100%, and average scores are well above national average in all sub-disciplines. Almost all graduates have their employment secured even before they complete the clinical training. These benchmarks are important in maintaining accreditation with NAACLS.

DMT also has international connections. Every year, a group of medical technology students from Niigata, Japan, visits the Department on a week-long student/faculty exchange. Japanese students join JABSOM students in classes conducted in English. They return to Niigata with renewed energy and interest in their career choice. Interacting with the Japanese students is an eye opening experience for our students as well. As part of the JABSOM mission, DMT students are training to be future healthcare professionals, establishing connections and understanding with colleagues from the Asia-Pacific region.

## Curriculum

The baccalaureate curriculum in medical technology is based on a 2+2 career-pathway model by collaborating with the Kapi'olani Community College's (KCC) MLT program. Dr. Shepherd Maingano, director of KCC's program, is the main pipeline of students entering the JABSOM MLS program. Joining the KCC MLT graduates are a few MLTs who come from the mainland or are military trained. This pathway enables MLTs to complete the baccalaureate requirements in just two more years.

Recently, a new admission pathway for students who already have earned bachelor's degrees was established. This pathway facilitates these highly motivated students with added expertise

in related fields to become certified MLSs, so that they can enter the healthcare arena. As a result, the program has doubled its enrollment.

As a bachelor of science degree program, students in medical technology must clear the foundational courses such as general biology, cell & molecular biology, general/organic chemistry, math, immunology, and the general education courses. When admitted to the major, students study the lab methods and clinical correlation in hematology, hemostasis (coagulation), clinical biochemistry, immunohematology (transfusion service), and clinical microbiology (bacteriology, virology, mycology, parasitology). Students also learn the basics of lab management.

Clinical training at one or more of our local clinical affiliates follows graduation. Here, graduates obtain hands-on experience in all areas of the lab so that they attain the knowledge, skills and professionalism in medical technology. Completion of clinical training qualifies graduates to challenge the national certification exam.

## Medical Laboratory and Workforce Issue

The medical laboratory has traditionally been a behind-the-scene player on the healthcare stage, but in reality it is one of the principle actors. For example, when a trauma case arrives, the blood bank section goes into action with MLS's testing and preparing various types of blood products for transfusions. A hematology MLS operating a microscope may be the first person to recognize the leukemia cell on a child's blood smear. Today, extremely sophisticated instruments such as the MALDI-TOF, HPLC/MS/MS, and others fill labs, necessitating the presence of qualified MLSs.

However, medical labs across the nation have been struggling with serious workforce shortage, partly because of its relatively unknown status; there is a lack of recognition for and awareness of this profession compared to other healthcare workers such as doctors or nurses. Hawai'i is no exception. According to the US Bureau of Labor Statistics, employment of medical lab professionals is expected to grow by 13% between 2010 and 2020. Due to many issues, such as closures of educational and training programs, retiring "boomer" generation, and difficulties with retention, MLS/MLT programs are producing only about a third of lab professionals needed.[2,3]

## The Future

Medical laboratories today are very different from labs of just a few decades ago. Shaking the Folin-Wu tubes for blood sugar assay is an ancient story; the classic "bleeding time" test is phasing out. Automation and robotics have now become the norm, especially in high volume labs and labs that handle hazardous or highly infectious materials. Modern instruments process samples efficiently and tirelessly, thus improving overall productivity.

Using modern instrumentations, instead of their positions being taken away by automations, MLTs and MLSs are busier than ever. Freed from performing inefficient manual procedures, they now spend much time in calibrating/maintaining the instruments, verifying results, and validating new procedures. Increasingly, MLSs serve as consultants to clinicians so that the most meaningful tests are selected and the results are properly interpreted. As more Point-of-Care-Testing (POCT) devices are utilized by healthcare providers right at the patient's "bedside," MLSs must train POCT operators in various settings.

Many diseases can be diagnosed at the genetic level today. Although these tests are available only through specialized labs, and are costly and highly complex to perform, they generate precise information that can lead to "personalized" medical care. How to effectively integrate artificial intelligence (AI) in the medical labs is an exciting challenge for the next generation of medical technologists.

Developments in the field of microbiology are especially phenomenal. With the molecular technologies available today, pathogenic organisms can be quickly identified without having to wait for the bacteria to grow on culture media which can take days or even weeks. Specialized microbiology labs are in need of lab professionals who have advanced knowledge in the field. In response, JABSOM DMT is initializing a clinical microbiology curriculum for students majoring in microbiology. Planned to start in 2019, this program is a collaboration with the Department of Microbiology in the UHM College of Natural Sciences, the State Department of Health, and JABSOM's affiliate clinical labs.

The Department of Medical Technology at JABSOM, the only accredited program in medical laboratory science in Hawai'i, strives to remain at the forefront of producing highly qualified lab professionals for Hawai'i and the Pacific region.

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# The Effects of Vancomycin Use and De-escalation in Patients Hospitalized with Pneumonia

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## Abstract

*Methicillin-resistant* Staphylococcus aureus *(MRSA) causes about 80,000 severe infections each year. Compared to Methicillin-susceptible* Staphylococcus aureus *(MSSA), MRSA is associated with higher mortality and increased hospital length of stay (LOS). Vancomycin hydrochloride, an antibiotic with activity against MRSA is often used as empiric therapy for pneumonia. However, current pneumonia treatment guidelines recommend against the routine use of MRSA coverage since MRSA prevalence rates are low. In this retrospective, observational study, 38.3% of the population received vancomycin while only 2.6% had evidence of a MRSA infection. Data was gathered manually from electronic medical records from four hospitals over a six-month period. To identify a well-balanced comparison and account for potential confounders, matching on the propensity scores was conducted. Prior to matching, those who received vancomycin had a significantly higher rate of mortality (14.3% vs 4.9%,* P < *.001) and higher LOS (9.6 days vs 7.2 days,* P < *.001). Those who were de-escalated from vancomycin had a significantly lower LOS (8.3 days vs 11.6 days,* P = *.001) with no difference in mortality. After performing a survival analysis on matching data, those who received vancomycin had a significantly higher LOS (9.2 days vs 7.5 days,* P = *.002) with no difference in mortality (*P = *.1737). Those who were de-escalated had a significantly lower LOS (8.3 days vs 11.3 days, P=.005) with no difference in mortality (*P = *.8624). This study demonstrates a low prevalence of MRSA with the potential overuse of vancomycin. This along with no difference in mortality and a lower LOS supports the recommendation to limit vancomycin use as clinically appropriate. If vancomycin is used, assessment for rapid de-escalation is needed.*

## Keywords

*De-escalation, length of stay, methicillin-resistant* Staphylococcus aureus*, methicillin-susceptible* Staphylococcus aureus*, mortality, pneumonia, vancomycin*

## Abbreviations

*ASMD: Absolute standardized mean differences*
*ATS: American Thoracic Society*
*CAP: community acquired pneumonia*
*COPD: chronic obstructive pulmonary disease*
*HAP: hospital-acquired pneumonia*
*HCAP: healthcare-associated pneumonia*
*HPH: Hawai'i Pacific Health*
*ICU: intensive care unit*
*IDSA: Infectious Disease Society of America*
*IQR: interquartile ranges*
*KM: Kaplan-Meier*
*LOS: length of stay*
*MRSA: Methicillin-resistant Staphylococcus aureus*
*MSSA: Methicillin-susceptible Staphylococcus aureus*
*PCR: polymerase chain reaction*
*VAP: ventilator-associated pneumonia*

## Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) causes approximately 80,000 severe infections and 11,000 deaths each year.[1] These infections can range from skin and soft tissue infections to pneumonia and bacteremia and are associated with higher mortality and increased hospital length of stay (LOS) when compared to methicillin-susceptible *Staphylococcus aureus* (MSSA) infections. Due to the high mortality rates associated with MRSA infections, clinicians often empirically treat patients with vancomycin. Vancomycin is an antibiotic with activity against MRSA and is one of the most commonly prescribed inpatient antibiotics.[2] Current treatment guidelines [2016 Hospital-Acquired (HAP) and Ventilator-Associated Pneumonia (VAP) and 2007 Community-Acquired Pneumonia (CAP)] from the Infectious Disease Society of America (IDSA) and American Thoracic Society (ATS) do not recommend routine use of MRSA coverage.[3,4] The estimated prevalence of MRSA in pneumonia is 1% to 5% for CAP and 20% to 40% in HAP.[5-8] In Hawai'i, the 2015 MRSA prevalence was 38.2%.[9] These estimates demonstrate that empiric treatment with vancomycin, which initially may have been appropriate, is theoretically not needed in most patients. In these patients, the use of an "unnecessary" antibiotic could lead to antibiotic resistance.[1] The Centers for Disease Control and Prevention (CDC) states that up to 50% of antibiotics are inappropriately prescribed.[1] One of the tools that can be used to help prevent antibiotic resistance is antibiotic de-escalation where initial empiric "broad" antibiotics, which cover many types of bacteria, can be switched to a "narrow" antibiotic that covers only a few types of bacteria once cultures and sensitivities return. Ideally, antibiotics should be de-escalated to target the pathogen of interest. In the case with

pneumonia, since MRSA rates are low, de-escalation can help to reduce the unnecessary use of vancomycin.

A study by Schlueter M., et al, found that in culture-negative healthcare-associated pneumonia (HCAP), de-escalation was associated with significantly lower inpatient mortality, significantly shorter hospital LOS, and significantly lower costs.[10] These benefits show the need for de-escalation interventions in pneumonia. Additionally, there are studies showing higher efficacy of beta-lactam antibiotics over vancomycin for the treatment of MRSA negative infections demonstrating effective treatment without the use of vancomycin.[11-13] The IDSA recommends de-escalation from vancomycin if there is no growth on cultures for 48 hours, no evidence of MRSA growth on cultures, or if a MRSA nasal polymerase chain reaction (PCR) is negative.[2]

MRSA nasal PCR tests for the presence of MRSA colonization in the nares. There have been studies correlating the presence of MRSA nasal colonization and culture-positive MRSA pneumonia infections.[13,14] MRSA nasal PCRs appear to have a high negative predictive value, up to 99.2%.[14,15] This suggests that if the PCR is negative, the patient is likely not colonized with MRSA in the nares and they have a very low incidence of having MRSA in the lungs. Another benefit of MRSA PCRs is that results can return within 24 hours which provides a quick and useful tool for de-escalation even before culture results are finalized.[14,15]

The low prevalence of MRSA pneumonia along with the potential overuse of vancomycin creates opportunities for de-escalation and the prevention of unnecessary antibiotic use. More studies on the relationship between vancomycin use in pneumonia and vancomycin de-escalation in pneumonia are needed. The purpose of this study was to determine the effects of using vancomycin in the treatment of pneumonia and to determine the effects of de-escalating vancomycin in the treatment of pneumonia.

## Methods

### Study Design and Patients

This was an exempt, retrospective chart review study (University of Hawai'i Institutional Review Board) of patients patients at least 18 years of age or older with a primary or secondary diagnosis of pneumonia who received at least one antibiotic during hospitalization. This study consisted of two comparisons with a total of four groups. The first comparison (vancomycin comparison) compared patients with pneumonia who received vancomycin compared to patients with pneumonia who did not receive vancomycin during their hospitalization. The second comparison (de-escalation comparison) involved only patients with pneumonia who received vancomycin. In this comparison, patients who were de-escalated (vancomycin duration of ≤ 3 days) from vancomycin during their hospitalization were compared to those who were not de-escalated (vancomycin duration > 3 days). A list of patients was generated in September 2016 based on a diagnosis of pneumonia during hospitalization. Study patients had admission dates from March 2016 to August 2016 from the four hospitals that comprise the Hawai'i Pacific Health (HPH) Systems: Kapiolani Medical Center for Women and Children (Honolulu, Hawai'i), Straub Medical Center (Honolulu, Hawai'i), Pali Momi Medical Center (Aiea, Hawai'i), and Wilcox Memorial Hospital (Lihue, Hawai'i). Patients were excluded if they were pregnant, had a concurrent documented or suspected infection requiring antibiotic therapy, or had a hypersensitivity to vancomycin. In the de-escalation subgroup analysis, patients were excluded if they did not receive vancomycin during their hospitalization, if there were any positive MRSA findings (blood or sputum culture positive for MRSA or a positive MRSA nasal PCR), or if they had a hospital LOS of ≤ 3 days or died ≤ 3 days from the date of admission.

Baseline data was gathered on age, gender (female/male), intensive care unit (ICU) admission, sepsis, prior antibiotic use in the past 90 days of hospital admission, any MRSA positive cultures, and comorbidities such as diabetes mellitus, chronic obstructive pulmonary disease (COPD), renal disease, and immunocompromised status.

### Outcomes

For both comparisons, the primary outcomes were death and hospital LOS. Mortality was defined as death from any cause during hospitalization. LOS was defined as the number of days hospitalized.

### Statistical Analysis

Descriptive statistics were generated to characterize the sample. Means, standard deviations, medians and interquartile ranges (IQRs) were used to describe continuous variables. Frequencies and percentages were used to describe dichotomous variables. Chi-square or Fisher's exact tests were used to examine differences in baseline characteristics for patients with pneumonia who received vancomycin during their hospitalization versus those who did not. Two-sample t-tests were used to compare normally distributed continuous variables, such as age, across the two groups, while non-parametric Kruskal-Wallis tests were used for comparisons of non-normally distributed continuous variables. Differences in baseline characteristics for the subgroup of patients with pneumonia who received vancomycin that were de-escalated versus not de-escalated were also examined.

Separate propensity score models were used to match patients with pneumonia in the vancomycin comparison groups as well as the de-escalation comparison groups to account for the covariates. Logistic regression models were used to estimate a propensity score using variables known to be associated with receiving vancomycin (or de-escalation from vancomycin) and each outcome of interest (mortality, hospital LOS). These variables included: age, gender, diabetes, COPD, immunocompromised status, renal disease, sepsis, prior antibiotics within 90 days, ICU admission, and positive MRSA findings. Note that positive MRSA findings were not included as a matching variable for de-escalation groups. The propensity scores from each respective logistic regression model were used to match patients with the closest propensity score on a ratio of 1:1 using a nearest neighbor approach with no replacements and specifying a caliper of 0.25. Absolute standardized mean differences

(ASMDs) were used as a balance statistic for individual covariates for each model, where an ASMD below 0.20 is desirable for all variables.[16]

Overall survival was estimated in the unmatched and matched samples using Kaplan-Meier (KM) methodology with comparisons accomplished using log-rank statistics. Additionally, separate backwards selection Poisson regression models were used to examine predictors of patients' LOS in the unmatched samples. Potential predictor variables considered for inclusion were: vancomycin (or de-escalation) group, age, sex, diabetes, COPD, immunocompromised status, renal disease, sepsis, prior antibiotic use within 90 days, and ICU admission. Differences in expected LOS between the matched vancomycin groups and the matched de-escalation groups were estimated using simple Poisson regression models, where hospital LOS in days was regressed on the group variable. To account for multiplicity, statistical significance was considered at the 0.05/2 = 0.025 level.[17] Propensity score matching procedures were conducted using the *MatchIt* package in R, which required no missing values in the data before matching.[18] With the exception of immunocompromised status (n = 1), no missing values were observed for all matching variables. To deal with the missing value for immunocompromised status, the mode was used to replace this entry prior to matching.[19] All other analyses were conducted using SAS software, version 9.4 (SAS Institute Inc., Cary, NC).

## Results

### Vancomycin Comparison

Of the total 946 patients with available data, 178 were excluded, with 162 being due to concurrent infection. Nine were excluded for having no antibiotics used during hospitalization, 4 patients were pregnant, 2 patients had duplicate entries on the data list, and 1 electronic medical record could not be found. The remaining sample of 768 patients was diagnosed with pneumonia, with 294 patients (38.3%) having received vancomycin and 474 patients (61.7%) who did not. Baseline characteristics of all patients by group before and after matching are listed in Table 1. Several significant differences in baseline characteristics were found between patients that received vancomycin versus those who did not prior to matching. Specifically, patients who received vancomycin were significantly younger (mean = 67.0 vs 71.0, $P = .001$), more likely to have renal disease (32.0% vs 22.2%, $P = .003$) and sepsis (47.6% vs 25.1%, $P < .001$), more likely to be admitted to the ICU (34.7% vs 17.5%, $P < .001$), and more likely to have received prior antibiotics within the last 90 days (33.0% vs 23.0%, $P = .002$) compared to those who did not receive vancomycin. Among the 768 patients who were diagnosed with pneumonia, a total of 20 patients (2.6%) had an MRSA positive culture. The remaining 748 patients (97.4%) either did not have cultures collected or had cultures that did not grow MRSA.

Table 1. Vancomycin vs No Vancomycin Baseline Characteristic and Primary Outcome Results for Unmatched and Matched Samples

| Variable | Unmatched Sample (N=768) | | | Matched Sample (N=514) | | |
|---|---|---|---|---|---|---|
| | No vancomycin (n=474) | Vancomycin (n=294) | *P* value | No vancomycin (n=257) | Vancomycin (n=257) | *P* value |
| **Baseline Characteristics** | | | | | | |
| Age (years), mean (SD)<br>median (IQR) | 71.0 (16.5)<br>73 (62, 84) | 67.0 (16.7)<br>67 (58, 80) | .001* | 67.9 (17.5)<br>69 (58, 82) | 67.9 (16.4)<br>67 (59, 80) | .96 |
| Male, n (%) | 272 (57.4%) | 172 (58.5%) | .76 | 147 (57.2%) | 147 (57.2%) | >.99 |
| Diabetes, n (%) | 164 (34.6%) | 107 (36.4%) | .61 | 91 (35.4%) | 95 (37.0%) | .71 |
| COPD, n (%) | 120 (25.3%) | 69 (23.5%) | .56 | 55 (21.4%) | 58 (22.6%) | .75 |
| Immunocompromised, n (%) | 30 (6.3%) | 29 (9.9%) | .075 | 26 (10.1%) | 26 (10.1%) | >.99 |
| Renal disease, n (%) | 105 (22.2%) | 94 (32.0%) | .003* | 74 (28.8%) | 77 (30.0%) | .77 |
| Sepsis, n (%) | 119 (25.1%) | 140 (47.6%) | <.001* | 97 (37.7%) | 106 (41.2%) | .42 |
| ICU admission, n (%) | 83 (17.5%) | 102 (34.7%) | <.001* | 67 (26.1%) | 78 (30.4%) | .28 |
| Prior antibiotics within 90 days, n (%) | 109 (23.0%) | 97 (33.0%) | .002* | 78 (30.4%) | 76 (29.6%) | .85 |
| MRSA positive, n (%) | 5 (1.1%) | 15 (5.1%) | .001* | 5 (1.9%) | 10 (3.9%) | .190 |
| Antibiotic therapy treatment duration** (days), mean (SD)<br>median (IQR) | 5.8 (4.4)<br>5 (3, 7) | 7.9 (5.4)<br>7 (4, 10) | <.001* | 5.9 (4.0)<br>5 (3, 7) | 7.7 (5.2)<br>6 (4, 9) | <.001* |
| Number of antibiotics**, mean (SD)<br>median (IQR) | 2.4 (1.0)<br>2 (2, 3) | 2.9 (1.3)<br>3 (2, 4) | <.001* | 2.4 (1.1)<br>2 (2 ,3) | 2.9 (1.3)<br>3 (2, 4) | <.001* |
| **Primary Outcomes** | | | | | | |
| Mortality, n (%) | 23 (4.9%) | 42 (14.3%) | <.001* | 17 (6.6%) | 32 (12.5%) | .024* |
| Hospital length of stay (days), mean (SD)<br>median (IQR) | 7.2 (4.7)<br>6 (4, 9) | 9.6 (7.1)<br>8 (5, 12) | <.001* | 7.5 (4.9)<br>6 (4, 9) | 9.2 (6.7)<br>7 (5, 11) | .002* |

*$P < .025$; **Not included as a matching variable in propensity score modeling.

Propensity score matching narrowed the total sample size from 768 to an equally matched sample of 514 patients (257 in each group). In the matched samples, all ASMDs were below 0.20, indicating patients who received vancomycin and those who did not were well-matched on all baseline characteristics. No significant differences in baseline characteristics were found between the vancomycin groups after matching (Table 1). There were statistically significant differences in mortality between the vancomycin groups prior to matching (log-rank *P*=.008). There was a statistically significant difference in the distribution of mortality between the groups after matching (Table 1, 6.6% vs 12.5%, *P*=.024) with more deaths in those who received vancomycin. However, the Kaplan-Meier method found no significant differences in mortality after matching on baseline characteristics (Figure 1, log-rank *P*=.174).

Prior to matching, median hospital LOS in days among patients who received vancomycin was 8 days (IQR=5, 12) compared to 6 days (IQR=4, 9) in those who did not receive vancomycin (Table 1, *P*<.001). Results from a backwards selection Poisson regression model demonstrated that patients' hospital LOS was significantly associated with the vancomycin group (*P*<.001), sepsis (*P*=.010), ICU admission (*P*<.001), and age (*P*<.001) in the unmatched sample. Specifically, the expected hospital LOS in days among patients receiving vancomycin was 25% higher (RR=1.25, 95% CI=1.18-1.31) compared to those not receiving vancomycin. The expected hospital LOS in days among patients admitted to the ICU was 65% higher (RR=1.65, 95% CI=1.57-1.75) compared to those not admitted to the ICU prior to matching. For every 10-year increase in age, the expected hospital LOS in days increased by 3% (RR=1.03, 95% CI=1.02-1.05). After matching, patients who received vancomycin have a significantly longer hospital LOS compared those who did not receive the drug (Table 1, median=7 vs 6 days, *P*=0.002). Specifically, the expected hospital LOS in days among patients receiving vancomycin was 23% higher (RR=1.23, 95% CI=1.15-1.30) compared to those not receiving vancomycin after matching on baseline characteristics.

**De-escalation Comparison**

Of the 294 patients that received vancomycin, 44 were excluded from this analysis, with 18 being due to having a hospital LOS ≤3 days, 10 for having died ≤ 3 days from the date of admission, and 16 were excluded for having a positive MRSA finding (10 positive sputum cultures, 5 positive blood cultures, and 1 positive MRSA nasal PCR) leaving a total of 250 patients before matching. Baseline characteristics of the de-escalation groups before and after matching are listed in Table 3. Prior to matching, patients who were de-escalated from vancomycin were significantly older (Mean = 69.9 vs 64.7 years, *P* = .012), and less likely to be admitted to the ICU (25% vs 43%, *P* = .002) compared to those who were not de-escalated.

Propensity score matching resulted in a matched sample of 192 patients (96 in each group). In the matched samples, all ASMDs were below 0.20, indicating patients who were de-escalated and those who were not de-escalated were well-matched on all baseline characteristics. No statistically significant differences in baseline characteristics were found after matching (Table 2). Prior to matching, there were no statistically significant differences in mortality between the de-escalation groups (log-rank *P* = .90). Similar results were found after matching, as no significant differences were found in mortality between the two groups (Figure 2, log-rank *P* = .86).

Prior to matching, median hospital LOS among non-de-escalated patients was 9 days (IQR = 6, 14) compared to 7 days (IQR = 5, 10) in those who were de-escalated (Table 2, *P* = .001). Results from a backwards selection Poisson regression model

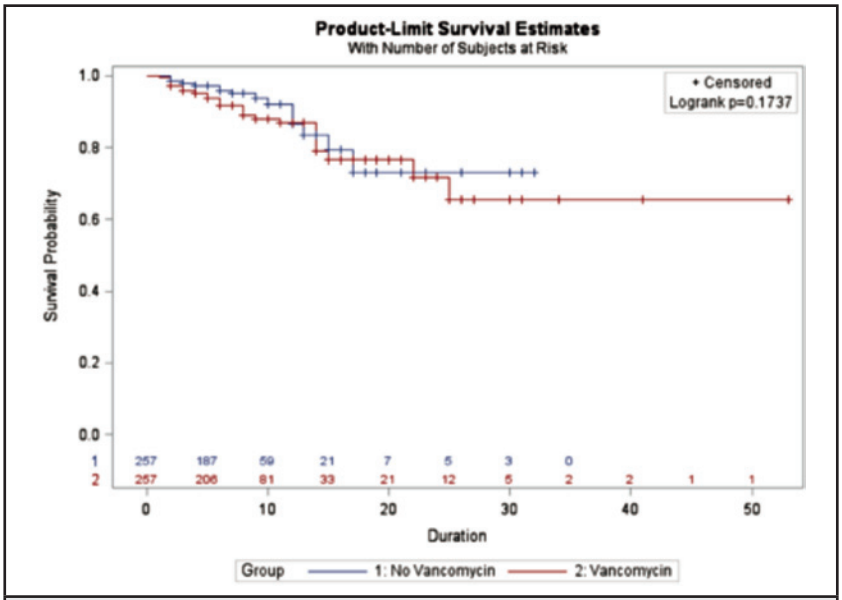


Figure 1. Vancomycin vs No Vancomycin Kaplan-Meier Survival Curves After Matching (N=514)

demonstrated that patients' hospital LOS was significantly associated with the de-escalation group ($P < .001$), diabetes ($P = .008$), sepsis ($P = .002$), and ICU admission ($P < .001$) in the unmatched sample. Specifically, the expected hospital LOS in days among non-de-escalated patients was 27% higher (RR = 1.27, 95% CI = 1.17-1.38) compared to those de-escalated. After matching, patients who were not de-escalated continued to have a significantly longer hospital LOS compared to those who were de-escalated (Table 2, median = 8 vs 7 days, $P = .005$). Specifically, the expected hospital LOS in days among non-de-escalated patients was 36% higher (RR = 1.36, 95% CI = 1.25 - 1.50) compared to those de-escalated after matching on baseline characteristics.

Table 2. De-escalation vs No De-escalation Baseline Characteristic and Primary Outcome Results for Unmatched and Matched Samples

| Variable | Unmatched Sample (N=250) | | | Matched Sample (N=192) | | |
|---|---|---|---|---|---|---|
| | Not De-escalated (n=141) | De-escalated (n=109) | *P* value | Not De-escalated (n=96) | De-escalated (n=96) | *P* value |
| **Baseline Characteristics** | | | | | | |
| Age (years), mean (SD)<br>median (IQR) | 64.7 (16.6)<br>66 (56, 76) | 69.9 (16.0)<br>68 (61, 83) | .012* | 69.3 (14.7)<br>70.5 (60, 80) | 69.5 (16.2) 6<br>8 (60, 83) | .92 |
| Male, n (%) | 79 (56%) | 58 (53%) | .66 | 51 (53%) | 52 (54%) | .88 |
| Diabetes, n (%) | 50 (35%) | 39 (36%) | .96 | 37 (39%) | 32 (33%) | .45 |
| COPD, n (%) | 35 (25%) | 27 (25%) | .99 | 27 (28%) | 23 (24%) | .51 |
| Immunocompromised, n (%) | 17 (12%) | 7 (6%) | .134 | 8 (8%) | 7 (7%) | .79 |
| Renal disease, n (%) | 40 (28%) | 38 (35%) | .27 | 30 (31%) | 31 (32%) | .88 |
| Sepsis, n (%) | 73 (52%) | 46 (42%) | .133 | 44 (46%) | 41 (43%) | .66 |
| Prior antibiotics within 90 days, n (%) | 50 (35%) | 36 (33%) | .69 | 31 (32%) | 32 (33%) | .88 |
| ICU admission, n (%) | 61 (43%) | 27 (25%) | .002* | 31 (32%) | 27 (28%) | .53 |
| Antibiotic therapy treatment duration** (days),<br>mean (SD)<br>median (IQR) | 9.6 (5.9)<br>8 (5, 12) | 6.9 (4.0)<br>6 (4, 8) | <.001* | 9.2 (5.6)<br>8 (5, 11) | 6.8 (3.8)<br>6 (4, 9) | .001* |
| Number of antibiotics**, mean (SD)<br>median (IQR) | 3.2 (1.4)<br>3 (2, 4) | 2.7 (1.2)<br>3 (2, 3) | .025 | 3.0 (1.3)<br>3 (2, 4) | 2.8 (1.2)<br>3 (2, 3.5) | .24 |
| **Primary Outcomes** | | | | | | |
| Mortality, n (%) | 21 (15%) | 9 (8%) | .109 | 13 (14%) | 6 (6%) | .091 |
| Hospital length of stay (days), mean (SD)<br>median (IQR) | 11.6 (8.3)<br>9 (6, 14) | 8.3 (4.5)<br>7 (5, 10) | .001* | 11.3 (8.4)<br>8 (6, 13.5) | 8.3 (4.4)<br>7 (5, 10) | .005* |

*$P < .025$; **Not included as a matching variable in propensity score modeling.

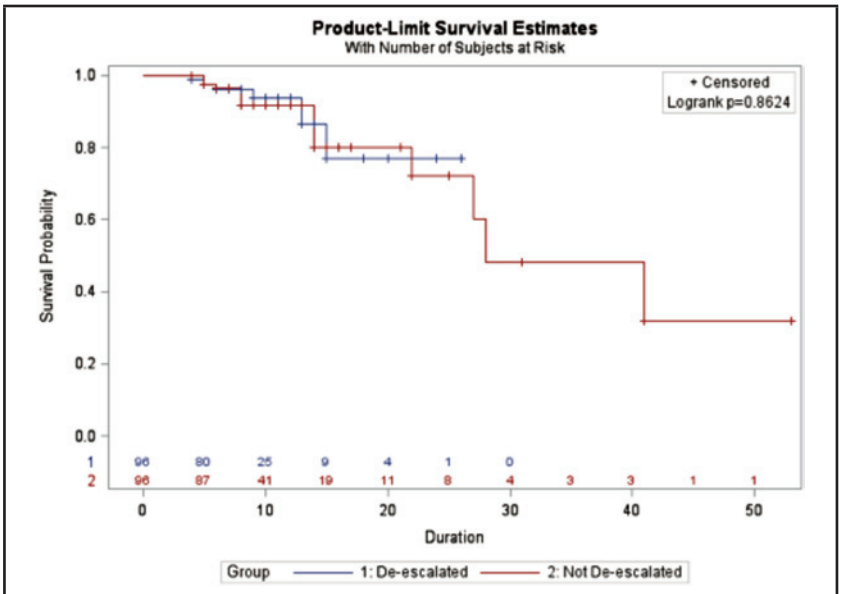


Figure 2. De-escalation vs No De-escalation Kaplan-Meier Survival Curves After Matching (N=192)

## Discussion

Based on IDSA pneumonia treatment guidelines, MRSA coverage is recommended in those with a high risk for mortality or if MRSA prevalence is 20% or greater.[3,4] Based upon these guidelines, Hawaii's reported 2015 MRSA prevalence was 38.2%, which would suggest the use of empiric vancomycin in Hawaii's pneumonia patient population.[3,4,9] However, our findings show that while 294 (38.3%) of our patients received vancomycin, only 20 (2.6%) patients had a positive MRSA finding and 274 (35.7%) patients had no evidence of MRSA infection or colonization. This study demonstrates two points: (1) the low prevalence of MRSA pneumonia within the HPH system, as well as (2) the overuse of vancomycin for treating pneumonia. Overuse of antibiotics not only puts patients at risk for adverse drug reactions but also provides opportunities for antibiotic resistance. Avoiding the use of unnecessary initial antibiotics or prompt de-escalation are potential solutions to antibiotic overuse.

Prior to matching, there was a significant difference in mortality between the two groups in the vancomycin comparison with the vancomycin group having a higher mortality rate. However, due to the significant differences in certain baseline characteristics, such as ICU admission and sepsis, potential confounders were likely, and the causality of mortality was uncertain. It was unclear whether the vancomycin was increasing the mortality rate or if the patients were already at an increased risk for mortality and why they then received vancomycin. To address this, a propensity score matching was done. After matching, there were statistically significant differences in mortality, as shown in Table 1. However, it was concluded there were no significant differences in mortality using the Kaplan-Meier methods (Figure 1), as we were interested in analyzing mortality as a time-to-event variable and the most appropriate methodology would rely on survival methods given their ability to account for censoring that the methods in Table 1 do not properly account for. In the de-escalation comparison, there were no significant differences in mortality before and after matching. LOS was significantly longer in both the vancomycin and de-escalation comparisons before and after matching.

A longer LOS contributes to an increase in healthcare costs and increases the risk for hospital-acquired infections, which could result in worse outcomes. Since our data demonstrates that LOS is increased with the use of vancomycin, decreasing use of the drug or utilizing prompt de-escalation would decrease LOS. The significant differences in LOS for both comparisons before and after matching supports this option. Lowering LOS would parallel both lower patient costs and the risk of hospital acquired infections, and prevent negative outcomes. Even though there were no significant differences in mortality in both comparisons, vancomycin use did not improve or worsen outcomes. Drug therapy intervention via antimicrobial stewardship intervention will help to reduce the growing challenge of antibiotic resistance.

One study limitation is that the study did not distinguish between CAP versus HAP. Both CAP and HAP are treated differently and have different prevalence rates of MRSA, with HAP having a higher MRSA prevalence rate. Another limitation was the relatively small sample size for the de-escalation comparison. After matching, there was a change towards significance for mortality (Table 2). This could have been due to insufficient power in the de-escalation comparison.

## Conclusion

Overall, in our retrospective review, only 2.6% of the population had positive MRSA findings while 38.3% received vancomycin suggesting vancomycin overuse. No difference in mortality was found in both comparisons showing no negative outcomes associated with not using vancomycin. Not using vancomycin and de-escalating off of vancomycin showed potential benefits in lowering LOS. This could reduce hospital costs and the unnecessary risk for hospital-acquired infections, which could reduce negative outcomes. Before any strong recommendations can be made, further prospective studies with larger numbers of patients are needed to confirm the findings. However, no difference in mortality, a lower LOS, and a low MRSA prevalence rate support an appropriate recommendation to limit vancomycin use in pneumonia as clinically appropriate. Should clinical signs and symptoms suggest empiric prescribing of vancomycin, a MRSA nasal PCR should be ordered with cultures to guide rapid de-escalation in cases of negative PCRs.

## Disclosure Statement/Conflict of Interest

None of the authors identify any disclosures or conflicts of interest.

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# THE WEATHERVANE

RUSSELL T. STODD MD; CONTRIBUTING EDITOR

### A SURPRISE MEDICAL SOLUTION: HYPNOSIS.

Hypnotherapy is often associated with alternative therapy and somewhat removed from the mainstream of medical thought, therapy and planning. Wait a minute, doctor, increasingly medical centers are using it to treat digestive conditions like acid reflux, irritable bowel syndrome (IBS) and ulcerative colitis. Too often, when the therapist mentions hypnosis, patients conjure up an image of an entertainer in Vegas making a person bark like a dog. Patients have to be educated as to what it constitutes and what it does not. About one-third of patients are open to it. GI experts theorize that hypnotherapy works because many gastrointestinal disorders are affected by a faulty connection between the brain and the digestive tract. The gut and the brain are in constant communication and when something disrupts that communication the brain misinterprets normal signals. The body becomes hypersensitive to stimuli detected by the gut and the result is pain. These GI experts believe hypnosis shifts the brain's attention away from stimuli and provides healthy suggestions about what's going on in the gut. It doesn't eliminate the stimulus. The GI tract is still in motion, but it alters the threshold of perception so the patient is not feeling the same intensity, according to John Paldolfino, Chief of gastroenterology and hepatology at Northwestern. There they have started offering hypnotherapy in 2006 and have plans to expand to two regional hospitals. Hypnotherapy has become the front line in treating IBS because there aren't many treatments that help. Northwestern has trained health psychologists in GI disorders who have moved on to start programs at other academic centers.

### DOCTOR (AND NURSE) BEWARE. YOU ARE BEING WATCHED.

Hospitals spend considerable resources trying to reduce the preventable mistakes that the staff make. Do caregivers skip washing their hands? Do they need to be watched all the time? In a small group of recent pilot studies, computer scientists and doctors have installed monitors in hallways, depth sensors next to patient bedsides and in operating rooms. These sensors generate video images that look like blurry silhouettes—protecting patient privacy—that can be used to train computer algorithms to identify certain movements. The technology called computer vision would allow hospitals to watch workers 24/7 across an entire hospital ward. Arnold Milstein, professor of medicine and director of Clinical Excellent Research Center at Stanford University says, "People are prone to mental slips and lapses." Even the most attentive and careful physicians and nurses are likely to skip steps occasionally without realizing it. According to the Centers for Disease Control and Prevention (CDC) one in 25 patients develop health care associated infection in hospitals. Professor Milstein and his colleagues designed a series of studies to see if computer vision could tell whether people used hand sanitizers before entering patients' rooms. The team is now trying to determine how to use the data to encourage vigilance in hand washing. Computer vision can identify movements other than hand washing such as oral care with ventilator use and patient rotation in bed. Ultimately these data can allow for improved safety in many hospitals. The message: stay alert.

### THE OLD RELIABLE (NOT) "TWO FINGER TEST."

A judge in the high court of the Indian state of Rajasthan acquitted a man of rape. He noted of the complaining woman "Her hymen was ruptured and the vagina admitted two fingers easily." The medical opinion is that she may be accustomed to sexual intercourse. The implication was that only a virgin can really be raped. The so-called "two finger test" in which a doctor examines the vagina to determine if a woman is sexually active was banned in 2014. The Supreme Court ruled it was an invasion of privacy (as well as irrelevant). Yet in India, Pakistan, and Bangladesh the test is still widely used. There are signs of progress. Recently in Mumbai a judge disregarded the two-finger test and cited the 2014 law. "The girl has a right to make a choice, which includes a right to deny sexual intercourse without her consent." Experts reckon that fewer than 10% of rapes in south Asia are reported. The two-finger test stops women from coming forward. In Bangladesh only 22 convictions were secured in 2012-2017 out of 18,668 rape cases filed.

### THE DARWIN AWARDS.

The annual Darwin awards are granted to individuals who improve our human gene pool by removing themselves from it. This year's top prize was awarded to a 19-year-old German man. He and his soon-to-be ex were walking along the icy Havel River in December locked in argument. When he failed to win his point he pushed her into the river, then tried to drown her by pushing under. But she could swim and moved away and got to shore. He could not swim and went under. He was kept alive initially, but ultimately died Valentine's Day 2018 removing himself from the gene pool and winning the Darwin prize. Reported widely in two newspapers this Darwin award winner was carrying an illegal firearm in his waistband. When the gun was accidentally discharged he lost both of his testicles, as well as his job. The judge did not sentence the criminal stating that he had been punished already. It was not a fatal event, but he earned the Darwin award by removing himself from the gene pool.

### ADDENDA

- When it is a question of money, everyone is of the same religion. (Voltaire)
- A feast is made for laughter, and wine for making merry, but money answers all things. (Ecclesiastes)
- Taxpayers are people who don't have to pass a civil servant examination to work for the government.
- This multitude of books is a great evil. There is no limit to this fever for writing. (Martin Luther)
- Get out of here and leave me alone. Last words are for those who haven't said enough already. (Karl Marx)
- My parents didn't want to move to Florida, but they turned sixty and it was the law. (Seinfeld)

### ALOHA AND KEEP THE FAITH **rts**

*(Editorial comment is strictly that of the writer.)*

# Hawai'i Journal of Medicine & Public Health
# Instructions to Authors

The Hawai'i Journal of Medicine & Public Health (HJMPH) publishes original contributions, reviews, balanced viewpoints (ie, point/counterpoint articles), editorials, and other categories of articles. Topics of interest include scientific articles related to the practice of medicine and public health, with a focus on the unique, multicultural and environmental aspects of the Hawaiian Islands and Pacific Rim region. Some frequently published types of articles are described herein. Authors interested in published other types of articles may contact the journal.

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**Reviews** summarize the literature, address current practice or issues within the medical or public health communities, and are intended to promote a discussion of different viewpoints.

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- Do not underline and do not use full caps.
- Use double spaces between lines. Do not use 1-1/2 spacing.
- Use a single space between sentences. Do not use two spaces.
- Number pages consecutively beginning with the title page.

## II. Tables and Figures:

Tables and figures may be submitted as part of your manuscript. Each table or figure should be carefully selected or designed to add value to the manuscript by showing a relationship of ideas, data, or objects that would be difficult to describe precisely or completely using words alone. Authors must be judicious in their use of tables and figures.

- All illustrations (ie, graphs, flow charts, diagrams, drawings, maps, and photographs) are identified using the word "Figure." Do not mix in alternatives such as "Photo" or "Chart."
- Tables and figures may be up to 7-1/2 inches in width.
- Tables and graphs must be prepared in Microsoft Word, PDF, or Excel.
- Flow charts, diagrams, drawings, maps, and photos must be submitted as a high resolution (300 dpi is optimal) in JPEG, TIFF or PDF format.
- All tables and figures must be numbered sequentially, and include a caption. They must be well-labeled, stand alone, and not require the reader to refer back to the text.
- All tables and figures must be referenced within the text (ie, readers must be appropriately referred to all tables and figures that are part of the article.)
- Data points on graphs should be labeled. Numerical data should accompany graphs.
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## III. Cover Letter

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2. The names of all contributing authors, listed in the order in which they will appear in the manuscript. List first name, middle initial and last name of each author with highest academic degrees; and name of department and institution to which the work should be attributed.
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A few specific guidelines to consider in preparing an abstract follow:

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- Cite no references.
- Avoid abbreviations.
- Use the salt or ester of a drug at first mention.
- If an isotope is mentioned, when first used spell out the name of the element and then, give the isotope number.
- Avoid the use of trademarks or manufacturers' names unless they are essential to the study.
- Include major terms in the abstract, since the abstract can be text searched in many data retrieval systems.
- Include Keywords

**Include Keywords**

**Include Abbreviations: for example,**
**Abbreviations and Acronyms**
BP = blood pressure
CI = Confidence Interval

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We recommend that articles be divided into sections with headings. The traditional layout described below may not apply to all submission types (eg, editorials or case reports). Nevertheless, the journal recommends that authors create 3-5 sections with appropriate headings to optimize the organization and flow of their write-ups. In addition, a background/review piece, and a summary/discussion piece is recommended for all types of articles submitted to the journal. *Note:* If your manuscript includes more than five abbreviations, please include a list of abbreviations, along with their definitions in a table.

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3. Centers for Medicare & Medicaid Services. CMS proposals to implement certain disclosure provisions of the Affordable Care Act. http://www.cms.gov/apps/media/press/factsheet.asp?Counter=4221. Accessed January 30, 2012.
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