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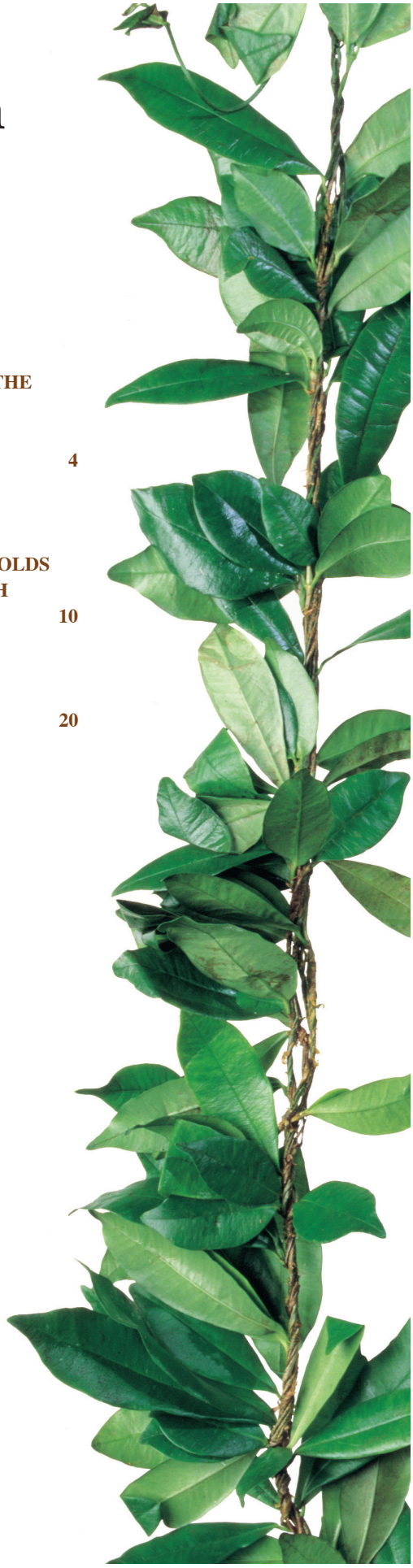

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Aim:

The aim of the Hawai‘i Journal of Health & Social Welfare is to advance knowledge about health and social welfare, with a focus on the diverse peoples and unique environments of Hawai‘i and the Pacific region.

History:

In 1941, a journal then called The Hawai‘i Medical Journal was founded by the Hawai‘i Medical Association (HMA). The HMA had been incorporated in 1856 under the Hawaiian monarchy. In 2008, a separate journal called the Hawai‘i Journal of Public Health was established by a collaborative effort between the Hawai‘i State Department of Health and the University of Hawai‘i at Mānoa Office of Public Health Studies. In 2012, these two journals merged to form the Hawai‘i Journal of Medicine & Public Health, and this journal continued to be supported by the Hawai‘i State Department of Health and the John A. Burns School of Medicine.

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Hawai'i Journal of Health & Social Welfare
General Recommendations on Data Presentation and Statistical Reporting (Biostatistical Guideline for HJH&SW)
[Adapted from Annals of Internal Medicine & American Journal of Public Health]

The following guidelines are developed based on many common errors we see in manuscripts submitted to HJH&SW. They are not meant to be all encompassing, or be restrictive to authors who feel that their data must be presented differently for legitimate reasons. We hope they are helpful to you; in turn, following these guidelines will reduce or eliminate the common errors we address with authors later in the publication process.

Percentages: Report percentages to one decimal place (eg, 26.7%) when sample size is >=200. For smaller samples (<200), do not use decimal places (eg, 27%, not 26.7%), to avoid the appearance of a level of precision that is not present.

Standard deviations (SD)/standard errors (SE): Please specify the measures used: using "mean (SD)" for data summary and description; to show sampling variability, consider reporting confidence intervals, rather than standard errors, when possible, to avoid confusion.

Population parameters versus sample statistics: Using Greek letters to represent population parameters and Roman letters to represent estimates of those parameters in tables and text. For ex ample, when reporting regression analysis results, Greek symbol (ß), or Beta (b) should only be used in the text when describing the equations or parameters being estimated, never in reference to the results based on sample data. Instead, one can use "b" or ß for unstandardized regression parameter estimates, and "B" or ß for standardized regression parameter estimates.

***P* values:** Using *P* values to present statistical significance, the actual observed *P* value should be presented. For *P* values between .001 and .20, please report the value to the nearest thousandth (eg, *P*=.123). For *P* values greater than .20, please report the value to the nearest hundredth (eg, *P* =.34). If the observed *P* value is great than *.999*, it should be expressed as "*P* > *.99*". For a *P* value less than .001, report as "*P*<.001". Under no circumstance should the symbol "NS" or "ns" (for not significant) be used in place of actual *P* values.

"Trend": Use the word trend when describing a test for trend or dose-response. Avoid using it to refer to *P* values near but not below .05. In such instances, simply report a difference and the confidence interval of the difference (if appropriate), with or without the *P* value.

One-sided tests: There are very rare circumstances where a "one sided" significance test is appropriate, eg, non-inferiority trials. Therefore, "two-sided" significance tests are the rule, not the ex ception. Do not report one-sided significance test unless it can be justified and presented in the experimental design section.

Statistical software: Specify in the statistical analysis section the statistical software used for analysis (version, manufacturer, and manufacturer's location), eg, SAS software, version 9.2 (SAS Institute Inc., Cary, NC).

Comparisons of interventions: Focus on between-group differ ences, with 95% confidence intervals of the differences, and not on within-group differences.

***Post-hoc* pairwise comparisons**: It is important to first test the overall hypothesis. One should conduct *post-hoc* analysis if and only if the overall hypothesis is rejected.

Clinically meaningful estimates: Report results using meaningful metrics rather than reporting raw results. For example, instead of the log odds ratio from a logistic regression, authors should transform coefficients into the appropriate measure of effect size, eg, odds ratio. Avoid using an estimate, such as an odds ratio or relative risk, for a one unit change in the factor of interest when a 1-unit change lacks clinical meaning (age, mm Hg of blood pressure, or any other continuous or interval measurement with small units). Instead, reporting effort for a clinically meaningful change (eg, for every 10 years of increase of age, for an increase of one standard deviation (or interquartile range) of blood pressure), along with 95% confidence intervals.

Risk ratios: Describe the risk ratio accurately. For instance, an odds ratio of 3.94 indicates that the outcome is almost 4 times as likely to occur, compared with the reference group, and indicates a nearly 3-fold increase in risk, not a nearly 4-fold increase in risk.

Longitudinal data: Consider appropriate longitudinal data analyses if the outcome variables were measured at multiple time points, such as mixed-effects models or generalized estimating equation approaches, which can address the within-subject variability.

Sample size, response rate, attrition rate: Please clearly indicate in the methods section: the total number of participants, the time period of the study, response rate (if any), and attrition rate (if any).

Tables (general): Avoid the presentation of raw parameter estimates, if such parameters have no clear interpretation. For instance, the results from Cox proportional hazard models should be presented as the exponentiated parameter estimates, (ie, the hazard ratios) and their corresponding 95% confidence intervals, rather than the raw estimates. The inclusion of *P*-values in tables is unnecessary in the presence of 95% confidence intervals.

Descriptive tables: In tables that simply describe characteristics of 2 or more groups (eg, Table 1 of a clinical trial), report averages with standard deviations, not standard errors, when data are nor mally distributed. Report median (minimum, maximum) or median (25th, 75th percentile [interquartile range, or IQR]) when data are not normally distributed.

Figures (general): Avoid using pie charts; avoid using simple bar plots or histograms without measures of variability; provide raw data (numerators and denominators) in the margins of meta-analysis forest plots; provide numbers of subjects at risk at different times in survival plots.

Missing values: Always report the frequency of missing variables and how missing data was handled in the analysis. Consider add ing a column to tables or a footnote that makes clear the amount of missing data.

Removal of data points: Unless fully justifiable, all subjects included in the study should be analyzed. Any exclusion of values or subjects should be reported and justified. When influential observations exist, it is suggested that the data is analyzed both with and without such influential observations, and the difference in results discussed.

Resilience in Medical Education: Examining the Effects of the COVID-19 Pandemic on Pre-clerkship Curriculum Outcomes and Learner Perceptions at the University of Hawai'i John A. Burns School of Medicine

Kyra A. Len MD; Chieko Kimata PhD, MPH, MBA; Sheri F.T. Fong MD, PhD

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Abstract

The transition to virtual learning formats during the COVID-19 pandemic necessitated substantial curricular adjustments to the University of Hawai'i John A. Burns School of Medicine. This study compares student satisfaction and academic performance between the pre-pandemic (up through March 25, 2020) and pandemic (after March 25, 2020) periods. Standard end of course surveys for first year (M1) and second year (M2) courses and exam scores were compared between the pre-pandemic and pandemic groups. The median exam scores for problem-based learning generally increased for M1 and M2 courses during the pandemic, whereas Anatomy scores showed variability with some declining and some remaining stable or inclining. End-course evaluations indicated a significant decrease in student-perceived effectiveness for PBL, Lecture and Anatomy during the initial pandemic period. However, survey ratings for the learning environment improved in later courses, suggesting adaptation over time. Notably, Anatomy exam scores and course ratings improved significantly later in the pandemic which may be attributed to the development of virtual resources and early introduction of in-person sessions. This study provides insight into the dynamic effects of the pandemic on medical education, enhancing understanding of student experiences and academic outcomes during this challenging time. This study underlines adaptations in the curriculum that were effective, highlighting the resilience of the curriculum and students in maintaining quality education during the pandemic.

Keywords

Pandemic; Curriculum changes; Medical students; Medical education; Virtual education

Abbreviations

AY = academic year
AAMC=Association of American Medical Colleges
COVID-19 = coronavirus disease of 2019
IQR= interquartile range
JABSOM = John A. Burns School of Medicine
PBL= problem-based learning
PPE=personal protective equipment
SARS =severe acute respiratory syndrome
UH= University of Hawai'i

Introduction

In March of 2020, the coronavirus disease of 2019 (COVID-19) pandemic significantly changed medical student curriculums across the world. Nationally and internationally, clinical education was abruptly halted as students were removed from clinics and hospitals for varying periods of time due to concern for patient and student safety, and shortages of personal protective equipment (PPE) and COVID-19 tests.[1-4] Pre-clerkship lectures were replaced with virtual lectures and small group learning experiences were attempted to be replaced by online forums.[3] However, online forums had limited interaction between students resulting in reduced collaboration.[3,5] This conversion of in-person to online was particularly impactful at the University of Hawai'i (UH) John A. Burns School of Medicine (JABSOM), due to the format of the curriculum.

The pre-clerkship medical school curriculum at JABSOM is primarily a problem-based learning (PBL) approach where students learn from interacting with each other in small groups. The first 2 years of the curriculum, "pre-clerkship years," consists of problem-based learning cases, lectures, practical labs in anatomy, and clinical skills largely in the classroom setting. In the final 2 years of medical school, the "clinical/clerkship years", the curriculum involves hands-on practice of patient care in clinical environments. From March 2020 to March 2021 even traditionally hands-on experiences such as anatomy lab, clinical skills, and standardized patient exercises were modified into virtual or socially distanced experiences due to pandemic restrictions. Students were removed from clinical rotations due to concerns about PPE shortages, student and patient safety, and complying with the recommendations from the Association of American Medical Colleges (AAMC).[6] This dramatic change to the medical school curriculum was unprecedented at JABSOM.

It is important to investigate the impact that these changes may have had on student satisfaction and knowledge acquisition. Historically, disruptions to medical student education have been shown to affect student performance, as shown in a study where student performance declined after disruptions due to Hurricane Katrina.[7] Singapore drew on past experiences with the severe acute respiratory syndrome (SARS) outbreak in 2003 and leveraged technology during the COVID-19 pandemic to adjust their curriculum which included e-learning platforms, videoconferencing and online resources, and involving students

and residents in crisis relief.[8,9] An international study found that the COVID-19 pandemic negatively impacted medical student education, primarily due to the reduction in face-to-face lectures, conferences, simulations and tutorials.[10]

The purpose of this study was to retrospectively compare both student satisfaction with the restructured pre-clerkship courses pre-pandemic and during the COVID-19 pandemic, as well as the final (summative) scores of pre-clerkship exams including PBL and lecture, and anatomy exams.

Methods

JABSOM's pre-clerkship years encompass the first 2 years. The first year (M1) courses in the fall include health and illness (hereby labeled by class year, month of end-course exams, and year when noted: M1 Sep) & cardiovascular and pulmonary problems (M1 Dec). In the spring, the courses are renal and hematologic problems (M1 Mar) & endocrine and gastrointestinal problems (M1 Jun). The second pre-clerkship year (M2) consists of 2 PBL-based courses: locomotor, neurological and behavioral problems in the fall (M2 Dec), and life cycle in the spring (M2 Mar). Students also take at least 1 summer elective between M1 and M2 years, but the elective was not included in this study. Anatomy is included as part of the courses from the second fall course during M1 year (M1 Dec) through the fall M2 course (M2 Dec). Due to the timing of the courses with the start of the COVID-19 pandemic, the first course affected was the last course in the first year (M1 Jun'20), followed by the next academic year: M1 Sep'20, M1 Dec'20 and M2 Dec'20 in the fall semester and M1 Mar'21 and M2 Mar'21 in the spring semester.

Each course had end-course exams and end-course surveys conducted (Table 1).

This study adapted a standard instrument created and administered by the Office of Medical Education to evaluate the pre-clerkship curriculum. Questions on individual student satisfaction with the learning environment and overall course effectiveness were analyzed. The survey used a 4-point Likert Scale with 1=strongly disagree/very ineffective; 2=somewhat disagree/somewhat ineffective; 3=somewhat agree/somewhat effective; 4=strongly agree/very effective. The surveys were anonymous and distributed at the conclusion of each course to gather comprehensive feedback regarding various aspects of the educational experience.

Percentile exam scores for the pre-clerkship courses were evaluated, including the final combined PBL and Lecture exams for each course, and the anatomy and neuroanatomy exams, when administered. Of note, the PBL and Lecture exams are more weighted to PBL (80%) than Lecture (20%) except for M2 Dec which is split 50/50.

To identify changes in student satisfaction with their pre-clerkship courses between the pre-pandemic and pandemic groups, data from academic years (AY) 2018-2019, 2019-2020 and 2020-2021 were analyzed. For the exam results and survey data, the pre-pandemic group consisted of students enrolled in courses that were completed prior to Hawai'i's governor's "stay at home, work from home" orders that went into effect March 25, 2020[11]. The pandemic group was defined as students who completed their courses after March 25, 2020. This designation allows for a clear distinction between the pre-pandemic and pandemic groups. Survey data was only analyzed for the first pandemic year to assess the immediate effect of the pandemic.

Statistical Analysis

Descriptive statistics were used to summarize exam scores with median and interquartile range (IQR), and survey evaluation results with mean and standard deviation (SD). The Mann-Whitney test was used to compare exam scores between pre-pandemic and pandemic groups. Ordinal logistic regression model was used to compare Likert scale survey results between pre-pandemic and post-COVID start status. All statistical analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC). A 2-tailed *P*-value <.05 was considered to be statistically significant.

This study was approved by the University of Hawai'i Institutional Review Board as an exempt study (protocol number 2022-0738).

Table 1. Course, Exams and Survey Evaluation Items Analyzed in This Study

Courses	Exams	Survey Evaluation Items
M1 month'year	PBL (PBL and Lecture)	PBL Lecture
	Anatomy (except M1 Sep'20)	Anatomy
M2 month'year	PBL (PBL and Lecture)	PBL Lecture
	Anatomy (only M2 Dec'20)	Anatomy
	Neuroanatomy (only M2 Dec'20)	Neuroanatomy

Results

Student Examination Results

There were significant increases in median scores of the PBL/Lecture exams in the pandemic group when compared to the pre-pandemic group, as well as two other first year courses. In contrast, there was a significant decrease in the median PBL/Lecture exam score between groups for the first post-pandemic second-year course and no change in two other courses. In anatomy, there was a significant decrease in exam scores for pandemic vs pre-pandemic groups for first year courses, but a significant increase for the second year course. (Figure 1)

Student Survey Results

Excluding neuroanatomy, student-perceived effectiveness of the anatomy component of the course on the pre-clerkship end-course survey had a similar pattern to exam performance with a decrease in M1 courses and increase in the M2 course. In contrast to the anatomy component, student-perceived effectiveness of the PBL component of the course, which composed the majority of the exam content, did not change or decreased in the first 3 courses early in the pandemic (M1 Jun'20, M1 Sep'20, M1 Dec'20), while their exam scores increased. (Figure 1 and 2)

For the broader survey items about the whole course and learning environment, there were significant rating decreases in multiple survey items for the pandemic group in the first 4 courses after the start of the pandemic. This decrease was particularly notable for the survey item "Effectiveness of the overall course experience". The M1/M2 Mar'21 courses, which started almost 9 months after the start of the pandemic, had either no significant changes or had significant rating increases compared to pre-pandemic, with the most notable being, "The learning environment was supportive" which had significant rating increases for both courses. (Figure 3)

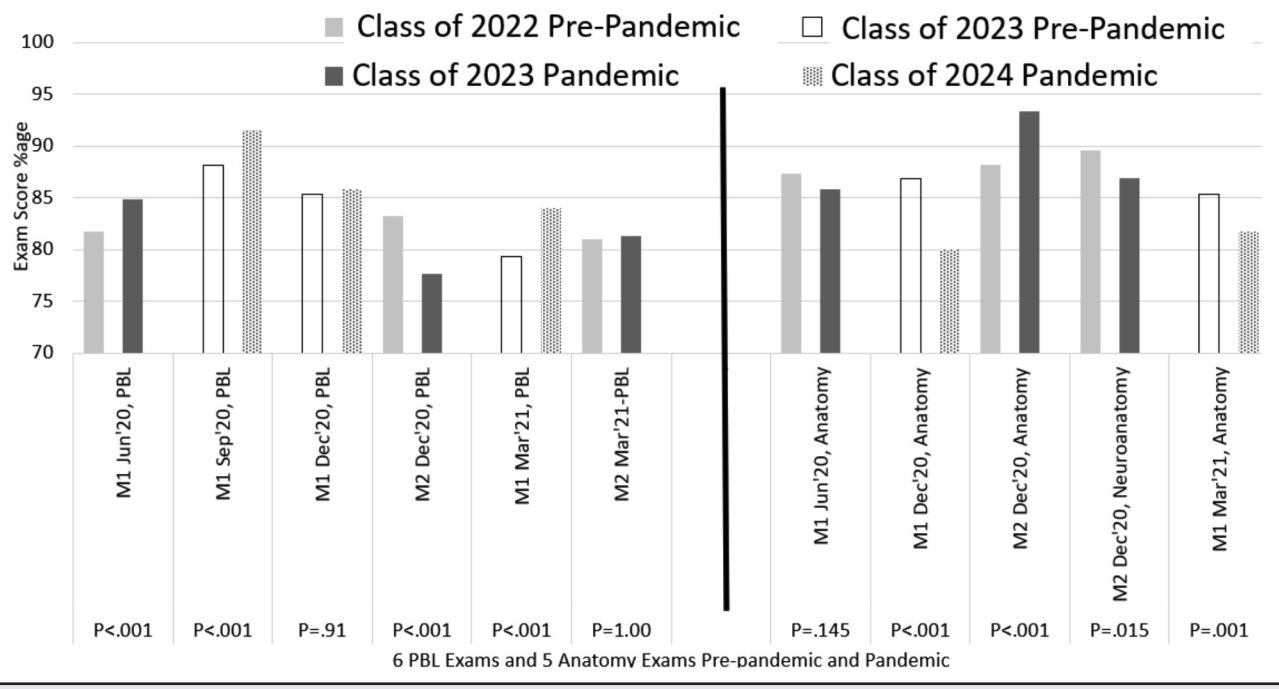

Figure 1. Median of Pre-pandemic and Pandemic Cohort Exam Scores Placed in Order of Pandemic Timeline

Problem Based Learning (PBL) refers to PBL and Lecture exam. M1 refers to first year medical student courses, M2 refers to second year medical student courses. Mann-Whitney test was used for statistical analysis. PBL exams are to the left of the black vertical line. Anatomy exams are to the right of the vertical line. Each pairing represents a separate course.

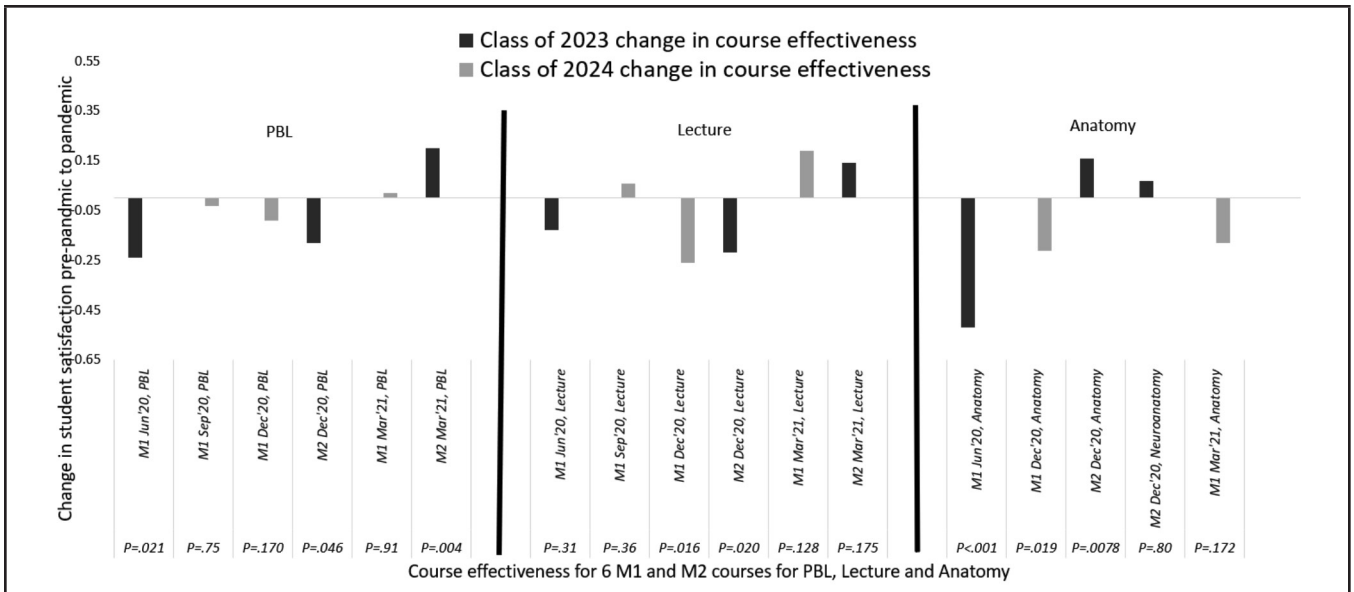

Figure 2. Pre-clerkship End-course Evaluation Change in Student-perceived Effectiveness of PBL, Lecture and Anatomy Experiences Pre-pandemic vs Pandemic, Placed in Order of Pandemic Timeline

M1 refers to first year medical student courses, M2 refers to second year medical student courses. Ordinal logistic regression model was used for statistical analysis. Vertical bars are used to separate overall effectiveness of 3 items: Problem Based Learning (PBL), Lecture and Anatomy.

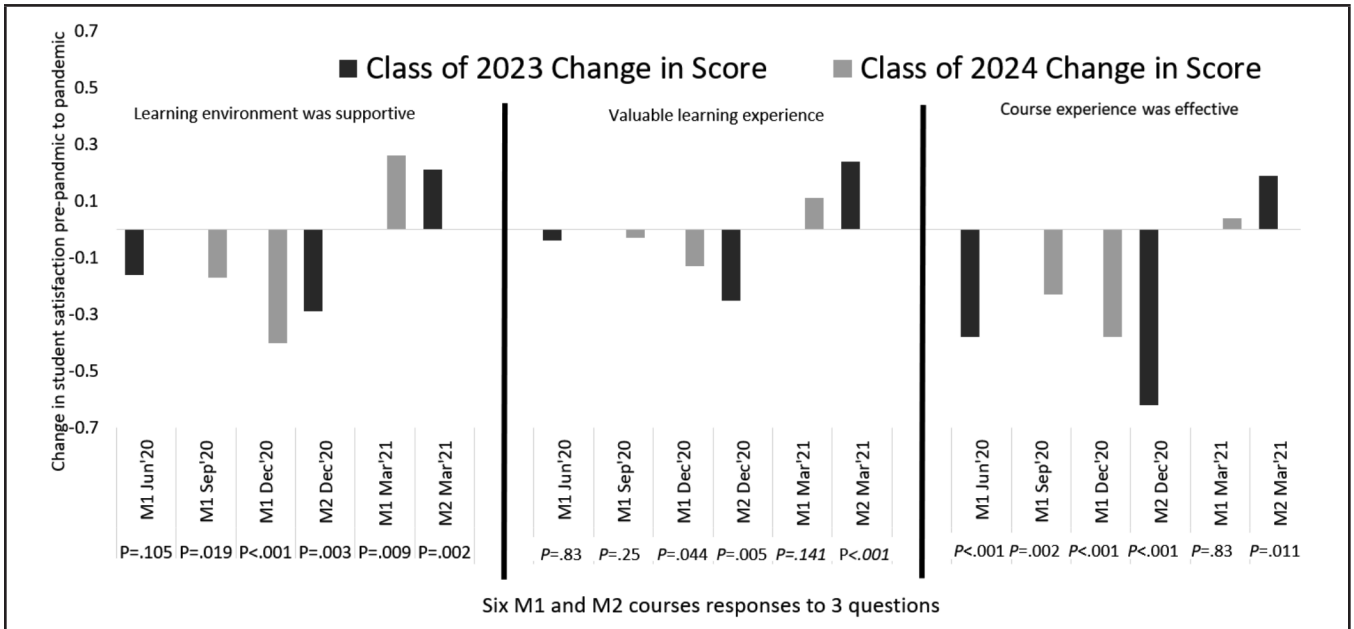

Figure 3. Pre-clerkship End-course Evaluation Ratings Change Pre-pandemic vs Pandemic, Placed in Order of Pandemic Timeline

M1 refers to first year medical student course, M2 refers to second year medical student course. Ordinal logistic regression model was used for statistical analysis. Vertical bars are used to separate the 3-course evaluation questions for the 6 courses.

Discussion

Changes that occurred during the COVID-19 pandemic included moving classes to virtual formats and canceling in-person activities. Nationally, learners appeared to gravitate toward online learning, and virtual lectures or recordings were fairly well received.[5] However, collaboration was reduced due to limited interaction between students in online forums.[3,5] These can have effects on student well-being and life satisfaction which could lead to increased burnout.[12] At JABSOM, the transition to virtual learning overall led to a decline in student's perceived effectiveness of the course in the first 4 pre-clerkship courses that occurred after the start of the pandemic, affecting the Class of 2023 and 2024. In particular, the Class of 2023, who had a "normal" pre-pandemic medical school experience for the first 3 quarters of their first year of medical school, rated their first 2 courses after the start of the pandemic (M1 Jun'20 and M2 Dec '20) lower for survey items such as the effectiveness of the overall course experience, presence of a supportive learning environment, and effectiveness of the overall anatomy experience (M1 Jun'20 only).

Anatomy in particular, can be difficult to teach in a virtual format.[1,4,14] The initial first-year course that post-dated the start of the pandemic (M1 Jun'20) had anatomy sessions that were converted to completely virtual and had the lowest ratings for "anatomy lab". Thus, anatomy was deemed a priority for early transition and returned to socially distanced in-person instruction (October 2020) before other concurrent PBL and Lecture sessions (January 2021). For the class of 2023, their second course after the start of the pandemic (M2 Dec'20) started in August, several months into the pandemic. This time frame allowed the anatomy department to develop virtual anatomy resources, and students had access to freely available educational tools. These changes likely contributed to the improved anatomy exam scores and ratings.

The statistically significant changes in exam performance and survey ratings contrasts with a previous study that showed no statistical difference in examination scores and satisfaction with the learning experience, but that study compared only the first basic science course for first year students,[13] as opposed to this study comparing all courses over multiple academic years. In this study, the end-course survey ratings increased significantly for "learning environment was supportive" in courses which ended 12 months after the pandemic restrictions were put into place, and thus the last courses analyzed as the pandemic group. This suggests that students were able to adjust to the new learning environment implemented during the COVID-19 restrictions. The gradual phased transition back to in-person may have contributed to the students feeling supported in the pandemic learning environment.

Interestingly, the pandemic cohort excelled in first-year final exams. This could be due to the Class of 2023 being familiar with first year medical school exam expectations from the first 3 courses prior to the pandemic, the Class of 2024 having some experience with pandemic-related social changes prior to starting medical school or less pandemic related stress in the students overall. Without reassurance from their upperclassmen about exam expectations, and additional time due to the postponement of in-person clinical skills on physical exam, the Class of 2024 may have adopted a more intensive study schedule resulting in better exam scores. Additionally, students may prefer virtual lectures and online small group learning may be conducive to their learning style.[4,5] This was also promoted through many free or discounted medical education resources provided by multiple organizations during the early pandemic.[15] However, the exam performance did not extend to the beginning of the second year. This could be due to the increase in course length, content and complexity of this particular course, and the different weighting of PBL (50%) and Lecture (50%) content. Indeed, the student ratings of both PBL and Lecture effectiveness were significantly decreased for M2 Dec'20. Another factor could be the absence of in-person study groups for collaborative learning.

Advantageously, a curricular addition that started in AY 2020-2021, right after the start of the pandemic, was the introduction of the learning communities program. The learning communities foster the building of connections between peers within JABSOM and the larger community. Walters et al recommended that learning communities are an important initiative to support student learning during the pandemic.[1] Such communities were shown to be important for mental well-being, resiliency, and mentorship, and JABSOM learning communities structure and activities are similar to those published by Zheng et al.[16] Although the JABSOM learning community launch was planned before the pandemic, it fortunately provided crucial connections for students when social distancing measures had been implemented. The learning communities might have contributed to the rise in some of the satisfaction scores for the learning environment in the pandemic cohort, even though students faced additional restrictions in their learning environment such as social distancing and virtual learning.

Conclusion

The transition of pre-clerkship courses to virtual formats due to the COVID-19 pandemic overall led to a general increase in exam scores during most courses, except the first exam of 2nd year which is a more difficult course with different grading weights. Additionally, scores in anatomy courses also declined, likely reflecting the challenges of mastering anatomy in a virtual environment. However, the exception was the 2nd year anatomy course, where more innovative resources were developed during the pandemic, resulting in higher scores than pre-pandemic. Initial shifts to virtual formats also decreased satisfaction with key components of the courses, including PBL and anatomy. However, this study also highlights the process of resiliency and recovery, as ratings progressively improved as

adaptations to the virtual format and resumption of in-person activities took place. Significantly improved satisfaction scores were observed in the final courses analyzed in this study in the pandemic group. Importantly, this study reveals that negative objective and subjective measures associated with COVID-19 pandemic curriculum changes lasted less than a year. More long-term effects such as residency preparedness and specialty choice will be monitored.

A pivotal lesson learned from this experience is the resilience and adaptability of JABSOM's medical education in the face of unprecedented challenges. The progressive improvement in satisfaction scores following adjustments to virtual formats and the resumption of in-person activities underscores the importance of flexibility and ongoing adaptation. Moving forward, these insights can inform the development of contingency plans for future disruptions, ensuring that medical education remains responsive and effective under varying circumstances. Finally, the transient nature of the observed negative impacts highlights the capacity for the medical education community to navigate and overcome challenges, allowing for more informed decision-making and strategic planning in the post-pandemic era.

Conflict of Interest

None of the authors identify a conflict of interest.

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Baseline Estimates for Companion Animals Living in Households in Hawai‘i: Associated Socio-Demographic, and Select Health Variables, as Measured by a Household Survey

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Abstract

Information on companion animals in Hawai‘i is lacking. The Hawai‘i Department of Health's Hawai‘i Health Survey, collected data on adults and households by telephone interview. National estimates of companion animals range from 50-67%. However, the estimate from Hawai‘i was lower with 39% of households in Hawai‘i having a companion animal that spends part or all of the day indoors, including 29.5% of households with dogs and 14.7% with cats. There may be multiple reasons the count is lower for Hawai‘i and possible factors are identified.

There were significant differences in companion animals by ethnicity with Whites having the highest percentage of cats (25.8%) and Japanese the highest percentage of dogs (33.8%). Differences were observed between Asian ethnicities and Native Hawaiians. Specifically, individuals of Japanese ethnicity were more likely to have dogs, while Native Hawaiians were more likely to have cats compared to other Asian and Other Pacific Island ethnicities. Furthermore, companion animals were associated with counties other than Honolulu, lower poverty, ownership of a car or home, women, education, and middle-aged adults. Thus, many households in Hawai‘i may not have the resources for a companion animal. Adults who rated their general health excellent had the highest association with having a cat(s). Asthma was higher for women living with dogs than women without cats or dogs. Asthma was lowest for men with cats compared to other groups for men and women.

This study contributes to the understanding of complex interrelationships of humans, animals, and their environment which is gaining momentum under the umbrella of "One Health" by supporting increased collaboration and new data sources.

Keywords

Hawai‘i; dog; cat; companion animals; general health; asthma; Asian; NHOPI

Abbreviations

CA = companion animal(s); specifically, cats and dogs
CASRO = Council of American Survey Research Organizations
CDC = Centers for Disease Control and Prevention
COVID-19 = Coronavirus disease 2019
HBRFSS = Hawai‘i Behavioral Risk Factor Surveillance System
HHS = Hawai‘i Health Survey
HIHS = Hawaiian Humane Society
NHOPI = Native Hawaiians or Other Pacific Islanders
SMS = SMS Research & Marketing Services Inc. of Hawai‘i
ZCTA = ZIP Code Tabulation Area

Introduction

Companion Animals in Households

Estimates of percentages of companion animals (CA) in the continental US households range from 50% to 67%, with the US Census Bureau estimate at 50%, considered "the gold standard", or most reliable.[1-4] Regardless of the source, percentages have increased in the last 40 years.[5]

Adoptions of CA increased during the coronavirus disease 2019 (COVID-19) pandemic (1 in 5 households acquired a CA). Many CA were from animal shelters which helped more shelters reach their no-kill benchmark of 90% save rate.[6,7] CA may have provided social support, and physiological and psychological health benefits while human interaction was limited.[7,8] The American Veterinary Medical Association stated that during the COVID-19 pandemic; "one thing that millions of people have been able to rely on has been the companionship and love of their pets."[9]

On O‘ahu, during the COVID pandemic, Feather and Fur Animal Hospital reported increased caseloads during 2020, attributed to increased adoptions and adult awareness of issues with their CA. (Brian Walsh, DVM/Medical Director. Oral Communication. Feather and Fur Animal Hospital. Kailua, HI. A telephone call, September 21, 2020, https://www.featherandfur.com/). Although; there is a history of estimating CA in the US, there is limited information on CA in households in Hawai‘i.[1] Two estimates of CA in Hawai‘i households (64% and 60%) are higher than many estimates for US households.[5,10] However, Hawai‘i has a mixed reputation for CA: known for being a pet 'obsessed' state by analyzing tweets and hashtags, yet ranked as one of the least pet-friendly states based on home security and anti-abuse laws.[11-14]

CA Expenditures

Expenditures for CA in the US have increased yearly and indicate the importance of CA. For example, $136.8 billion was spent on CA in 2022 (10.8% increase from 2021), including $58.1 billion spent on pet foods and treats (16.2% increase from 2021), and $35.9 billion on veterinary care and product sales (4.7% increase).[15]

Health and the Animal Bond

Multiple research institutes and health researchers are investigating the bond between CA and humans.[16-17] Strikingly, the Human Animal Bond Research Institute estimates $11.7 billion saved on health care costs associated with having a CA.[18] Notably, the Centers for Disease Control and Prevention (CDC) and research studies report the health benefits of having a CA: improved blood pressure, cholesterol, depression, and cognitive functions. The CDC, also, provides information on possible diseases associated with a specific CA.[19-21] CA can increase social interaction.[20] Additionally, adults with CA may be more attuned to broader social issues. CA can serve as a gateway to concerns inclusive of all nature.[22]

Strikingly, given the interrelationship of humans, animals, plants, and their environment, CA researchers from multiple disciplines have proposed to unite human and veterinary medicine under "One Health." The goals of One Health include increasing collaboration, developing data sources, and determining associations that improve health for all.[23]

In contrast, negative effects such as asthma and *Toxoplasmosis* may accompany CA. In childhood, asthma is more likely among boys than girls. As adults, women are more likely to have asthma.[24] Cats may carry *Toxoplasmosis* in their feces and transfer the organism to humans. However, contaminated food is the leading cause of *Toxoplasmosis*.[25]

Abandoned and Free-roaming Cats and Dogs

Abandoned, lost from households, and other free-roaming CA are abundant on O'ahu. The Hawaiian Humane Society (HIHS) estimated that 82% of cats and 51% of dogs taken in were euthanized between 1993-2008.[10] A 2021-2022 report indicated an intake of 12 899 animals with 57% of animals adopted, 13% returned to owners, and 30% of intake animals left unaccounted for (the number euthanized was not reported).[26] There are also no-kill shelters in Hawai'i.[27]

Cat caretakers work with animal organizations in Hawai'i to trap, neuter, release, feed, and care for free-roaming cats.[28] Cat sanctuaries (eg, Lāna'i), also provide humane care.[29] Additional solutions to prevent euthanasia are increased adoptions, education, enforcement of laws on abandonment, keeping CA indoors, and the more effective reduction of cat numbers with a "higher intensity option" of trap, neuter, and release.[30] Also, a new intramuscular injection for cats has been proposed providing long-term contraception.[31]

Objectives

The primary objective of this study is to provide baseline data on CA and associated variables. Additionally, data are presented by ZIP Code Tabulation Area (ZCTA) for planning needs.

Methods

Data are from the Hawai'i Health Survey (HHS, 2011-2012), an annual survey of households and adults who lived in Hawai'i.[32] As an anonymous survey, the HHS is exempt from the Internal Review Board process (B. Woods, PhD, DOH IRB Administrator, Hawai'i Department of Health, Email October 2018).

The sample frame for 2011-2012 was all households with landline telephone service and cell phone contracts issued in Hawai'i. The Office of Health Status Monitoring contracted with SMS Research & Marketing Services Inc. of Hawai'i (SMS) to conduct the HHS using Computer-Assisted Telephone Interviewing software to interview a knowledgeable adult ≥ 18 years.

A total of 10 226 adults were surveyed. The exact survey response rate is not available, due to changes in the surveillance metrics, but is estimated to be similar to the Hawai'i Behavioral Risk Factor Surveillance System (HBRFSS, response of 44.4% in 2011, 38% in 2012) since it was conducted by the same vendor, on the same population, and the response rates were similar in 2010.[33-35] Missing responses for CA responses at 2% were not imputed; missing values for income (20%) were imputed (hot-deck method).[36]

Survey questions included: "Does your household have pets such as dogs, cats, hamsters, birds, or other feathered or furry pets that spend time indoors?" If yes, then the pet type and number were recorded. Questions on households included county, household type, and poverty. Percent poverty was calculated using the US Department of Health and Human Services poverty guidelines for Hawai'i, household income, and household size and was grouped into <100%, 100%-124%, and ≥125%.[37] In 2011, the HHS asked about car ownership, and in 2012 home ownership. Other variables included sex, age, marital status (dichotomized into married and all others; including single, divorced, widowed, and other), employment, and education (ages 18-<25 years were listed separately, as their education may not be completed). Single race/ethnicity (multiple responses were possible) was derived from mother and father's ethnicity. Native Hawaiian was coded first, then the father's first non-White ethnicity, then the mother's. The SF12 Survey® questions assessed general health status.[38] Additionally, respondents answered, "Has a medical professional ever told you that you have asthma?" Specific ZCTAs were combined so that sample sizes were over 50.

Survey responses for adults and households were weighted, adjusted, and raked (using SAS MACROS) to bring the survey data into correspondence with the 2010 Census and then adjusted using an SMS growth model specific to Hawai'i.[39-40] Thus, the sample represented 1 079 943 adults and 448 125 households in Hawai'i (2011 and 2012 years averaged).

Data presented are percentages and predicted marginal percentages for households or adults. Non-overlapping confidence intervals or a Wald F (P<.05) value indicate a significant difference. The cutoff for inclusion was a sample size of 50 respondents for the denominator and a relative standard error <.30.

Univariate logistic regression models for the binary outcome, yes/no having a companion cat(s) or dog(s), were constructed for each independent variable with a logit-transformed probability. Select variables were age or age and sex-adjusted, as significant differences existed by age and sex. Data were analyzed using SAS software, version 9.4 (SAS Institute Inc., Cary, NC), and SUDAAN software, version 11.0 (RTI International, Research Triangle Park, NC).

Results

CA in Hawai‘i Households

An estimated 174 781 of 448 125 (39.0%) households in Hawai‘i had at least one CA (cat, dog, rabbit, other), with more households reporting dogs (29.5%) than cats (14.7%), **Table 1**. Rabbits (0.8%) and others (4.0%) (*data not shown*) were excluded from further analysis due to their small sample size and heterogeneity, respectively.

Honolulu County, with a large urban area, had the lowest percentage of cats per household (12.0%), compared to all other counties. With more rural areas, Hawai‘i County had the highest percentages of households with cats (22.1%) and dogs (35.6%). Households with 1 adult and no children had the lowest percentages of cats (10.5%) and dogs (15.6%) compared to other household types, **Table 1.**

Cats and Dogs and Poverty

The percentage of CA increased with decreasing poverty. The percentage of cats was significantly lower for households <100% of the poverty level compared to those ≥125%. The presence of CA was significantly associated with owning a car /or owning a home, **Table 1**.

Table 1. Percentage of Households in Hawai‘i with Cats and/or Dogs by Household Demographics, Hawai‘i Health Survey 2011 and 2012 Weighted Average.

Household Cats and/or Dogs				
Variables	**Cat(s)**		**Dog(s)**	
Sample Size n[a]	1 855		2 954	
Weighted	**Percent**	**95% CI**	**Percent**	**95% CI**
Total	14.7	(13.8-15.8)	29.5	(26.9-29.5)
County				
Honolulu	12.0	(10.7-13.3)	29.1	(25.5-29.1)
Hawai‘i	22.1	(20.0-24.3)	35.6	(30.6-35.6)
Kaua‘i	18.6	(16.3-21.1)	31.2	(24.6-31.2)
Maui	19.2	(17.3-21.3)	29.7	(24.8-29.7)
Household Type				
One Adult No Children	10.5	(9.0-12.3)	15.6	(13.5-18.1)
Adults No Children	18.1	(16.6-19.6)	31.1	(29.4-32.9)
One Adult With Children	19.9	(12.8-29.6)	29.8	(21.0-40.5)
Adults With Children	12.8	(11.1-14.8)	33.9	(31.1-36.7)
Federal Poverty Guidelines				
<100%	11.7	(9.7-14.0)	25.9	(22.3-29.8)
100-124	14.3	(12.2-16.6)	26.1	(23.3-29.2)
≥125	15.5	(14.3-16.8)	29.2	(27.6-30.9)
Car Ownership[b]				
Yes	16.0	(14.6-17.5)	31.2	(29.3-33.1)
No	8.5	(5.5-13.0)	10.5	(7.1-15.3)
Home Ownership[c]				
Yes	16.2	(14.6-17.8)	32.1	(29.9-34.3)
No	11.5	(9.2-14.3)	20.4	(17.1-24.1)

[a] Sample size 10 226 households; [b] Owning a car was asked only in 2011; [c] Owning a home was asked only in 2012

County Maps and Cats and Dogs by ZCTA

Rural areas of Honolulu County, Kaua'i, and Maui had higher percentages of cats in households. The Upcountry and Hāna areas on Maui Island had the highest percentages of cats in households. Dogs in households were highest in the Puna/ Ka'u area of Hawai'i County and the Kailua area of Honolulu County, **Figures 1 and 2**.

Adults Living with Cats and/or Dogs

Women were statistically more likely than men to be living with a CA. There were significant differences by age for adults. The highest percentages were for 35-74 years and the lowest for ages ≥75. Although the data for ages ≥75 years has a large enough sample size to present statistically, the sample may be skewed toward healthier adults, **Table 2**.

A higher percentage of married adults (34.0%) had dogs than all others (26.4%, *P*<.001). Adults with higher levels of education were associated with having a cat (*P*<.001). Whites had the highest percentage of cats (25.8%), and the Japanese (33.8%), and Whites (32.8%) had the highest percentages for dogs, **Table 2**.

Cats and Dogs and Selected Health Variables

Adults who rated their general health as excellent had the highest percentage of cats at 17.4%. The lowest likelihood of asthma was for men with cats compared to men without cats or dogs and women. Asthma was higher among women with cats and/or dogs (15.7, 16.1%, 16.8%) than women without (13.2%), **Table 3**.

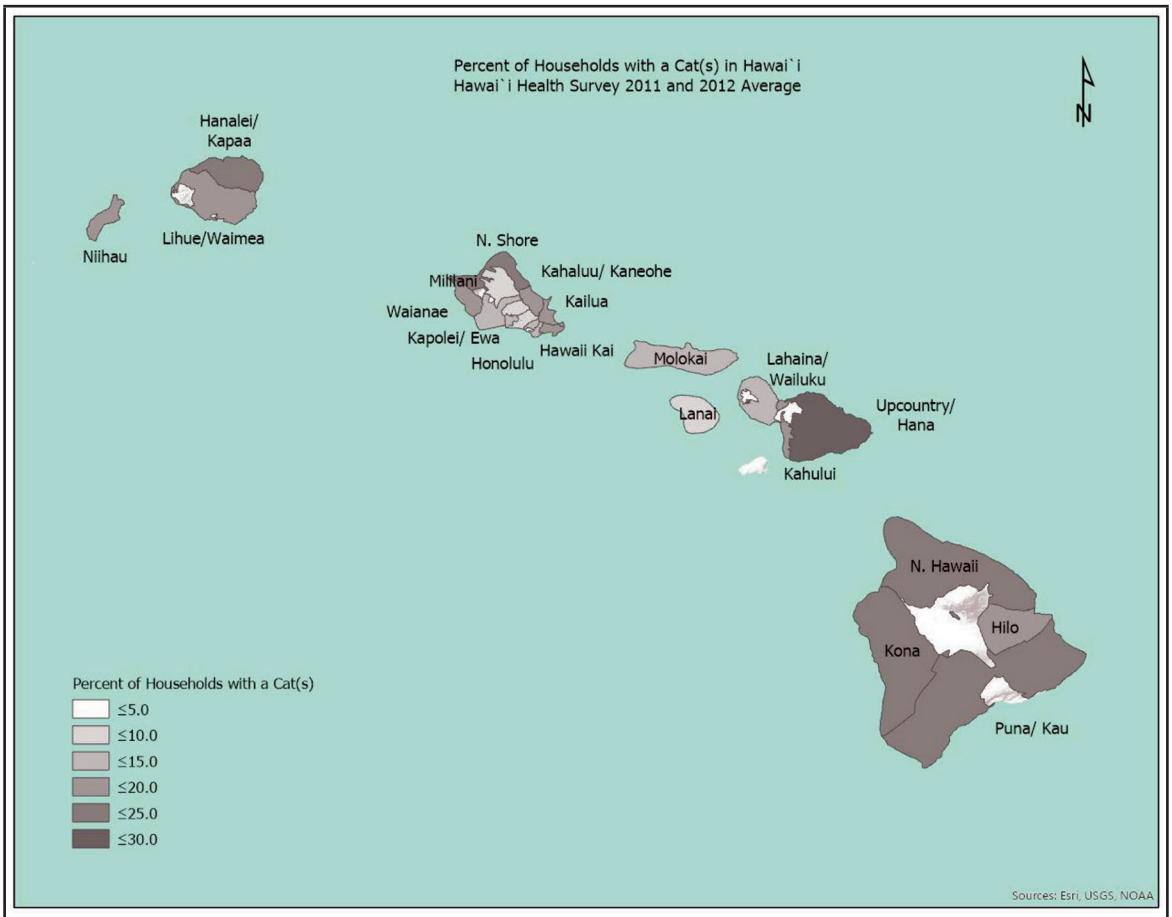

Figure 1. Percentage of Households with a Cat by ZIP Code Tabulation Area, Hawai'i Health Survey 2011 and 2012 Weighted Average

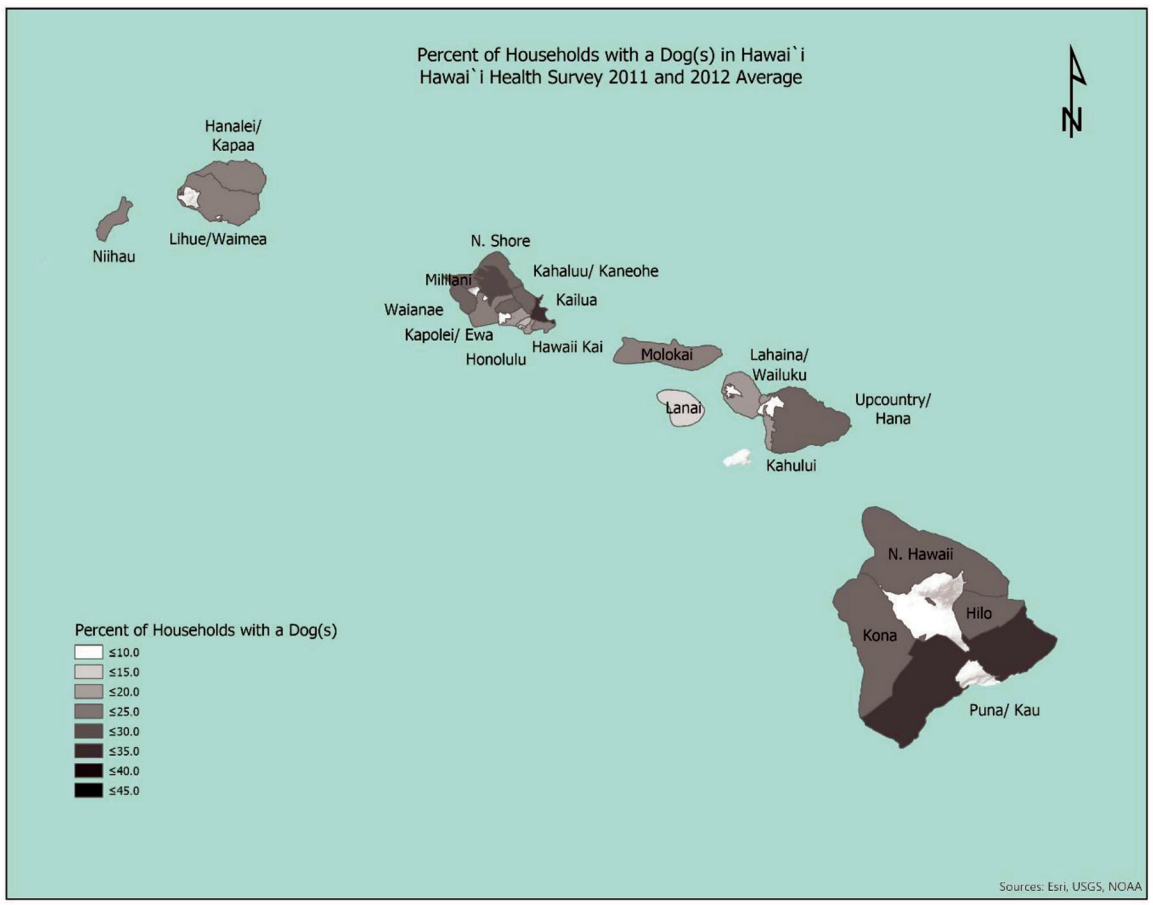

Figure 2. Percentage of Households with a Dog by ZIP Code Tabulation Area, Hawai'i Health Survey 2011 and 2012 Weighted Average

Table 2. Percentage of Adults in Hawai'i Living with Cats and Dogs, Hawai'i Health Survey 2011 and 2012 Weighted Average						
Cat(s) and Dog(s)						
Demographic Variables	**Cat(s)**			**Dog(s)**		
	%	**(95% CI)**	**Wald F *P*-Value**	**%**	**(95% CI)**	**Wald F *P*-Value**
All Adults	13.9	(12.9-15.0)		30.4	(28.9-32.0)	
Gender						
Men[a]	12.8	(11.3-14.4)	.034	27.9	(25.7-30.2)	.002
Women	15.1	(13.7-16.6)		32.9	(30.8-35.0)	
Age						
18-34	12.4	(10.2-15.1)		30.5	(27.0-34.2)	
35-44	12.7	(10.1-15.8)		32.1	(28.0-36.5)	
45-54	16.2	(14.0-18.7)	<.001	36.8	(33.4-40.4)	<.001
55-64	17.1	(15.2-19.1)		30.8	(28.3-33.4)	
65-74	14.9	(13.1-17.0)		25.8	(23.2-28.6)	
≥ 75[a]	9.6	(7.9-11.7)		19.1	(16.1-22.4)	
Marital Status						
Married	14.7	(13.4-16.2)	.11	34	(31.9-36.1)	<.001
All Other[a]	13	(11.5-14.6)		26.4	(24.2-28.8)	
Education						
None-11th Grade	8.2	(5.6-11.9)		24	(18.9-30.0)	
HS Grad/GED	11.4	(9.6-13.5)	<.001	30.3	(27.2-33.6)	.165
College 1->4 Years	15.7	(14.4-17.0)		31.1	(29.3-33.1)	
Age <25 Years[a]	13	(9.3-17.8)		31.8	(26.2-37.8)	
Ethnicity/ Race[b]						
Native Hawaiian	11.9	(9.6-14.5)		30	(26.6-33.7)	
Filipino	6.8	(4.9-9.4)		25.6	(21.6-30.1)	
Japanese	10.4	(8.3-12.8)		33.8	(30.5-37.3)	
Chinese	7.8	(5.1-11.6)	<.001	25.2	(19.6-31.7)	.031
White	25.8	(23.2-28.5)		32.8	(30.0-35.8)	
Other Asian	5.6	(3.3-9.4)		27.5	(19.1-37.8)	
Other PI	5.4	(2.3-12.4)		21.6	(12.7-34.3)	
Other[a]	14.2	(10.8-18.5)		31.1	(25.2-37.7)	
Employment						
Employed	14	(12.6-15.4)	.525	31.7	(29.7-33.9)	.055
Not Employed	15.9	(11.8-21.2)		31.3	(25.5-37.8)	
Other[a]	13.3	(11.8-15.0)		27.9	(25.6-30.3)	

[a] referent for Wald F P; [b] age adjusted value

Table 3. Percentage of Adults in Hawai'i Living with Cats and/or Dogs by General Health and Asthma Status, Hawai'i Health Survey 2011 and 2012 Weighted Average

Adults General Health Self-Reported	Cat(s) and Dog(s) by Adult General Health and Asthma			
	Cat(s)		Dog(s)	
	Adj. %[a]	(95% CI)	Adj. %[a]	(95% CI)
Excellent	17.4	(14.9-20.1)	29.4	(26.2-32.9)
Very Good	15.2	(13.3-17.4)	30.6	(27.9-33.4)
Good	11.8	(10.3-13.6)	31	(28.3-33.7)
Fair	11.1	(8.5-14.3)	30.9	(26.4-35.7)
Poor	14	(10.4-18.6)	29.7	(23.3-36.9)
Asthma				
Companion Animals	**Women**		**Men**	
	Adj. %[b]	(95% CI)	Adj. %[b]	(95% CI)
Total	14.7	(13.9-15.6)	12.1	(10.2-14.3)
Cat and Dog	15.7	(12.8-18.9)	14.2	(10.3-19.2)
Cat Only	16.1	(12.4-20.7)	4.3	(2.0-9.0)
Dog Only	16.8	(15.0-18.8)	13.9	(11.7-16.4)
No Cat or Dog	13.2	(11.3-15.4)	12.1	(9.9-14.7)

[a] age and sex adjusted; [b] age adjusted

Discussion

CA in Households in Hawai'i

The percentage of CA in households in Hawai'i at 39% was significantly lower than reported for the US (50%-67%).[1-5] The reasons may include the survey questions, state quarantine restrictions, fears concerning CA, and the high cost of living. The initial survey question asked about CA that spend at least some time inside; thus, exclusively outdoor CA may not be represented. Quarantine laws, designed to prevent the introduction of rabies in Hawai'i, may have affected the number of CA imported; however, quarantine is now waived for CA with required documentation.[41]

Patterns of CA in households were similar to the continental US, dogs were more prevalent than cats, and urban areas (Honolulu County) had fewer CA than more rural counties.[1-6,42] The estimates of cats may be lower possibly because of myths surrounding cats as independent, aloof, evil, and bad luck (black cat).[43,44] Interestingly, adults with higher education were significantly more likely to live with a cat than those with less education.

Single adult households had fewer CA compared to other household types, perhaps when the companionship of a cat or dog might be needed.[1-4,45] Studies have shown that living alone after a heart attack is associated with a higher risk of health problems and death, than not living alone when the companionship of a CA may be of benefit.[7,46]

This study includes data by ZCTA to aid in disaster planning for CA. The PETS Act, a federal law, requires plans for states and local municipalities, as well as non-profit organizations and private companies, to account for expenditures for household pets and service animals after a major disaster for reimbursement.[47] In addition, the Planning for Animal Wellness Act (PAW) requires the Federal Emergency Management Agency (FEMA) to form an advisory group to help plan for the needs of animals in disasters.[48,49]

Patterns of CA for adults were similar to other US studies.[5,45] Women had a significantly higher percentage of cats and dogs than men. Women and cats have been associated in art and literature, such as Cleopatra's cats, the myths of the crazy cat lady, and the Witch's black cat. Historically, women and cats may have relied on each other in a world when options were limited.[50,51] The National Park Service, during the anti-suffrage movement, promoted women's role as a homemaker with their companion cat.[52] Women were also significantly associated with the domestication of dogs as their emotionally supporting and loyal companions.[53]

Older adults were less likely to have a CA, perhaps when animal companions are needed to improve health status and quality of life.[54,55] In a retirement study, respondents with a CA considered them a friend.[56] Among older adults deciding on a retirement community, 70% reported the ability to have a CA as an important factor, as a CA provides "unconditional love".[54] However, disparities by ethnicity such as chronic conditions and poverty may affect the ability to have a CA for the elderly. Studies of

Native Hawaiians and Other Pacific Islanders (NHOPI) have reported higher chronic diseases, cardiovascular risk factors, cognitive decline, a significantly shorter life span, and higher poverty.[57-61] Interestingly, in the present study, Native Hawaiians had a higher percentage of CA than Other Pacific Islanders but this did not reach statistical significance.

CA and Socioeconomic Variables

Financial resources were highly associated with having a CA: lower poverty, having a car, and a home were significantly associated with cats and dogs. In addition, having a dog or cat was associated with marriage and higher education status.[4-5,45] The relationships of these variables may be an example of collinearity and future statistical analysis will provide more information.

Socioeconomic status may be especially relevant in Hawai‘i given the higher cost of living.[37] Recognizing the problem of CA and poverty, the HIHS stated "Pets are family and no one should have to choose between a roof over their head or a pet."[62]

CA and Ethnicity

The HHS provides data separately by Asian and NHOPI ethnicities, often combined in other studies.[42] Among Asian groups, the Japanese had the highest percentages of living with dogs and cats. Native Hawaiians and Japanese had the highest percentage of cats among Asian and NHOPI ethnicities. Overall, Japanese and then Whites had the highest percentages of living with dogs. However, further studies are warranted. As reported elsewhere, the White ethnicity was significantly associated with cats.[45]

CA and Health

Better overall general health was associated with having a cat. In contrast, studies have reported an association between CA and mental health indicators (reduced depression, anxiety, isolation, and loneliness), during COVID-19 but either no difference by species or dogs having a higher association than cats.[63,64] Other research studies, with mixed results, point out the need for further investigations.[56,64]

However, surveys of pet owners reported that 81% of adults with dogs and 83% of adults with cats felt that their dogs or cats provided companionship, love, company, and affection. Indeed, 59% of adults with dogs and 56% with cats say their CA is like a child or family member.[65]

CA may reduce perceptions of stressful events by providing social support and counteracting other established risk factors such as smoking, elevated blood pressure, obesity, etc. CA may provide a buffering effect to threats (real or perceived).[66] Also, the benefits may extend to the CA.[67]

Paradoxically, given the possible health benefits of CA on health, women with a CA reportedly have had a higher prevalence of asthma compared to men, as was the case in the present study, however, the association was not significant except for cats.[24] Men with cats had a significant decrease in asthma compared to the other groups for men and women. However, this association is complicated as cat exposure has been associated with rhinitis symptoms in men (not measured in the present study).[68] Other studies have had mixed results and report complex associations (genetic, environmental, hormonal, etc.) with asthma. Additionally: exposure to CA or farm animals at an early age can be protective against developing asthma.[69-73] Thus, sensitization not exposure may be an important factor in triggering asthma.[71] Interestingly, a national survey found that 100% of homes sampled had dog allergens and 99.9% cat allergens, as the community may introduce allergens from CA.[72,73]

Other confounding variables may be poverty and/or smoking. Higher-income adults have had asthma triggers associated with CA but not lower-income adults.[74] Smoking (not included in the present study) may also be associated with asthma.[69] Future studies at the molecular level with asthma may further elucidate patterns associated with CA.[72,73]

Difficulties in assessing the effects of CA on health include understanding the link or association. There may be an apparent link (cofactor associations), an indirect link (enhanced social interaction), or a direct link. Then there is the difficulty of defining health. A broader definition of health is needed, including further investigation of well-being and a sense of social integration.[66]

Given the interconnectedness of humans and CA, uniting them under One Health has been proposed. The goals include providing new data and collaboration on the complex relationship among people, animals, plants, and their environment.[22] Already the CDC has published information on possible zoonotic and infectious diseases associated with CA.[75] Given the increase in research and analysis the future should provide more definitive information on the benefits between humans and their CA.

Limitations

This study is cross-sectional thus, associations do not imply cause and effect. The questionnaire excluded households where pets spent all their time outdoors. Respondents without phones were not included. Health data were self-reported. Response rates for the HHS may be lower than surmised; however, they should be similar to the HBRFSS since they were conducted by the same vendor and on the same population (the rates of both surveys were similar in 2010). There may be selection bias as adults with CA may differ in characteristics from adults without.

Conclusions and Recommendations

The present study provides baseline data on CA in Hawai'i and associated variables with many patterns similar to those reported for the US. Having a CA was significantly associated with socio-economic indicators. Given the high cost of living, affordable housing allowing CA, and the cost of care many households do not have the resources for a CA.

The study revealed new data on CA ownership among Asian and NHOPI ethnicities. Among Asian ethnicities, Japanese had the highest association with dogs and cats in the household. Among Asian and NHOPI ethnicities, Native Hawaiians had the highest percentage of cats. CA associations with general health and asthma were not definitive. Future research could benefit from adding survey questions on CA to the HBRFSS, which already has detailed data on health, thus, enabling complex statistical analysis controlling on confounders (eg, poverty, ethnicity). Given the development of One Health, future research will elucidate the complex associations of humans and their CA.

Conflict of Interest

The author does not identify a conflict of interest.

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Creating a Sustainable Native Hawaiian Pacific Islander Community Health Worker Workforce to Address Health Inequity in Hawai‘i

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Introduction

In Hawai‘i, the COVID-19 pandemic revealed longstanding and disproportionate health challenges faced by Native Hawaiian, Pacific Islander, and Filipino communities.[1] State and federal efforts to implement public health policies often failed to resonate or prove effective within racially and culturally diverse communities.[2] The pandemic exacerbated this gap in health equity, rooted in a historical lack of culturally competent health care services and professionals that can adequately serve these communities.[3] However, the pandemic also demonstrated the potential for Community Health Workers (CHWs) to bridge the gap between these communities and health services, becoming trusted liaisons and sources of critical information, services, and care. As Hawai‘i recovers from the pandemic, there is a clear opportunity to create a sustainable CHW workforce that can address health disparities by drawing on Indigenous knowledge, lived-life experiences, and culturally responsive practices. This article discusses how creating a sustainable pathway for CHWs among Native Hawaiian and Pacific Islander (NHPI) communities can strengthen public health infrastructure and create a more equitable and community-centered health landscape in Hawai‘i.

The Disparities Exposed by COVID-19

COVID-19 disproportionately impacted Native Hawaiian, Pacific Islander, and Filipino communities with higher case rates, comorbidity, and mortality rates, revealing existing health disparities that were exacerbated by the pandemic.[4] Barriers to health care access, higher rates of chronic conditions, and economic inequities made these populations more vulnerable to severe outcomes.[5] Additionally, cultural and language barriers, mental health issues, and housing instability further compounded their challenges during this crisis.[6] The lack of representation in leadership roles and decision-making processes meant that policies created were often disconnected from the communities they aimed to serve. The crisis exposed the inefficiencies of conventional public health approaches in contact tracing, testing, and outreach programming, which often lacks in language resources and cultural sensitivity, and disregards the importance of community trust. This failure extended beyond the COVID-19 response, highlighting a broader issue: the absence of NHPI representation in the development and implementation of public health policies, outreach, and solutions. This gap in leadership resulted in a misalignment between the manner in which contact tracing, testing, and outreach programming was conducted and the values, beliefs, and practices of NHPI communities.[7] To address this issue, it is essential that future public health efforts incorporate CHWs who are embedded within their communities and can deliver culturally appropriate care.

The Role of Community Health Workers

CHWs have long played an important role in connecting underserved and marginalized populations with health care services.[8] They serve as trusted messengers, bridging the gap between health care systems and the communities they serve. CHWs are uniquely qualified to provide culturally safe spaces for care because they often come from the communities they serve, speak the same language, and understand the cultural nuances that impact health behaviors and attitudes toward care.[9]

During the pandemic, CHWs played a crucial role in providing essential outreach and support to NHPI communities.[10] They effectively communicated important health information in the appropriate languages and were mindful of cultural protocols, ensuring that their messages were more likely to resonate with community members.[11] For instance, Team 6B was a group of CHWs comprised of community members from the most affected communities and formed during the pandemic by the

Hawai‘i State Department of Health (DOH). Team 6B provided in-language and culturally appropriate contact tracing, community education presentations, and supported mobile vaccination clinics. Each team member quickly became the point of contact between their respective community and the DOH in all pandemic-related issues, from contact tracing to isolation to resource support. This culturally sensitive approach fostered trust and created an environment where community members felt safe asking questions and seeking assistance.

The CHWs of Team 6B played a key role in addressing barriers to care. In many cases, they went beyond their official duties to ensure that community members received the support they needed, such as delivering diapers or disinfectant supplies, or connecting with other community members to provide financial support, demonstrating a level of dedication and cultural competence that is crucial for improving health outcomes in underserved populations. Their contributions during the pandemic highlight the importance of integrating culturally informed practices into public health efforts. By building trust and rapport within the communities they serve, CHWs have the potential to facilitate better health outcomes and enhance the overall effectiveness of health initiatives. Moving forward, it is vital to continue investing in and supporting CHWs as essential players in promoting health equity and addressing the unique needs of NHPI communities.

Barriers to Building a Sustainable Workforce

Despite the success of CHWs during the pandemic, several barriers hinder the development of a sustainable CHW workforce in Hawai‘i. One of the primary challenges is the misconception that CHWs require a Western-academic degree to be effective in their roles. While this can be valuable in some instances, it is not always necessary for CHWs, especially when their lived experiences and cultural knowledge are equally, if not more, important. While most individuals can be trained in basic contact tracing, which includes interviewing a case over the phone with an elaborate script, it is impossibleto train an individual to become well-versed in all the nuances of a specific culture without having lived in that community and being a part of it. You can teach a Samoan to be a CHW but you cannot teach a non-Samoan to be Samoan.

Institutional racism and cultural stereotypes further compound the challenges faced by NHPI. The lack of representation in leadership roles and decision-making positions means that NHPI voices are often excluded from the conversation, leading to policies that do not reflect the needs and values of the communities they are meant to serve. This exclusion perpetuates health disparities and prevents meaningful progress toward health equity.

In addition to these barriers, the health care system in Hawai‘i often fails to value Indigenous knowledge and ways of knowing in its hiring processes. Instead, it focuses on Western academic achievements as the principle qualification, despite ample evidence on the barriers that marginalized communities face in accessing and completing Western academicprograms. The current system is rooted in a colonial framework that prioritizes Western medical practices and overlooks the importance of moving beyond cultural competence and focusing on creating culturally safe spaces. This paternalistic approach focuses on educating outside “qualified” individuals on a different culture, rather than shifting to focus resources on empowering NHPI communities to take an active role in shaping their own health outcomes by building up the existing community infrastructure and community members.

Crafting a Pathway to Public Health Careers for NHPI Communities

To create a sustainable CHW workforce, Hawai‘i must invest in pathways that provide NHPI community members with opportunities to enter into and advance in public health careers. This means reallocating resources to support equitable hiring practices that value lived experiences on par with formal Western education, thus creating workspaces that reflect the communities being served. NHPI community members must be recruited, trained, and retained as CHWs, and their contributions must be recognized as vital to the success of the public health system.

One solution is to develop community-based teams that embrace inclusivity and foster meaningful engagement. These teams should reflect the diversity of the communities they serve and include CHWs who have the language skills, cultural knowledge, and lived experience to provide effective care. By creating entry-level positions that offer opportunities for advancement, Hawai‘i can build a thriving sustainable pathway of CHWs who are prepared to take on leadership roles in public health.

The success of Team 6B during the pandemic demonstrates the power of community-based CHWs in addressing health disparities. By looking within the community for trusted messengers, Team 6B was able to provide culturally informed outreach that resonated with NHPI communities. Their success illustrates the importance of drawing upon existing community strengths and assets to create solutions that are both effective and sustainable.

Valuing Indigenous Ways of Knowing

One of the most significant lessons learned from the pandemic is the value of Indigenous knowledge and ways of knowing in public health. As members of the communities that they serve, NHPI CHWs possess a deep understanding of their communities’ values, beliefs, and practices, which allows them to provide care that is culturally responsive and appropriate.[8] This knowledge is as important as formal education when it comes to addressing health disparities and creating sustainable change.

The DOH's decision to implement a parallel hiring system that valued lived-life experience alongside formal education was a step in the right direction. This system allowed NHPI CHWs to take on leadership roles and provided them with the authority to determine who was best suited to serve their communities and how those services were provided. By prioritizing lived-life experience and community ties, the DOH created a hiring process that was more equitable and better aligned with the needs of NHPI communities.

Long-Term Solutions for Health Equity

Building a sustainable CHW workforce is not just about addressing the immediate needs of the pandemic—it is about creating long-term solutions for health equity in Hawai'i. CHWs are uniquely positioned to play a central role in these efforts, as they possess the cultural knowledge and community connections needed to provide effective care that can shift the health outcomes being experienced by underserved and marginalized communities.

The success of Team 6B during the pandemic serves as a model for how CHWs can address health disparities and foster equity within the public health system. By drawing upon existing community strengths and assets, and providing culturally informed care, CHWs can create solutions that are both effective and sustainable.

Policy Recommendations

The following policy recommendations are suggested to support the development of a sustainable CHW workforce and promote health equity in Hawai'i:

1. Implement more equitable hiring practices that embrace both Western and Indigenous/Native educational qualifications.
2. Create a pathwayto increase access for NHPI individuals to educational and professional opportunities in public health.
3. Support systems changes that result in deliberate diversity in leadership and decision-making processes.
4. Develop mechanisms to evaluate and monitor progress towards greater racial and cultural diversity at all levels of public health.

Conclusion

The COVID-19 pandemic laid bare the entrenched health disparities in Hawai'i, revealing the critical gaps that need addressing. However, it also demonstrated the transformative potential of community-based CHWs in bridging these gaps. By investing in a sustainable and culturally grounded CHW workforce, Hawai'i can revolutionize its public health system to be more equitable and attuned to the unique needs of its diverse populations. The triumphs of Team 6B during the pandemic illustrate the profound impact that integrating Indigenous knowledge and lived experiences can have on health outcomes. These successes offer a blueprint for future public health initiatives, highlighting the importance of community resilience and creating culturally safe spaces for care. Moving forward, Hawai'i has the opportunity to lead by example, fostering an environment where public health strategies are not only inclusive but also reflective of the rich cultural tapestry that defines the islands. By doing so, Hawai'i can ensure lasting and meaningful improvements in health equity, setting a standard for others to follow.

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Guidelines for Publication of Hawai'i Journal of Health & Social Welfare Supplements

The Hawai'i Journal of Health & Social Welfare (HJH&SW) partners with organizations, university divisions, and other research units to produce topic-specific issues of the journal known as supplements. Supplements must have educational value, be useful to HJH&SW readers, and contain data not previously published elsewhere. Each supplement must have a sponsor(s) who will work with the HJH&SW staff to coordinate all steps of the process. Please contact the editors at hjhsw@hawaii.edu for more information if you would like to pursue creating a supplement.

The following are general guidelines for publication of supplements:

1. Organizations, university divisions, and other research units considering publication of a sponsored supplement should consult with the HJH&SW editorial staff to make certain the educational objectives and value of the supplement are optimized during the planning process.

2. Supplements should treat broad topics in an impartial and unbiased manner. They must have educational value, be useful to HJH&SW readership, and contain data not previously published elsewhere.

3. Supplements must have a sponsor who will act as the guest editor of the supplement. The sponsor will be responsible for every step of the publication process including development of the theme/concept, peer review, editing, preliminary copy editing (ie, proof reading and first round of copy editing), and marketing of the publication. HJH&SW staff will only be involved in layout, final copy editing and reviewing final proofs. It is important that the sponsor is aware of all steps to publication. The sponsor will:

a. Be the point of contact with HJH&SW for all issues pertaining to the supplement.

b. Solicit and curate articles for the supplement.

c. Establish and oversee a peer review process that ensures the accuracy and validity of the articles.

d. Ensure that all articles adhere to the guidelines set forth in journal's Instructions to Authors page (https://hawaiijournalhealth.org/authors.htm), especially the instructions for manuscript preparation and the statistical guidelines.

e. Obtain a signed Copyright Transfer Agreement for each article from all authors.

f. Comply with all federal, state, and local laws, rules, and regulations that may be applicable in connection with the publication, including ensuring that no protected health information appears in any article.

g. Work with the editorial staff to create and adhere to a timeline for the publication of the supplement.

h. Communicate any issues or desired changes to the HJH&SW staff in a timely manner.

4. Upon commissioning a supplement, the sponsor will be asked to establish a timeline for the issue which the sponsor and the HJH&SW editor(s) will sign. The following activities will be agreed upon with journal publication to take place no later than 24 months after signing. Extensions past the 24 months will be subject to additional fees based on journal publication rates at that time:

- Final date to submit a list of all articles, with working titles and authors
- Final date for submitting Word documents for copy editing
- Final date for submitting Word documents for layout
- Final date to request changes to page proofs (Please note that changes to page proofs will be made only to fix any errors that were introduced during layout. Other editing changes will incur an additional fee of $50 per page.)

5. The cost of publication of a HJH&SW supplement is $6,000 for an 8-article edition with an introduction from the sponsor or guest editor. Additional articles can be purchased for $500 each with a maximum of 12 articles per supplement. This cost covers one round of copy editing (up to 8 hours), layout, online publication with an accompanying press release, provision of electronic files, and indexing in PubMed Central, SCOPUS, and Embase. The layout editor will email an invoice for 50% of the supplement to the designated editor for payment upon signature of the contract. The remaining will be due at the time of publication. Checks may be made out to University Health Partners.

6. The sponsor may decide to include advertisements in the supplement in order to defray costs. Please consult with the HJH&SW advertising representative Michael Roth at 808-595-4124 or email rothcomm@gmail.com for assistance.

7. Supplement issues are posted on the HJH&SW website (https://hawaiijournalhealth.org) as a full-text PDF (both of the whole supplement as well as each article). An announcement of its availability will be made via a press release and through the HJH&SW email distribution list. Full-text versions of the articles will also be available on PubMed Central.

8. It is the responsibility of the sponsor to manage all editorial, marketing, sales, and distribution functions. If you need assistance, please contact the journal production editor. We may be able to help for an additional fee.

9. The editorial board reserves the right of final review and approval of all supplement contents. The HJH&SW will maintain the copyright of all journal contents.

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Hawai‘i Journal of Health & Social Welfare
Style Guide for the Use of Native Hawaiian Words and Diacritical Markings

The HJH&SW encourages authors to use the appropriate diacritical markings (the ‘okina and the kahakō) for all Hawaiian words. We recommend verifying words with the Hawaiian Language Dictionary (http://www.wehewehe.org/) or with the University of Hawai‘i Hawaiian Language Online (http://www.hawaii.edu/site/info/diacritics.php).

Authors should also note that Hawaiian refers to people of Native Hawaiian descent. People who live in Hawai‘i are referred to as Hawai‘i residents.

Hawaiian words that are not proper nouns (such as keiki and kūpuna) should be written in italics throughout the manuscript, and a definition should be provided in parentheses the first time the word is used in the manuscript.

Examples of Hawaiian words that may appear in the HJH&SW:

‘āina	**Kaua‘i**	**O‘ahu**
Hawai‘i	**Lāna‘i**	**‘ohana**
kūpuna	**Mānoa**	**Wai‘anae**

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