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Hawai'i Journal of Public Health

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Welina aloha,

Welcome to the first issue of the Hawai'i Journal of Public Health. Why a new public health journal for Hawai'i? First, this Journal offers public health professionals, academics, students, and even members of the public from Hawai'i and the Pacific a venue for publishing their Hawai'i and Pacific-based research in a publication which is targeted at Hawai'i and the Pacific. This aim is particularly true for the three thousand staff members of the Hawai'i State Department of Health, where Director Chiyome Leina'ala Fukino sees the Journal as an essential tool for workforce improvement.

What is the Journal? As the name states, we are a Journal of public health. Our focus is on all disciplines of public health, from chronic disease to environmental, maternal and child health to infection control. We aim to improve the quality of public health practiced everywhere in Hawai'i and the Pacific by providing a forum for students, practitioners and the public to share their research and learn about the research and best practices of others. We are not a journal of clinical medicine.

While we welcome submissions from any location, our focus is on Hawai'i and the Pacific. Specifically, we hope that the research, policies and commentary published in the Journal will be a resource for public health practitioners, students and the public in Hawai'i and the Pacific. At the same time, public health is global, and we recognize the substantial links of Hawai'i and the Pacific to locations such as the continental United States. Thus, we particularly encourage submissions from authors concerning populations from Hawai'i and the Pacific who have settled in other areas.

Although our Journal will remain a high-quality, peer-reviewed publication, we also recognize the need to encourage first-time authors to publish. Thus, we will work with authors to make their work publishable, if at all possible. While maintaining high standards, we believe that we should facilitate, rather than be a barrier to, publication. To this aim, we offer a wide variety of formats, from the traditional original research articles to brief reports, student submissions, and a discussion section where issues of public health can be debated.

We are particularly grateful to all the section editors and peer reviewers, without whose help this Journal is not possible.

Mahalo for your interest in the first issue of the Hawai'i Journal of Public Health, and we look forward to your participation in this new endeavor.

Me ka ha'aha'a,

Kawika Liu and Andrew Grandinetti
Co-editors, Hawai'i Journal of Public Health.

A Few Thoughts on Public Health and Our Healthcare Crisis

Chiyome Leinaala Fukino, MD¹

Public Health is something of a mystery to most people. In the minds of many, the services and purposes of public health and clinical medicine are essentially the same. The confusion is understandable because in many states, public health departments have become the “provider of last resort”, assuring access to direct healthcare services for vulnerable populations such as the mentally ill, homeless and uninsured.

By definition, Public Health protects and improves the health of communities through education, promotion of healthy lifestyles, and research to prevent disease and injury. By contrast, Clinical Medicine maintains or restores the health of individuals through study, diagnosis and treatment of individual patients.

Regulatory functions of Public Health in Hawaii assure that our communities have clean air, clean water, safe food, safe drinking water, proper sewage treatment and appropriate solid and hazardous waste disposal. We license many types of healthcare facilities and certify practioners in various public health related professions. We work with many community partners to solve current health and safety problems and practice with them in preparation for future natural or man made disasters and disease outbreaks. These are just a few of the activities of the Hawai'i State Department of Health.

It is no secret that healthcare in the United States is in crisis, providing some of the best and some of the worst healthcare the world has to offer! Many are not happy with the ways things are right now, but clearly, this is the healthcare industry that we built. Rushing to enact healthcare reforms based on perceived benefits of nationalized health care systems in other countries without unbiased evaluations of their advantages and disadvantages, as well as appropriate consideration of

our own unique cultural, legal and political differences will only serve to aggravate an already bad situation.

An effective partnership of the two great health houses—Public Health and Clinical Medicine, must be forged if we are to solve our nation's “healthcare crisis”.

One of the most significant things that Public Health does is to focus on prevention efforts now in order to reduce the need for expensive tertiary healthcare services later. Good nutrition, regular physical activity and abstinence from tobacco and other illicit drugs are health habits that greatly improve the quality and duration of our lives, no matter what our gene pool may be. These good health habits are well understood by the health savvy, but for many adults, consistent educational outreach is needed to improve health knowledge and counteract decades of physical neglect. Early education of our children in environments supportive of these good health habits is essential!

Public Health in Hawai'i must take an active role in shaping our natural environment and helping individuals to shape their personal environments to enable consistent application of good health habits which decreases future demand for Clinical Medicine services.

¹Hawai'i State Department of Health

Academic Public Health at the University of Hawaii at Mānoa

Jay Maddock, PhD¹

It gives me great pleasure to see this inaugural issue of the *Hawai'i Journal of Public Health*. The journal provides another strong link between the public health academic and practice communities in Hawai'i. Over the past few years, several linkages have been made between the Office of Public Health Studies and the Hawai'i Department of Health to better address public health issues. This includes the Science Officer's Program, Hawai'i Health Data Warehouse, the Healthy Hawaii Initiative and several student practical experiences. We look forward to additional academic-practice linkages in the future.

The Office of Public Health Studies (OPHS) is also rapidly growing and maturing. As many of you know, the School of Public Health was closed in 2000 and the Office of Public Health Studies was created in the John A. Burns School of Medicine. Since that time we have been hard at work developing new programs and research areas. Currently, we offer MPH and MS degrees in the areas of Social and Behavioral Sciences and Epidemiology. Earlier this fall, we opened the DrPH program in Community-Based and Translational Research. All of these programs are fully accredited by the Council on Education in Public Health. We are currently working to open a specialization in Health Policy and Management for fall of 2009. The OPHS also offers certificate programs in Maternal and Child Health and Population Studies. These short courses of study can be completed part time in one year.

The OPHS is also developing several new exciting initiatives in the Asia Pacific Region. In 2008, we signed agreements with two Schools of Public Health in China. Our agreements with Fudan and Wuhan Universities provide for student and faculty exchange and joint research projects. This past summer, three students and two faculty members spent a month in Wuhan, China learning with their Chinese colleagues. We are also moving rapidly ahead in our distance education capacity. This fall we offered our first course on Elluminate, a desk top based distance learning software. Students from Atlanta to Calcutta participated in the course. We have recently hired a distance education coordinator and hope to be able to offer complete certificates and eventually entire degree programs on-line to serve our rural Oahu, Neighbor Island, Pacific and Asian students. We have also jumped into the field of undergraduate education. In fall 2008, we offered our first undergraduate class, an honors class with eight students. Current plans are underway to add several new undergraduate courses in the coming years.

We are excited about the reemergence of academic public health in Hawaii and would like to invite you to join us. Please visit our website at www.hawaii.edu/publichealth. If you are alumni please update your contact information there and we will keep you informed about upcoming events. You can also call 956-8577 if you would like to schedule a visit to talk about our programs and opportunities to get involved.

¹Department of Public Health Studies, John A Burns School of Medicine, University of Hawai'i at Mānoa

SPECIAL ARTICLE

Health Disparities in Hawai'i: Part 1.

David MKI Liu¹, MD, PhD, JD, R Kekuni Blaisdell², MD, Nia Aitaoto³, MS, MPH

Abstract

Objective: Although the United Health Foundation ranked Hawai'i as the third healthiest state in the United States in 2007, this status is not shared equally among the peoples of Hawai'i. Studies have identified disparities in breast cancer screening, body mass index (BMI), the use of mental health services by women with depressive symptoms, adherence to antihypertensive medications, breast cancer management and breast cancer survival, in addition to many other health areas. Lacking, however, is a comprehensive examination of health disparities across the most populous ethnic groups in Hawai'i – Native Hawaiians, Caucasians, Japanese, Chinese, and other Pacific Islanders. This series presents these data, beginning with an introduction and continuing to present data on disparities on obesity, diabetes, cardiovascular disease, and other chronic illnesses.

Methods: Data from the Behavioral Risk Factor Surveillance System was surveyed from the years 2002 to 2007.

Results: Significant health disparities exist between the different major ethnic groups in Hawai'i. Insufficient data exists, however, to identify significant trends for Other Pacific Islanders.

Conclusions: More data are needed to present a complete portrait of health disparities in Hawai'i. Once these data are obtained, comprehensive strategies can be developed to improve health equity in Hawai'i.

I. Introduction

Examining differences between societal groups, particularly ethnicities, can be examined through the lens of “health inequity” or “health inequality,” as is done outside the United States, or “health disparity,” as is done within the United States.¹ The National Association of Chronic Disease Directors has adopted a useful definition of disparity:

Health disparities are differences in the incidence, prevalence, mortality, burden of diseases and other adverse health conditions or outcomes that exist

among specific population groups in the United States. Health disparities can affect populations groups based on gender, age, ethnicity, socioeconomic status, geography, sexual orientation, disability or special health care needs and occur among groups who have persistently experienced historical trauma, social disadvantage or discrimination, and systematically experience worse health or greater health risks than more advantaged social groups.²

Although many different definitions of health disparity exist, a commonality among these definitions is that a disparity acts as a “signpost,” indicating that something is wrong. Research can then enable the public and policymakers to determine what differences are amenable to change, and what differences are unjust.

Although the United Health Foundation ranked Hawai'i as the third healthiest state in the United States in 2007, this status is not shared equally among the peoples of Hawai'i. Studies have identified disparities in breast cancer screening, body mass index (BMI), the use of mental health services by women with depressive symptoms, adherence to antihypertensive medications, breast cancer management and breast cancer survival, in addition to many other health areas.^{3,4,5,6,7,8,9} Lacking, however, is a comprehensive examination of health disparities across the most populous ethnic groups in Hawai'i— Native Hawaiians, Caucasians, Japanese, Chinese, Filipinos, and other Pacific Islanders. Because of limitations in the available data, we are unable to conduct similar analysis on less populous, but still numerous, groups, such as people of Samoan, Tongan, Vietnamese, Puerto Rican and Mexican descent.

We are conducting this survey in the context of the Department of Health's dedication to ameliorating disparities among and within the different ethnic groups in Hawai'i. The results of this survey will be presented here in a series of articles describing the major disorders affecting Hawaii, as well as specific problems affecting each of the major ethnic groups in Hawaii. These health disparities not only effect the groups experiencing the inequities, but also the whole of

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society, as the poorer health of disproportionately impacted groups results in reduced productivity, as well as higher healthcare costs for all members of society. Thus, reducing health disparities will benefit members of all ethnic groups in Hawai'i, not simply those who are disparately impacted.

Moreover, this study also takes place in the context of a renewed commitment by the Department of Health to the evidence-based practice of health. Examining inter- and intragroup disparities can provide materials for comparisons with the populations of other areas of the world. Such a comparison, for an example, may reinforce the finding that indigenous peoples, such as Native Hawaiians, tend to have wide disparities with the non-indigenous peoples of the world.¹⁰

A. Major ethnicities in Hawaii

We begin this series with a brief description of the history and cultures of each of the major ethnic groups represented in Hawaii, with special emphasis on the host culture, that of the Kānaka Maoli. Hawai'i is the most multiethnic State in the United States, and has been multiethnic since the early days of the Hawaiian Kingdom.^{11,12} Citizenry was not restricted to Native Hawaiians, and members of many ethnic groups were active participants in the civil affairs of the Kingdom.¹²

Native Hawaiians

Kānaka Maoli, now called "Native Hawaiians," were the first to arrive in their new, most-isolated homeland in the North Pacific Tropics approximately 300 AD. Later, they gave the name Kō Hawai'i Pae'aina to their entire 1523-mile archipelago chain of 132 islands and atolls, extending northwesterly from Hawai'i to Pihemanu (Midway) and Kānemiloha'i (Kure).

These early mariners continued their two-way, north-south, long voyaging introducing 29 special plants, such as taro, 'uala (sweet potato), mai'a (banana), niu (coconut) and hala (pandanus) plus three favorite animals—the pig, dog and chicken. All were essential to their unique culture that westerners would later call "Polynesian," within a 20 million square-mile Oceanic triangle, from Hawai'i north, to Aotearoa southwest, to Rapa Nui southeast.

The voyagers arrived in two main waves. First, from Te Henua Enana (Marquesas) 2000 mi to the southeast, approximately 300 AD. Second, from the south leeward Tahitian islands of Ra'iatea, Bora Bora and Huahine, approximately 1200 AD. Led by warrior chief and high priest Pa'ao, they created a stratified society of: sacred ruling ali'i (chiefs) and a hierarchy of lesser ali'i; kahuna (priestly specialty experts) who practiced and taught in each field of human endeavor; koa (warriors) loyal to their rival ali'i in control of each island; maka'āinana (farmers, fishermen and craftsmen); and kauā (servants). Then, approximately 1400 AD, they stopped long-distance ocean voyaging

and remained isolated from the rest of the planet for about four centuries.¹³

By January 1778, when British Capt. James Cook and his crews arrived by chance, these robust natives had adapted so well to their island ecosystems, that they had attained a population of perhaps 1 million, the largest at that time of any of the dispersed 50 Polynesian societies.¹⁴

Human anatomy reflected spiritual relationships, such as in the concept of nā piko 'ekolu (three body centers). Piko po'o, or manawa, at the top of each person's head, was the opening connecting each person's 'uhane (spirit) or wailua, with the spiritual realm beyond, including one's 'aumākua, departed, but ever-present, deified ancestors since the beginning of time. Piko waena, the navel, represented the remnant of each person's intrauterine umbilical connection to his mother in the contemporary world. This middle piko covered the na'au (gut) which was the seat of knowledge, wisdom and emotions. Piko ma'i was the genitalia, which linked each person to his mamo, descendants, into the future. But each mamo is also connected to his ancestors and so the linked DNA for each kanaka is perpetuated in a timeless circle.¹⁵

The essence of wellness was lōkahi (oneness) and pono (harmony, balance) with self, others and all in the cosmos, maintained by proper thoughts, feelings and actions toward others and all in the spiritual as well as material world. Misfortune, such as ma'i (illness) resulted from altered pono or impaired relationships with loss of personal mana. Thus, wellness was restored mainly by correcting the impaired relationships, including communication with spiritual forces, prayers, rituals and healing thoughts and actions.¹⁵

In spite of this prevalent spirituality, all was natural. There was nothing supernatural in the western sense. Events could, and were, influenced by all of the numerous forces in the material and spiritual realms, favorable and adverse, from the past as well as the present and into the future. These forces included each kanaka's thoughts and attitudes, as well as actions.¹⁵

If the individual's efforts at healing himself were not effective, the 'ohana (family) elder's intervention was sought. If this, too, was not of benefit, the patient was taken to the kahuna lapa'au (medical practitioner priest) at the nearest heiau ho'ōla (healing temple).¹⁵

The foregoing described, highly organized, yet locally-based, health system was threatened in 1778 by the fatal impact of introduced epidemics of foreign contagious infections by Capt. Cook's crew, beginning with gonorrhea, syphilis and tuberculosis. There followed recurring pneumonia, influenza, measles, mumps, typhoid, other infectious diarrheas, four smallpox epidemics; later, leprosy, plague, diphtheria and the streptococcoses. Traditional lapa'au, native medicine, could not stem the devastation. Nor was western or Asian medicine effective.^{15,16}

Other factors contributing to the over 95% decline in the native population, from an estimated one million in 1778 to approximately 40,000 in 1893, at the time of the end of the monarchy, were: colonial economic and political exploitation; market-money economy, private ownership and loss by Kanaka of their lands, economic dependence; suppression of indigenous culture, education, language and spirituality; cultural conflict, stress and despair, adoption of harmful foreign ways, such as, use of alcohol and tobacco, physical inactivity, western high-fat, high-cholesterol, high-salt and low-fibre diet; western religious, educational, economic and social institutional racism.^{15,18}

Homeless, urban Kanaka suffered most. Rural natives, retaining some of their spiritual and physical relationship to the land and sea, fared better.

In 1865 Kamehameha V, and in 1879 Kalākaua attempted to revive native lapa'au by issuing government board medical licenses to medical kahuna "to practice native medicine." However, these practices were largely limited to herbal medicine and lomilomi (native massage). Traditional 'ana'ana and related methods were officially banned, but remained underground. Christian prayers and ho'oponopono ('ohana spiritual group therapy) replaced pre-western rituals and ceremonies.¹⁵

With the 1893 U.S. armed invasion and overthrow of the monarchy, and the 1898 U.S. forced illegal occupation and annexation of Hawai'i, in spite of the Kanaka Kū'ē petitions accounting for failure of the U.S. Senate to ratify the Dole Republic of Hawaii-US Annexation Treaty, an official policy of coercive assimilation and de-Hawaiianization ensued with further suppression of lapa'au.¹⁸

In the 1980s, mounting native restlessness led to several US Congressional investigations resulting in the 1985 E Ola Mau Native Hawaiian Health Needs Study Report.

Publicly documented for the first time in modern times was the worst health plight of the Kānaka Maoli.¹⁹ The following year, a small nucleus of Kanaka health professionals, who had participated in the E Ola Mau Study and Report, founded a permanent organization—E Ola Mau (Live On!)—to reverse the health tragedy of Kanaka Maoli.¹⁵

The result was passage of the U.S. Native Hawaiian Health Care Act (NHHCA) and Native Hawaiian Health Scholarship Act of 1988, introduced by Sen. Daniel K. Inouye.

The first NHHCA authorized: (1) maximum participation by Kanaka Maoli, including traditional healers, (2) five Native Hawaiian Health Systems, established by Native Hawaiian organizations, to serve every inhabited island in Hawai'i, and (3) a coordinating Papa Ola Lōkahi five-member board, consisting of E Ola Mau, State Department of Health, Office of

Hawaiian Affairs, Alu Like and the University of Hawai'i.¹⁵

The second legislation provided federal scholarships to eligible Kanaka graduate students pursuing careers in medicine, dentistry, pharmacy, nursing, psychology and social work.¹⁵

Encouraged by E Ola Mau in 1986 and the 1988 US federal legislation, traditional healers have re-emerged and officially organized island-wide as Kūpuna Lā'au Lapa'au.¹⁵

Caucasians

The first Caucasians in Hawaii were Captain James Cook and the crew of his expedition in 1778.²⁰ Since that time, the Caucasian population of Hawai'i has grown through immigration to become the largest plurality in the State. During the period of the Kingdom, in addition to the immigration of missionaries, businessmen and their families, larger groups of immigrants were encouraged as part of an attempted "Europeanization" of the plantation workforce; significant among these groups were Portuguese from the Azores and Maderia Islands.^{21,22} This immigration, however, was far overshadowed by those of the Chinese, Japanese, and later Filipinos.²¹ The majority of Caucasians in Hawai'i are immigrants from the US continent.²³

Japanese

The first large group of Japanese arrived in Hawai'i as contract workers to labor on the plantations in 1868; they were preceded, however, by four shipwrecked Japanese sailors in 1841.^{24,25} Since that time, the Japanese population of Hawai'i grew until they were a clear plurality in 1923.²⁵ Immigration into Hawai'i, which by 1898 became a territory of the United States, was severely limited by the "Gentlemen's Agreement" of 1908, and subsequently the Immigration Act of 1924.²⁵

While initially beginning as almost indentured workers, by the 1930s Japanese in Hawai'i had successfully formed strong communities, with features ranging from stores to newspapers and baseball teams.²⁵ World War II, which brought internment to the Japanese-Americans on the continental US under Executive Order 9066, introduced restrictions on Japanese-Americans in Hawai'i, but there was no internment. In 1943, numbers of Japanese-Americans began enlisting in the US armed forces, serving famously in the 100th Battalion and the 442 Regimental Combat Team, the most decorated unit of its size in the US Army.²⁵

Following the end of the War, the return of the Nisei, or second generation Japanese-Americans to Hawai'i was one of the factors leading to societal change.²⁵ Organizing in the unions accompanied political organizing, and with Statehood in 1959 the

political, economic and social power and status of Japanese Americans began to climb.²⁵

Chinese

The first Chinese in Hawai'i arrived as members of the crew of Captain James Cook's journey in 1778, although large groups of Chinese did not immigrate to Hawai'i until 1865, when they were brought to the islands as contract laborers on the plantations.²¹ The percentage of Chinese in Hawai'i steadily rose, reaching 22% by 1884.²⁶ Opposition to the Chinese, and then generally Asian, presence grew, however, reaching a point where Asians were forbidden from working as mechanics or laborers for the Territory of Hawai'i in 1903.²⁶ Concurrently, in 1899, a fire deliberately set by the Department of Health of the Republic of Hawai'i led to the destruction of Honolulu's Chinatown, where a vast majority of Chinese lived.²⁶ As a result, Chinese-Americans in Hawai'i currently compose 7% of the population, although immigration continues. (Figure 1).

Filipinos

The first group of Filipino contract laborers arrived in 1906, brought in by the Hawai'i Sugar Planters' Association to work on the plantations.²¹ Although the last ethnic group brought to Hawai'i, by the 1930s Filipinos had become the largest percentage of plantation workers.²⁷ Initially, the Hawai'i Sugar Plantation Association members use Filipinos to replace striking Japanese workers, but Filipinos became union members and organizers by 1924.²⁷ Today, most Filipinos in Hawai'i remain working class, although there is a growing middle class consisting of people working in management and professional roles.²⁷

Other Pacific Islanders

Other Pacific Islanders is a broad category that refers to all Pacific Islanders other than Native Hawaiians from the three regions of Oceania: Polynesia, Melanesia, and Micronesia. Excluding Native Hawaiians, there are approximately 50,000 Polynesians, Micronesians and Melanesians in Hawai'i. Collectively, these three groups include more than 40 diverse peoples*, each with their own unique historical backgrounds, languages, and cultural beliefs and traditions.²⁸ Small populations and lack of appropriate data collection accounts for the aggregation of these groups into catch-all categories.

The largest groups of *Other Pacific Islanders* in Hawai'i are Samoans (26,365) and Tongans (6,148). Samoans are by far the largest group, arriving to Hawai'i in three waves: the first group arrived in 1919, concurrent with the construction of the Mormon Temple in Lā'ie, the second wave in 1952, when the U.S Navy unit in American Samoa closed and service members

were integrated into a base in Hawai'i.^{29,30} The third and on-going wave is due to a relative lack of health care, economic and education opportunities in both American Samoa and Samoa.^{30,31,32}

The most recent Pacific Islander populations to arrive in Hawai'i are those from the entities covered by the U.S. Compacts of Free Association.³³ These entities include the Republic of the Marshall Islands, the Republic of Palau and the Federated States of Micronesia, which is comprised of the states of Pohnpei, Chuuk, Kosrae and Yap. Of the approximately 16,000 Micronesians in Hawai'i, the largest group are migrants from the Republic of the Marshall Islands, where the US government conducted nuclear weapons testing from the 1940s to 1950s.³³ The second largest and fastest growing group is from Chuuk State of the Federated States of Micronesia.³³ Similar to the Samoans, migration of Micronesians to Hawai'i reflects a desire for better health, education and economic opportunities which are severely limited in their home countries.³³

*Other Pacific Islanders

Polynesians	Micronesians	Melanesians
American Samoan	Chamorro	Fijian
Samoan	Marshallese	Vanuatuan
Tongan	Chuukese	Torres-Strait Islander
Maori	Pohnpeian	Aboriginal
Tahitian	Palauan	Soloman Islander
Marquesan	Kosraean	Papuan
Tuamotuan	Yapees	New Caledonian
Niuean	Carolinian	Other Melanesians
Tokulauan	Pingalapese	
Tuvaluan	Mortlockese	
Rapanuian	Other Micronesians	
Rotuman		
Other Polynesians		

A. Demographics

Health is not determined solely by genetics or individual choice, but also, and probably predominantly, by one's social environment. Thus, factors such as un- or underemployment, unsafe workplaces, poor living conditions or homelessness, globalization and lack of access to healthcare also contribute to a person's health. With rare exceptions, the lower a person's socioeconomic status, the lower their health status; conversely, the higher status a person has attained, particularly in educational terms, the better her health.^{34,35,36} Having demographic data on the social determinants of health facilitates the contextualization of health disparities.

1. Population size

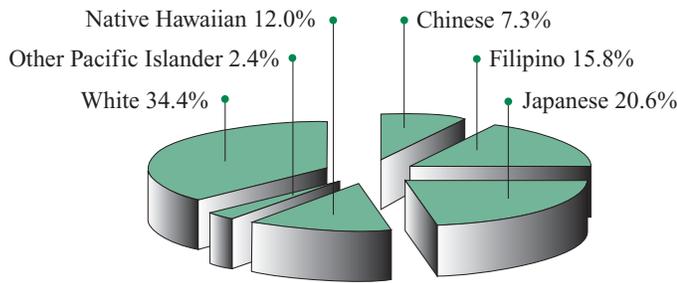


Figure 1: Ethnic percentages of adult population over 2002-2006.³⁷

a) Birth rates

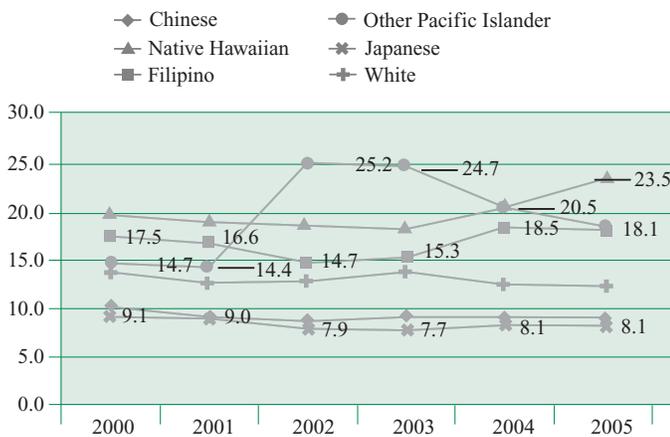


Figure 2: Birth rates by ethnicity, 2002-2005.

Birth rates are calculated from Office of Health Status Monitoring, with denominators from the Healthy Hawai'i Survey.³⁷ Numerator data are only available until 2005. An additional limitation is that ethnicity data is only collected to the level of Chinese, Filipino, Japanese, Native Hawaiian, Other, and White. There is no segregation of Other Pacific Islanders from the "Other" category.

b) Mortality rates

The data on mortality rates were provided by the Office of Health Status Monitoring, and thus reflects the same limitations as the data on birth rates. There is no separate category for Other Pacific Islanders; the ethnicities are Caucasian, Hawaiian/Part-Hawaiian, Chinese, Filipino, Japanese and Other.

Table 1: Crude death rates by ethnicity, 2002-2004.²

ETHNICITY	2002	2003	2004
Caucasian	782	813	731
Hawaiian/Part-Hawaiian	587	559	595
Chinese	775	835	820
Filipino	565	603	647
Japanese	1,108	1,094	1,027
All Others	358	342	382
Total	4,176	4,246	4,201

Table 2: Age-adjusted death rates by ethnicity, 2005.

ETHNICITY	Rate Per 100,000
Caucasian	602.4
Hawaiian/Part-Hawaiian	857.9
Chinese	517.9
Filipino	801.4
Japanese	517.3
All Others	565.2
Total	626.2

2. Gender

Figure 3 presents the gender distribution for the ethnic groups presented in this study.

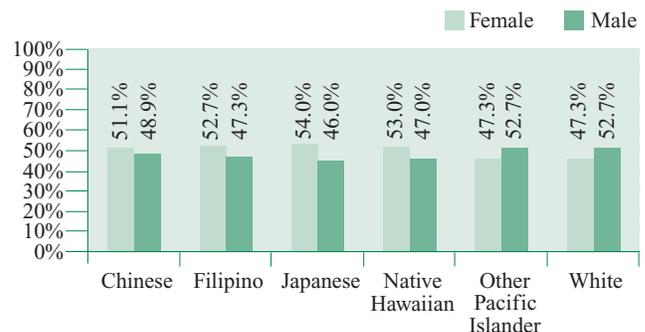


Figure 3: Gender distribution by ethnicity, 2002-2006.

3. Age

Table 3 presents age groups by ethnicity. An important limitation of this study is that no individuals below the age of 18 years were included, thus potentially skewing the data. It is likely, however, that Other Pacific Islanders and Native Hawaiians are the two groups with the youngest populations, while Japanese and Chinese have the oldest populations.

Table 3: Age distribution by ethnicity.

	18-24	25-34	35-44	45-54	55-64	65-74	75+
Chinese	6.1%	10.8%	19.3%	20.3%	14.5%	12.6%	15.7%
Filipino	7.8%	17.1%	23.1%	21.3%	14.4%	9.7%	6.2%
Japanese	3.9%	8.5%	14.1%	19.1%	17.1%	15.6%	20.9%
Native Hawaiian	9.0%	18.7%	19.4%	19.6%	16.3%	10.2%	6.5%
Other Pacific Islander	17.0%	24.7%	26.5%	17.9%	8.9%	3.9%	0.9%
White	5.1%	5.1%	17.6%	24.8%	20.3%	11.3%	8.3%

4. Life expectancy

There are no data available on life expectancy more recent than 1990.³⁸ Thus, this article does not present life expectancy data, since it is likely that the data have changed in the almost twenty years since that data was originally presented.

5. Length of stay

Although data on length of stay would be useful in comparisons of acculturation effects, such as Japanese nationals vs. Hawai'i – born Japanese, recent

Caucasian arrivals from the continent vs. Hawai'i – born Caucasians, such data has not been consistently collected and thus is not included in this report. If such data were available, it could point to differences between the health behaviors varying on nativity, such as been indicated for breast feeding, alcohol consumption in Latina women, access to cervical cancer screening, academic, behavioral and emotional difficulties in Filipino youth, and the relationship between ethnicity and obesity in Asian and Pacific Islanders.^{39,40,41,42,43}

6. Income

Table 4 presents household income levels by ethnicity. White and Japanese and Chinese residents of Hawai'i have the highest incomes, while Other Pacific Islanders have the lowest incomes, followed by Native Hawaiians.

Table 4: Incomes by ethnicity, 2002-2006.

	< \$10,000	\$10,000– 14,999	\$15,000– 19,999	\$20,000– 24,999	\$25,000– 34,999	\$35,000– 49,999	\$50,000– 74,999	75,000 +
Chinese	3.0%	3.2%	4.5%	6.2%	8.5%	12.8%	18.9%	23.0%
Filipino	3.0%	4.4%	5.8%	7.8%	14.5%	16.5%	17.8%	10.9%
Japanese	2.2%	2.6%	3.5%	4.9%	7.9%	12.6%	21.2%	25.7%
Native Hawaiian	4.5%	4.7%	8.0%	8.3%	10.7%	15.2%	17.2%	14.0%
Other Pacific Islander	10.9%	6.8%	9.0%	7.6%	11.6%	9.7%	13.6%	10.5%
White	3.1%	3.0%	4.1%	5.4%	9.4%	15.7%	19.2%	26.2%

In comparison to Table 4, Table 5 contains the persons of persons at different multiples of the Federal Poverty Guidelines by ethnic group. HHS 2007 (44). In this analysis, Chinese, Japanese, and Whites have the lowest rates of poverty, while Other Pacific Islanders, followed by Native Hawaiians and Filipinos have the highest poverty rates.

Table 5: Poverty rates by multiples of the Federal Poverty Guidelines by ethnicity, 2002-2009.

	0–130%	131–185%	186+%		0–130%	131–185%	186+%
Chinese	19.1%	9.3%	71.6%	Native Hawaiian	33.3%	15.3%	51.4%
Filipino	33.1%	18.5%	48.3%	Other Pacific Islander	51.9%	17.3%	30.8%
Japanese	12.7%	8.2%	79.1%	White	14.9%	10.4%	74.7%

7. Employment status

Table 6: Employment status by ethnicity.

	Employed for wages	Home- maker	Not employed	Retired	Self- employed	Student	Unable to work
Chinese	54.1%	5.2%	1.5%	26.1%	5.9%	5.2%	1.9%
Filipino	67.4%	5.4%	3.5%	12.4%	4.8%	4.9%	1.5%
Japanese	52.3%	3.7%	1.8%	32.1%	4.6%	4.0%	1.3%
Native Hawaiian	59.4%	4.5%	6.1%	10.3%	8.8%	0.3%	5.1%
Other Pacific Islander	60.4%	12.5%	7.7%	2.9%	6.2%	8.0%	2.1%
White	55.7%	6.5%	3.0%	17.6%	10.1%	3.6%	3.3%

Table 6 indicates that a majority of all ethnic groups are employed, while substantial portions of the Chinese (26.1%,) and Japanese (32.1%) communities are retired. These relatively high rates of retirees reflect the age profile of these communities, where 42.8% of Chinese are 55 years or older, and 54.5% of Japanese are 55 years or older.

8. Education

Table 7: Educational achievement by ethnicity

	Never attended school/ grades K–8	Grades 9–11	Grade 12 or GED	College 1–3 years	College 4 years or more
Chinese	1.6%	1.8%	27.0%	24.4%	45.1%
Filipino	3.5%	5.0%	36.4%	29.1%	25.8%
Japanese	1.9%	2.7%	26.1%	29.9%	39.3%
Native Hawaiian	1.6%	6.8%	48.8%	26.9%	15.9%
Other Pacific Islander	2.8%	5.0%	50.5%	28.0%	13.8%
White	0.8%	3.0%	24.0%	31.1%	40.9%

As Table 7 indicates, Native Hawaiians, Other Pacific Islanders, and Filipinos have lower rates of achieving four or more years of college than other ethnicities.

9. Housing

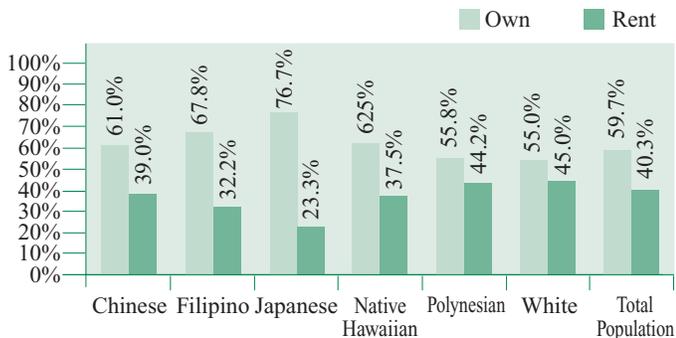


Figure 4: Home ownership by ethnicity, 2005.⁴⁵

Figure 4 indicates home ownership by ethnicity for the year 2005. All ethnic groups have home ownership rates greater than 50 percent, although Polynesians and Whites have lower rates of ownership than other groups. For Whites, this statistic may represent, to some degree, the relatively transient nature of Whites enlisted the military residing in Hawai'i, as well as the relatively high cost of homeownership in Hawai'i.⁴⁶

10. Health insurance status

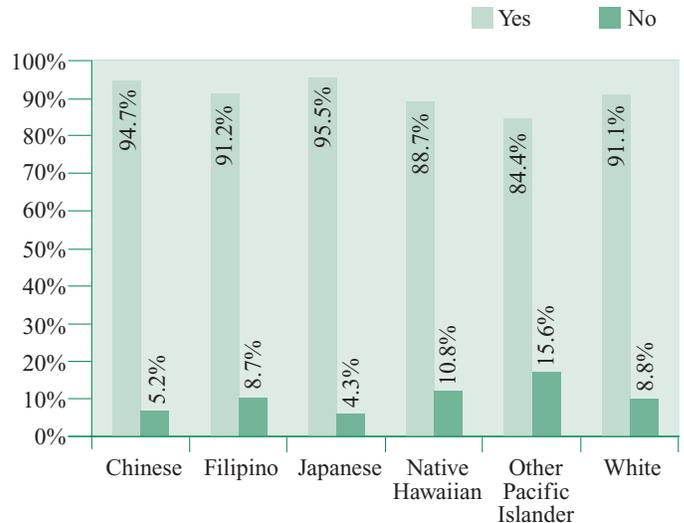


Figure 5: Health insurance status by ethnicity, 2002-2006.

As Figure 5 indicates, and reflecting the high overall rate of insured individuals, a majority of all ethnic groups are insured, but Other Pacific Islanders (84.4%) and Native Hawaiians (88.7%) have the lowest rates of insurance. Health insurance itself, however, is not an adequate proxy for “access to health care.” Other variables include the amount of insurance premiums required to use the insurance, the availability of both primary care and sub-specialty practitioners and healthcare facilities in an area, the availability of transportation, and the beliefs and attitudes of the individuals seeking, or not seeking care.

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ORIGINAL ARTICLES

Modelling Accessibility to Primary Health Care Using a Spatial Accessibility Index and a Need Index

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Abstract

Objectives: This research developed an integrated approach for modelling accessibility to primary health care (PHC) services using a spatial accessibility index and a need index.

Methods: New Zealand and World Health Organisation (WHO) rules were used to determine optimum levels of minimum travel time and modelling high need groups. A two-step Floating Catchment Area (FCA) method was used to calculate spatial accessibility index based on travel time. NZDep2001 score was also used to model high health need people and generating the need index. Then, spatial and need indices combined into one framework by using math tool in ArcInfo version 9.2.

Results: The results of this study have shown that some parts of north and central Otago (with a population of 4048 that comprises about 5.4 percent of the total rural Otago population) do not meet the WHO rules and New Zealand guidelines for access to primary health care (during business hours). The paper showed that people living in some areas of central rural Otago suffers from long travel time and high need to PHC facilities.

Conclusion: The paper illustrated the “accessibility index” as a tool to model the level of spatial accessibility of people to primary health care. A “need index”, as a surrogate tool for illustrating accessibility to primary health is also modelled. Then it is indicated that a better approach is to combine the spatial accessibility and need indices together.

Implications: The integrated approach allowed better data-mining abilities for more real patterns of accessibility and exploring ‘hot spots’ in terms of low accessibility to PHC in study area.

Background

Primary health care (PHC) is an important strategy for improving and maintaining population wellbeing.¹ World Health Organisation (WHO) and UNICEF [2] outlined the importance of PHC in the declaration of the Alma-Ata. Four important principles of a successful PHC strategy are;

1. Universal access to and coverage of health services based on health needs
2. Assurance to health equity as part of development oriented to social justice
3. Community involvement in defining and implementing health programmes
4. Intersectoral approach to health

Access is a multidimensional concept that describes people’s ability to use the necessary health care, immediately where ever they are [3]. Access to PHC is known as one of the indexes to achieving “*health for all*” and it was expressed as one the important principles of PHC [2]. There are two major dimensions for access:

1. Spatial and
2. Non-spatial.

Spatial accessibility implies the service is available within the vicinity of a potential user. Non-spatial access, follows when socio-demographic factors for accessibility of PHC are considered.⁴ However, the number and the type of barriers to accessibility of PHC differ from country to country and time to time. Penchansky and Thomas⁵ categorised barriers into five types: availability, accessibility, affordability, accommodation and acceptability. The first two types are considered spatial in nature. The last three types are known as non-spatial.⁵⁻⁷

The five types of barriers in the PHC accessibility context are:

1. *Accessibility* is travel impedance (distance or time) between residential or demand area and health care facilities or destinations.
2. *Availability* in the context of PHC refers to the number of health care services from which needy people can choose.
3. *Affordability* refers to the price of services in regard to people’s ability to pay. Income level and insurance coverage are crucial aspects of affordability.

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4. *Accommodation* identifies the degree to which services are organised to meet patient's need, including hours of operations, waiting time and application procedure.
5. *Acceptability* describes people's views about health care services and how service providers interact with patients.⁵⁻⁷

In this research, PHC is considered a team of multi-disciplinary staff, such as general practitioner (GP), practice nurse, midwife, dentist and pharmacist. A PHC team is usually led by a GP. The GP co-ordinates and directs the team towards achieving the final goal of "health for all" in their community. Therefore, this study prefers to use PHC team location instead of PHC location. The implication of this choice is that the research determined the accessibility of people to the actual PHC teams providing the first level of health care in community, rather than the PHC location which implies a building or centre where the PHC teams provide their services.

Application of geographic information systems (GIS) in health care has increased considerably in recent years. GIS has provided new solutions for measuring spatial access to health care, such as, modelling the health needs and detailing the accessibility levels to PHC. Potential and actual access must be considered together in assessing and locating health care services in community.⁸ There are a number of questions that GIS could answer, for example, "Where should health providers be located to best serve a population with high health needs?"

Accessibility applied to health care has been an area of on-going research and each of these applications has focused on one dimension of accessibility. This research considers spatial and non-spatial access into one framework. Hall & Bowerman⁹ have to date produced the most elegant approach with their *AccessPlan* software. *AccessMod*, a tool developed by WHO, was designed to analyse physical accessibility to health care and population coverage.^{10,11} An important feature of *AccessMod* is its ability to determine catchments around health care facilities and produce data to support evidence based policy assessments corresponding to the coverage offered by active health services. This research and *AccessPlan* both use vector based model (a representation of the world using points, lines and polygons) for measuring accessibility but with different methods and constraints.

Accessibility to health care in New Zealand is an active area of research. Ultimately the government of the day wants to achieve the highest level of care within budget constraints. Accessibility to health care research has not focused on health economics; it focuses on people, infrastructures and providers. However, it is thought that the tool and modelling techniques that eventuate out of for research on accessibility would help some health economics decision.

Accessibility to primary and secondary health care has been researched in the New Zealand context¹²⁻¹⁶ focused on the relationship between secondary health

care utilisation and distance to care. Their method was at the macro-level and they acknowledge advances in GIS tools, together with accurate data on GP locations would have provided more detailed results. A study by Beere and Brabyn¹⁷ used least cost path analysis (LCPA) model to estimate the travel time to maternity units in community level. They also summarised the travel time information by District Health Board (DHB) catchments, the results were only meaningful at a generalised aggregated level.

However, this paper benefits from a relatively new method that calculates accessibility index at a micro scale. In addition, the research would combine a need index to spatial index that provides further merit and highlights areas which have low accessibility to PHC.

The aim of this research is:

- Developing a new approach to integrate spatial and non-spatial dimension of accessibility to PHC into one framework

1. Method

1.1 Data Issues and study area

Spatial data such as PHC locations (health care centre), road networks, coverage of census blocks and core record system addresses (this dataset contains the cadastral information for New Zealand which provides the digital lodgement of title and survey information) were obtained from the New Zealand Land Information which provides New Zealand's authoritative land and seabed information. Core record system addresses (CRS) were used to calculate mean centre of population residence as the patient location. Socio-demographic data (such as age, gender, deprivation index, ethnicity, mean income) and meshblock boundaries were taken from Statistics New Zealand (2001 census dataset). More information about PHC team location and the number of general practitioners come from New Zealand Ministry of Health (MoH) data.

The study area is the rural Otago at meshblock level. The meshblock is the smallest geographic unit for which statistical data is collected by Statistics New Zealand.¹⁸ A meshblock is a defined geographic area, varying in size from part of a city block to large areas of rural land. The size of a meshblock depends primarily on the number of people and type of area covered. There are approximately 1200 Meshblocks in the rural Otago for the 2001 census, with an average population of 76 people. Meshblock data information and road network files were used to calculate the minimum travel time (based on road type, topography, sinuosity, surface) from population location inside of each meshblock to PHC locations.

This research used mean centre point of each meshblock as a population location. The mean centre is a point constructed from the average x and y values for the input feature centroids. Calculations are based on either Euclidean (straight line distance) or Manhattan distance and require projected data to accurately measure distances. To calculate the mean centre population, the geo-coded population at Meshblock level are required and they were extracted

from CRS address dataset. Since population is not uniformly distributed within the Meshblocks, particularly in rural areas with large Meshblocks, the use of *Simple geographic centroid* is not an appropriate representative of population location and potentially produces error in distance calculations. The use of *mean centre* overcomes the error.¹⁵

A PHC team is usually led by a GP. The GP coordinates and directs the team towards achieving the final goal of “health for all” in their community.² The geo-coded GP locations are selected as PHC team locations in study area. The New Zealand MoH guidelines are used to define the catchment area. The 30 minutes 60 and over 60-minutes threshold travel time are calculated by network analysis. The 30 minutes travel time is considered based on New Zealand MoH guideline, as a radius of catchment area for PHC teams and residential location for day time (business hour) criteria.

1.1 WHO “rules” and New Zealand “guidelines” for access to PHC

1.2.1 WHO “rules”

WHO’s main objective is to ensure that all people have a high level of health care. Moreover, WHO determines guidelines and rules for supporting countries to attain this goal. WHO’s guidelines and rules can be used as indicators to assist countries in evaluating their activities and situations in the context of health both globally and locally. The WHO’s guidelines and rules touching on accessibility to PHC are:

1. Universal access: This is a concept, when applied to environments ensures that health facilities can be accessed by all people regardless of where they live or work.
2. Focus on population with “high health needs”: High-need population groups usually experience more access difficulties than the rest of population. Therefore, priority is to ensure, they have appropriate access to PHC.
3. 1000 people per general practitioner

The availability of human resources for health care is an important indicator in the quality of the health care. Some WHO documents highlight as an optimal ratio one GP per 1000 head of population.²

1.2.2 New Zealand “guidelines”

The key priority for implementation of the PHC policy is to reduce barriers to high need groups’ access to health care. The New Zealand Ministry of Health’s guidelines are:¹⁹

1. To provide additional services to improve access to primary health care among high need groups. For example,
 - Those living in New Zealand Deprivation index 8-10 deciles areas
2. PHC services must be available for 95 percent of population in New Zealand during;
 - Normal business hours = within 30 minutes car travel time

- After hours = within 60 minutes car travel time

1.3 Method implementation

1.3.1 Travel time estimation

Researchers have used straight-line distance (Euclidean distance), travel time and Thiessen polygons (defines an area of influence around its sample points) to calculate distance from population residence to health centres.²⁰⁻²³ This research computed the best route (shortest travel time) between any pair of origin (demand) and destination (PHC) locations by using network analysis.

Sinuosity of road is one of the important factors that influences travel time. To calculate the sinuosity index, two variables were required, the observed length; and straight length.²⁴⁻²⁵ The observed length was calculated for the actual road network. However, to compute the straight length, this paper had to generalise the original road layer by removing vertices from the road segments until only one vertex remained per 500 metres tolerance (to keep the actual road shape). After simplifying the road layer, the lengths were calculated and called straight length. The new lengths were joined to the original road data set for further analyses (see Table 2). Sinuosity index was defined as observed length / straight length.²⁴ The sinuosity index ranged from 1 to 6.54. Roads with sinuosity of 1 are straight. Sinuosity increases with the “tortuousness” of a road an index of 6.54 typically indicates a very bendy road (see Table 1). Therefore, roads with high sinuosity index require low speed values for travel time estimation.

Table 1: Joining the sinuosity index and drive time to road network

Road ID	Observed length (km)	Straight length (km)	Sinuosity index	Drive time (minute)
115951	0.72	0.11	6.54	1.0
112622	1.05	0.17	6.14	0.9
117286	0.91	0.20	4.43	1.1
111548	0.67	0.16	4.10	0.8
93276	0.62	0.16	3.93	0.5
111861	0.12	0.03	3.84	0.1
...
115914	0.3	0.3	1.0	0.2

Travel time was estimated for each road segment (calculated as an average speed) as:

- Sealed urban roads 35 km/h
- Un-metalled, rural, bendy roads 35 km/h
- Metalled, 1 lane, rural, bendy road 40 km/h
- Un-metalled, rural, straight roads 45 km/h
- Metalled, 1 lane, rural, straight roads 60 km/h
- Metalled, 2 lanes, rural, bendy roads 60 km/h
- Sealed, 2 lanes, rural straight roads 80 km/h
- High-way 80 km/h

This categorisation of road speeds would alter based on speed limit rules. The values in this study do not take into account different time of day, traffic congestion, different seasons and different mode of transportation. If these are important then considerable effect will be required to collect this volatile parameter to impact on the friction surface calculations.

1.3.2 Two-step floating catchment area (FCA) model for calculating spatial accessibility index

The one-step FCA method was used for first time by Peng²⁶ for job accessibility. Luo and Wang²⁷ improved the one-step FCA and they repeated the process of floating catchment twice, once on population location and once on health services. A study by Luo and Wang²⁸ on measuring spatial accessibility to health care in the Chicago region proved that the Gravity model and two-step floating catchment area method have a similar theoretical approach. However, the Gravity model needs some weights to calculate travel friction coefficient for a road network. These weights are not usually available and need to be computed with complex calculations.

Therefore, this research used the two-step FCA approach which does not need the travel friction coefficient computed and can be comfortably modified to meet the policy of New Zealand's Ministry of Health. Furthermore, it is a relatively new method and easy to compare the provider and population to each other in a nominator and denominator format, respectively. Hence, it can simply calculate how many residents are cared for by PHC teams within a defined area. In addition, the FCA method is very suitable for finding areas with low accessibility in the community. Because it repeats the process of floating catchment twice, once on population location and once on PHC services. This method, unlike the gravity-based method, does not ignore the local pockets of low or very low accessibility of PHC facilities.

Equations 1 and 2 represent the FCA method. Equation 1, in the first step, for each PHC location j , searches all population locations (k) that are within a 30 minutes threshold travel time from PHC location (j) and computes a PHC to population ratio within the catchment area:

$$R_j = \frac{PHC_j}{\sum_{k \in \{d_{kj} \leq d_0\}} P_k}, \quad (1)$$

The next step (Equation 2) takes into account each population location (i), searches all PHC facilities (j) that are within the 30 minutes catchment from location i . Then, the PHC to population ratio is computed within the defined catchment area. Finally, the ratios sum up at these locations (see table 3). R_j is the PHC to population ratio at PHC location j whose centroid falls within the 30 minutes threshold travel time from population location i and d_{ij} is the travel time between population location (i) and PHC facility (j).

$$A_i^F = \sum_{j \in \{d_{ij} \leq d_0\}} R_j = \sum_{j \in \{d_{ij} \leq d_0\}} \left(\frac{PHC_j}{\sum_{k \in \{d_{kj} \leq d_0\}} P_k} \right), \quad (2)$$

In practice, the first phase is to assign a primary PHC to Population ratio to each PHC location (catchment area centred at a PHC location). Then, the initial values were calculated in the overlapped service areas to measure the PHC accessibility for population location, where the residents have access to multiple PHC locations. Indeed, the method supports interaction between people and PHC services within a Meshblock based upon travel times and calculates an accessibility index that varies from one meshblock to another. Equation 2 indicates the regional accessibility and is, fundamentally the ratio of PHC to population. It can be explained as the same as Equation 1.

The result of Equation (2) indicates the accessibility at population location i based on the FCA method at Meshblock level (see Table 2). A high value in the accessibility index represents better access and low value indicates low spatial access to PHC services respectively. The value of spatial accessibility index ranged from 1 to 10, where 1 represents high accessible and 10 highlights poor accessible areas.

Table 2: Spatial accessibility index at selected meshblock levels

Meshblock ID	PHC team	Population (30 min)	Spatial access index	Simplified spatial access index*
MB 2826302	3	7917	0.000379	4
MB 2954367	4	3870	0.001034	3
MB 3457812	1	1746	0.000050	10
MB 4267001	2	12525	0.000160	9
MB 5124673	4	15063	0.000266	5
MB 5243670	1	93	0.010700	2
...
MB 6264005	5	102333	0.083333	1

*The accessibility index has been altered and classified from 1 to 10 for ease of use

1.3.3 Modelling of high need groups

The existing GIS-based methods to measure accessibility assumed that all people have equal access to PHC services inside defined travel time catchments. However, population characteristics and socio-economic infrastructures affect level of accessibility to PHC services.²⁹ Among numerous variables, which have an effect on access to services, income, transport system, employment, qualification, communication, housing, age and gender are very important. Interestingly, those variables have been incorporated to develop a deprivation score (NZDep2001 score) across New Zealand by Salmond and Grampton.³⁰ Table 3 shows the variables that were used to calculate of the NZDep2001 score.^{30,31} This research used New Zealand deprivation score (NZDep2001) as a base for modelling high need groups and creating a “Need Index” at meshblock level.

Table 3: Variables from 2001 census data to calculate New Zealand Dep2001 index

Dimension of deprivation	Variable description (in order of decreasing weight)
Income (A)	People aged 18-59 receiving means tested benefit
Employment	People aged 18-59
Income (B)	People living equivalised households with income below an income threshold
Communication	People with no access to a telephone
Transport	People with no access to a car
Support	People aged < 60 living in a single parent family
Qualification	People aged 18-59 without a qualification
Owned home	People living in a home that they do not own
Living space	People living in equivalised households below a bedroom occupancy

Need index (NZDep2001 index) provides a score for each meshblock in the study area (see Table 4). Generally, the need index ranged from 1 to 10, where 1 shows the least deprived and 10 represents the most deprived population. According to New Zealand guideline regarding accessibility to PHC services, need index with score of 7-10 shows the high need people at meshblock scale. In effect, need index is non-spatial dimension of access that is combined to spatial accessibility dimension to generate an integrated index.

Table 4: Developing a need index at meshblock level in study area

Meshblock ID	Need Index
2826302	1
3457812	10
4267001	3
...	...
6264005	1

1.3.4 Combining spatial and non-spatial accessibility dimensions

The integrated approach combines spatial and non-spatial dimensions of accessibility into one framework. To implement the method of the integration approach, first a spatial accessibility index was developed based on the improved two-step FCA method. This index ranged from 1 to 10 where 1 represents high accessible and 10 highlights poor accessible areas. Second, a need index was designed to modelling high need people at meshblock scale. Similarly the need index classified from 1 to 10 where 1 indicates low deprivation and 10 represents high need deprivation area.

The spatial and need indices were then combined using the “math tool capability” addition function in ArcInfo version 9 to generate a new index called “Access & Need” index. This addition is calculated by generating a table of all meshblocks (1200 meshblocks in study area) with corresponding “Spatial access index” score. Then another table consisting of all meshblocks and corresponding ‘Need index’ score was made. After that, both tables were joined together based on a common field (Meshblock ID). Finally, a new column (field) is added to the combined table and called Access & Need index (see Figure 1). The value of access and need index was calculated by adding values in the spatial access index and need index fields. Access and need index values ranged from 2 to 20 in the combined table where, 2 represents high accessibility and low deprivation and 20 shows low accessibility and high deprivation areas at meshblock level.

For ease of use, the legend scale was categorised from 1 to 10 after various options were trialled. Therefore, in this map legend, 1 represents high accessibility and low deprived and 10 shows low accessible and high deprived areas in the study region.

2. Results

2.1 30 and 60 minutes threshold travel time

Figure 2 shows the 30-minutes and 60-minutes travel time catchments for rural Otago. The green polygons represent areas where PHC services are accessible within 0 to 30-minutes travel time. The red polygons indicate regions that have access to a PHC facility within 30- to 60-minutes travel time. Blue areas are highly remote and the time needed for people in these areas to access a PHC centre is over 60-minutes

drive time. These polygons show initial results for measuring accessibility of people to PHC for rural Otago based on New Zealand guidelines.

2.2 Accessibility index at meshblock level

Figure 3 displays spatial accessibility to PHC services at meshblock level. The accessibility index ranged from 1 to 10. Those areas with an accessibility index of 1 to 2 are very high accessible regions and areas with an accessibility index of 9 to 10 are very low accessible regions. The pattern of PHC accessibility

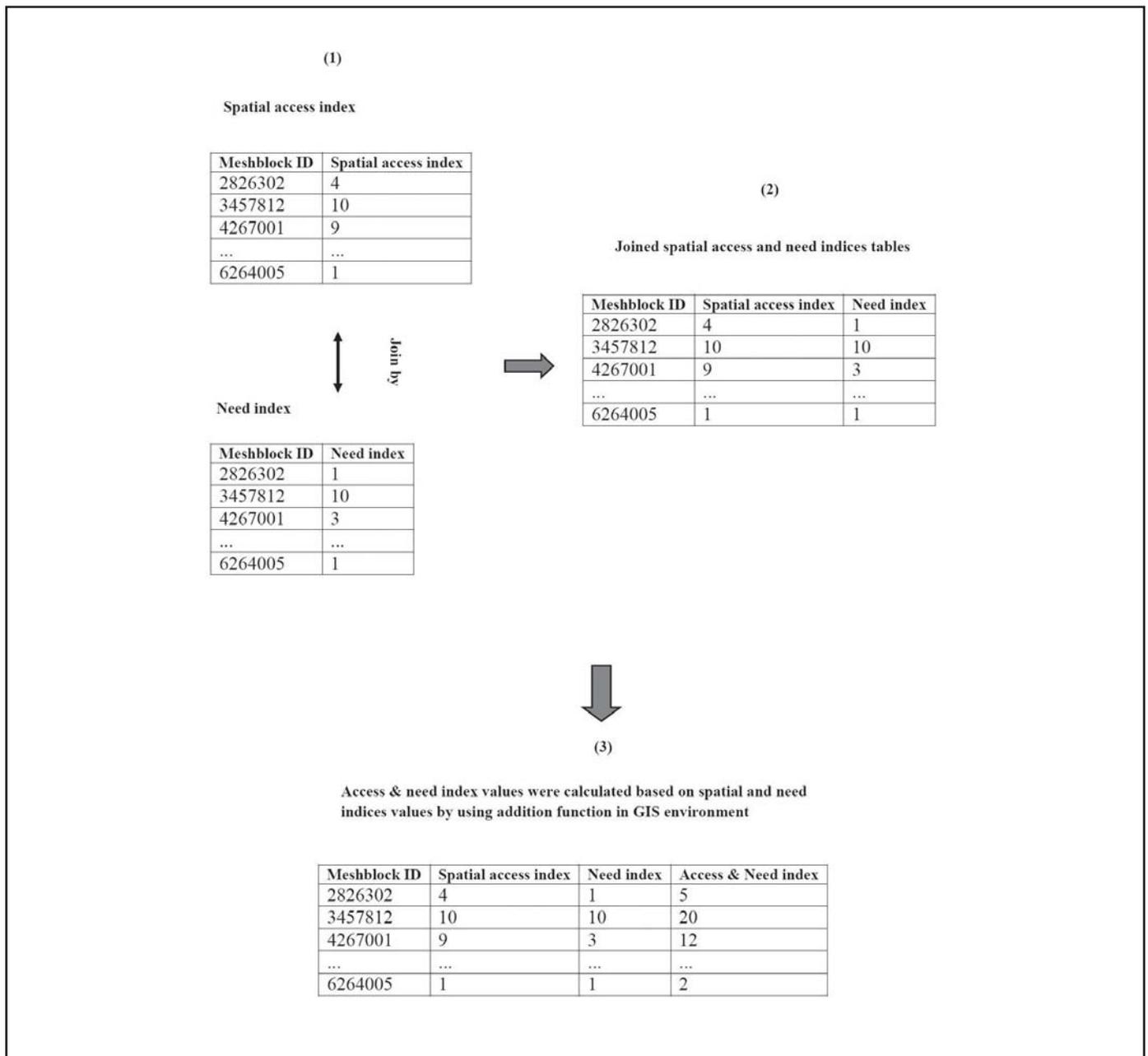


Figure 1: Implementation process of combined model (Access & Need index) in GIS environment



Figure 2: 30 and 60 Minutes threshold travel time in rural Otago region

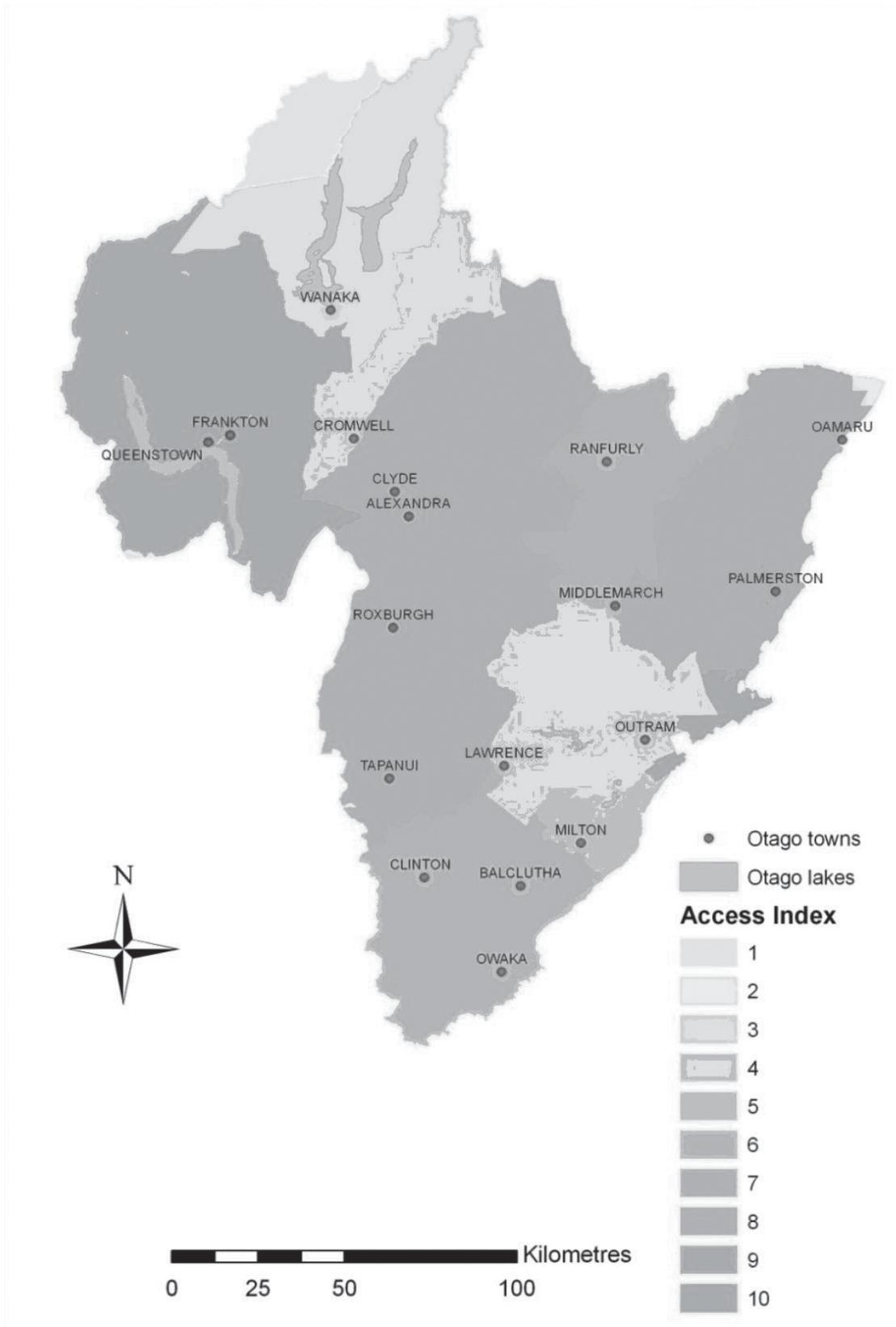


Figure 3: Access index at meshblock level in rural Otago region

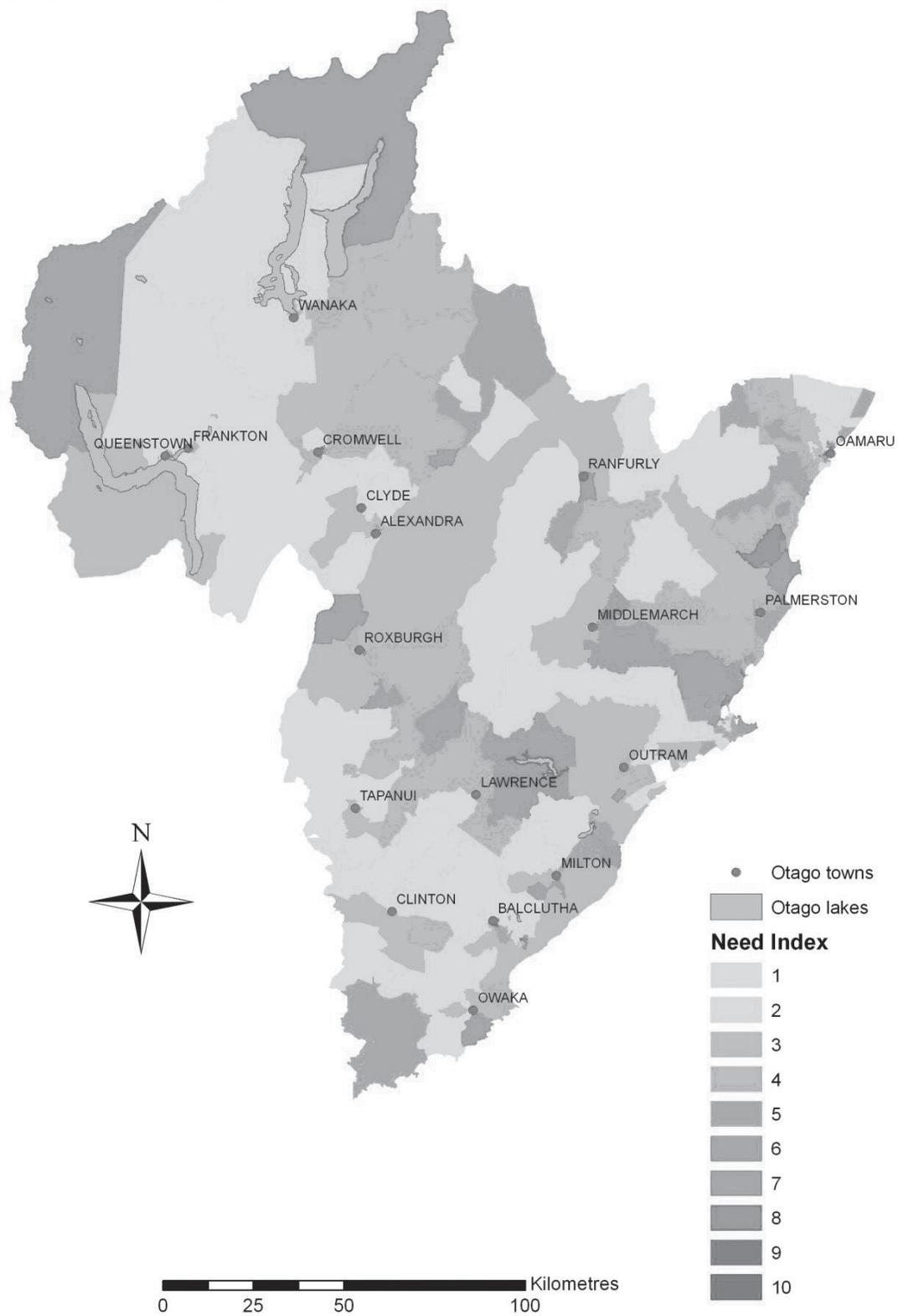


Figure 4: Pattern of Need index at meshblock level in rural Otago

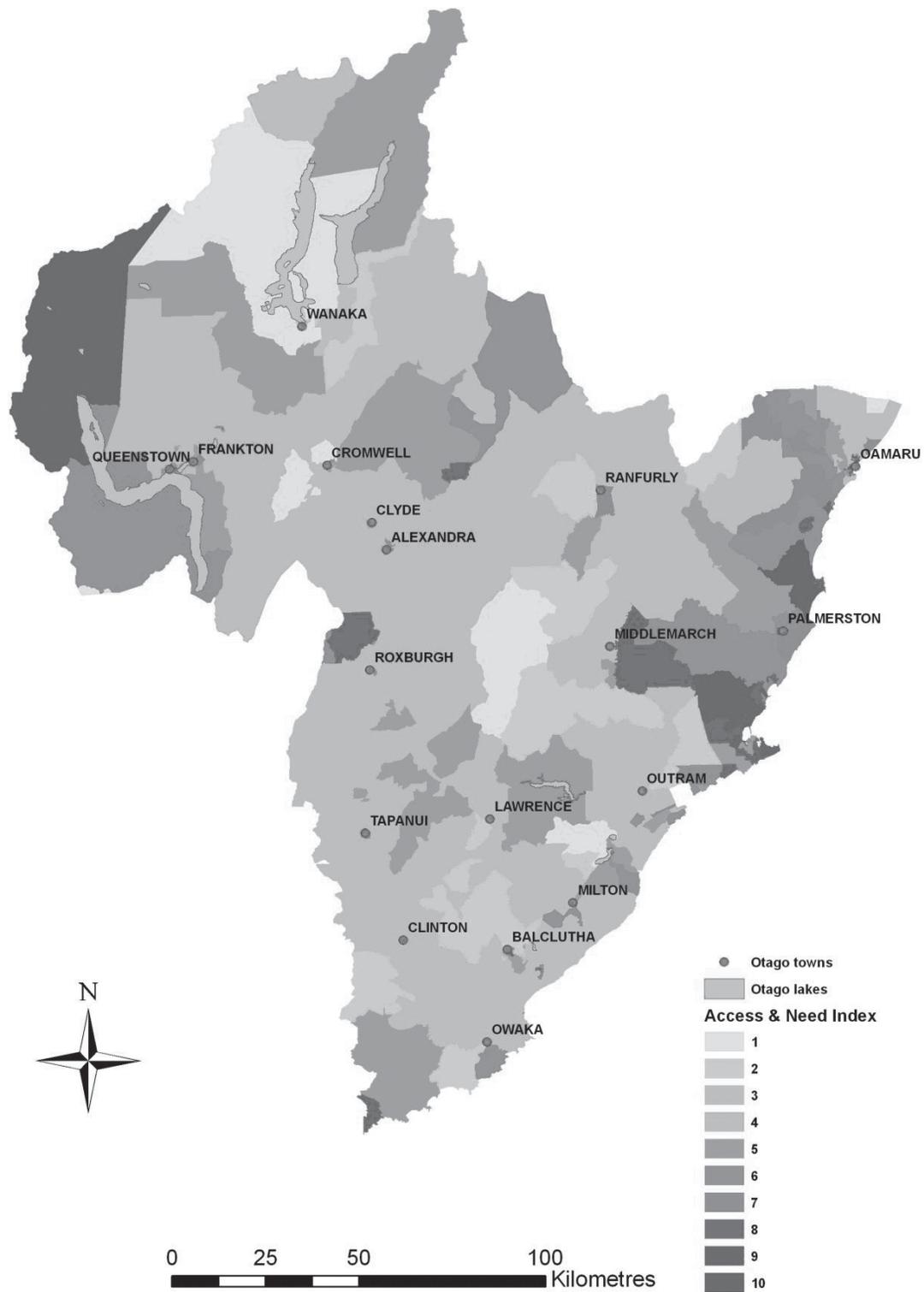


Figure 5: Access & Need index at meshblock level in rural Otago

has been shown in the map based on 30 and 60 minutes travel time in the Otago area. The results generally indicated that people living in the central, north-west and east Otago have poor access to PHC facilities with accessibility index of more than five. In contrast, some regions in Wanaka and Outram areas have good access to primary health care. Although the majority of high accessible area to PHC located inside of 30 minutes travel time catchment area but there were areas with poor accessibility (Access index more than five) in 30 minutes travel time catchments particularly in Queenstown and Palmerston areas.

2.3 Need index at Meshblock level

Figure 4 shows the result of modelling and mapping the high need groups (as a need index) at meshblock level in the study area. Some examples of high-deprived areas with corresponding 7-10 deciles need index are Roxburgh, Middlemarch and Palmerston regions. The figure 4 also represents the patterns of high needy groups across the rural Otago.

2.4 Combining the access index and need index (Access & Need index)

This index ranged from 1 to 10, where 1 represents areas with low need and high spatial accessibility and 10 shows high need and low spatial accessibility score respectively. Figure 5 shows the pattern of the integrated index (Access & Need index) that was generated based on integration of spatial accessibility and Need indices at meshblock level. As the Figure 5 illustrates the Access & Need index ranged from 1 to 10 where 1 represents high accessible area with low deprivation score and 10 shows low spatial accessibility and high deprivation scores. Middlemarch, Palmerston and north-west rural Otago have high deprivation and high spatial access scores. Population living in these areas have long travel time and high need to get care from PHC services.

However, according to Figure 5, Milton, Balclutha, Wanaka and Cromwell are examples of area that have low "Access & Need index" score. It means that people living in these areas have better spatial accessibility to PHC services.

2.5 The number of GP per population in rural Otago area

The rate of occurrence of a GP per 1000 people in this study area is 0.5. The rate for whole of New Zealand is 2.4 GP per 1000 population.³² This research showed that the rate of GP to population in the studied area falls below the WHO's guideline (one GP per 1000 people). Although provider (for example, GPs) to population is crude measure of accessibility to PHC and it shows just GP coverage in specific area.

3. Discussion

The emphasis of this research was on developing an approach to measure the accessibility of PHC services against national and international standards, based on New Zealand and WHO guidelines. The results highlighted some areas where access to PHC was a concern. For some parts of rural Otago,

particularly in the more remote areas, people still have long travel times to access health care.

Approximately 6 percent (4895 people) of population living (78,000) in rural Otago do not have access to PHC services according to New Zealand's access guidelines for business hours. The average and largest travel time to reach a PHC service for this proportion of population is 39 and 85 minutes respectively. Moreover, 25 percent of this population is living in areas with high deprivation particularly in central Otago (greater than 7 decile). Appropriate distribution of PHC facilities is therefore crucial as it helps to narrow the inequity gap in accessibility to health care among population in study area.

Some studies^{12,13,17,33} have surveyed accessibility to health care in New Zealand, However, they aggregated the results in global scale. Their research did not show the local variations inside provinces / regions. This was validated in results and global regression analysis. The GWR and Monte Carlo analysis showed positive relationship for local variation in accessibility to PHC. According to Brabyn and Barnett¹³ 500-2000 people live population more than 30 minutes travel time from a GP. However, this thesis indicates population with more than 30 minutes travel time is about 4000-5000 people for rural Otago. Both studies used the same census dataset (2001) for the analysis. The cause of this difference may be related to their study that aggregated the results at national scale and would not show the local variation inside regions and meshblock level.

This research showed that the rate of occurrence of a GP per 1000 people in this study area is 0.5. The rate for whole of New Zealand is 2.4 GP per 1000 population. This research showed that the rate of GP to population in the studied area falls below the WHO's guideline (one GP per 1000 people). The availability of human resources for health care is an important indicator in the quality of the health care.

The two-step floating catchment area (FCA) method used in this research is relatively new and has clear advantages over its more basic form of gravity model to measure accessibility of people to health care. The FCA method was improved in this research by combining the spatial index and need index into one framework. This might add to the literature base with regard to measuring spatial accessibility of people to PHC.

The majority of the researches used simple geographic centroid as population locations.^{13,21,27,34} Since population is not uniformly distributed within the meshblocks, particularly in rural area with large meshblocks, the use of simple geographic centroid is not an appropriate representative of population location and potentially produces error in distance calculations. This research used the mean centre point as the location of the population in meshblocks. The use of mean centre overcomes the error and points out the relatively accurate population inside the meshblocks.

Network analysis was used to calculate travel distance from population location in each meshblock to the closest PHC facility. This analysis used New Zealand guidelines for accessibility to model the

optimum travel time to PHC services. The meshblocks that did not meet the New Zealand guidelines were highlighted in study area.

Measuring spatial accessibility to PHC and identifying geographical variations that affect people's access to it are important steps in accessibility studies. As stated in the introduction, accessibility has many dimensions. When exploring the question of whether PHC facilities are distributed equitably in a rural community, the geographical accessibility might be misleading and we need to examine the influence of some non-spatial factors such as high health need people as a surrogate analysis for spatial accessibility to PHC.

This research used New Zealand road network and focused on important features of roads that affect estimating of the optimum travel time from population location to PHC services. The study does not compare the cost of improving quality of roads in New Zealand with other health expenditures and it is beyond the scope of this research. The research illustrates spatial accessibility index as a tool to model the level of accessibility to PHC and demonstrates the "hot spots" in terms of low accessibility to PHC by integrating spatial and need indices in rural area.

This research is novel in that it combines a "spatial access index" and a "need index" into one framework to highlight poor accessibility areas in the rural Otago to PHC. It is acknowledged that the New Zealand deprivation index is a pseudo representation of need; however, it is comprised of nine important non-spatial or socio-economic factors. To model the real need would mean having comprehensive information on the actual the health status or disease statistics (morbidity and mortality) of the population.

The main purpose of combining the spatial accessibility index and need index is to create a more sensitive index of the relatively disadvantaged in terms of access to primary health care. A study by Field [35] tried to create an index of relative disadvantage based on a patient survey and components of relative need and accessibility to health care in UK. However, the number of variables that were used by Field was less than the components of NZDep2001 index that was used in this research. Access to telephone and individual income were important variables that he did not incorporate in his research.

The integrated model (Access & Need index) has some advantages. First, it defines low accessibility areas systematically unlike current funding policy for primary care in New Zealand, which follows case-by-case approach. Second, the model is flexible and sensitive can change as the guidelines alter. Finally, this tool helps the health providers to explore highly disadvantaged areas and locate the PHC facilities relatively in right place.

The pattern of longer travel time and high accessibility index (see Figures 6.2 and 6.3) round the border of some parts of study region need to be interpreted with caution because residents may seek PHC services outside of the Otago area. This problem can be solved if the data of PHC location distribution in

adjacent area are available and incorporated into the study. We are aware of areal interpolation techniques and anomalies with edge results.

However in this research provinces or regions were not aggregated, meshblocks were used and this gave a much finer scale. This micro-scale analysis provided higher detail and therefore highlighted interesting patterns and in particular, areas that had low accessibility. These patterns were not evident using a general aggregated scale.

Ultimately, the two-step FCA and "Need Index" should be modelled at the meshblock level for the entire country. This was beyond the scope of this thesis. It is also acknowledged that the legend scale, in this case 1-10, can dramatically influence the patterns of result. A scale of 1-4, for example, is vastly different from a scale of 1-40. This research chose a scale of 1-10 after considerable experimentation.

Estimated travel time were influenced by factors such as whether a road was urban or rural, sealed or unsealed, number of lanes, and the sinuosity or "tortuousness" of the road. Incorporating some other factors that may influence travel time such as weather, time of day and traffic congestion is a challenge for future researches. In the meantime, the limitations of not incorporating all factors that affect travel time need to be acknowledged.

4. Conclusion

WHO provides guidelines and policies at global level directed to protecting and promoting the health of all people of the world and it supports governments and countries to meet these policies. Criteria for achieving these goals will however differ at the local level according to the socio-demographic and economic situation of each country. Thus, the development of an accessibility tool to better explore any inequity is seen as a means towards better access to PHC for all. This research showed how the global and local guidelines for access to health care come together to develop a tool in order to measure accessibility of people to health care. Ultimately based on those guidelines the accessibility of people can be monitored and the poor accessibility areas will be explored.

This research has succeeded in demonstrating the modelling of high need groups within under-served population in study area. The research explored the patterns of high need groups at meshblock level and inside the different catchment areas. The modelling of the need have significant implications for the policy planners and health providers to better allocate the health provisions.

GIS has made it possible to process and query large datasets and relationships at different scales. The methodology used for this research has provided a robust and efficient framework to identify patterns of spatial accessibility variation and inequality. Moreover, combining the need index to the spatial index in this study adds further merit. The GIS processes employed are not solely limited to the PHC accessibility explored within this research. Accessibility to any number of

health services, such as emergency units, hospitals and maternity units, could be routinely examined. Therefore, a mechanism of monitoring the spatial-temporal effects of health care service provision would help to keep decision-makers accountable to the wider populations.

In the current health reform policy in New Zealand, this research has provided a tool to explore the hot spots in terms of poor accessibility area to PHC services in rural Otago. This tool provides an avenue whereby the impacts of health provision funding decisions can be made explicit. As this tool can be adopted for any type of, publicly funded services and routine surveillance of access it would help decision makers to better provide the primary health care services in rural Otago.

Disparity in health care is an important issue that should be appropriately addressed. This research has presented further evidence that spatial accessibility and need are two important dimensions to incorporate into resource allocation and health provision formulae. However, understanding of the causes of inequalities in communities still requires further research to ensure that any amendment to formulae delivers an equitable outcome.

There are some challenging issues in modelling population accessibility to PHC in communities. This research estimated car travel time from a population weighted centre of each meshblocks to the nearest PHC facility based on different road types (rural or urban), surface of roads (sealed, unsealed, and metalled), number of lanes and bendiness. However, there are still some factors that affect the travel time estimation and were not incorporated in this thesis due to the unavailability of an accurate dataset. The good examples of such factors are time of the day, traffic congestion, different seasons, weather and different modes of travel (for example, bus, walk, horse). As a result, incorporating such factors is a challenge for future research in measuring accessibility of people to health care services.

This research used the NZDep2001 score to model high need groups and generated a need index. Epidemiological researchers need to more fully understand the causes of high health need and incorporate such cause in a developing need index. Therefore, generating a suitable resource allocation formula based on spatial and need indices still requires further research to ensure that any adjustment to formulae delivers an equitable outcome.

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Promoting Science-Based Approaches to Teen Pregnancy Prevention

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Abstract

Background: Hawai'i ranks 12th in the nation for teen pregnancy prevalence. Native Hawaiian and Pacific Islanders demonstrate a disproportionate share of teen pregnancies, accounting for more than 60% of the total teen births. Local organizations lacked the organizational capacity and funding to conduct needs assessments, select appropriate interventions, or evaluate results of teen pregnancy prevention programs. Youth workers had little knowledge of science-based programs and often believe that programs developed elsewhere will not work in Hawai'i.

Purpose: To address these issues, the Hawai'i Youth Services Network (HYSN) has worked with Hawai'i-based organizations since 2005 to build organizational capacity to select, implement and evaluate science-based approaches to teen pregnancy prevention.

Approaches: HYSN helps organizations assess community needs, develop goals and objectives, assess programs for community fit, make culturally appropriate adaptations to curricula, and implement, evaluate, and sustain their efforts. HYSN also provides intensive training and customized technical assistance, develops peer support, and identifies and removes barriers for organizations that want to offer more effective programs.

Findings: At the beginning of the project, few, if any, Hawai'i organizations were using science-based programs, and none were conducting evaluation. After two years, at least eight organizations have selected and implemented science-based curricula aimed at preventing teen pregnancy, and we are evaluating the effectiveness with Hawaiian, Pacific Islands, and Asian youth.

Discussion: This project demonstrates the critical importance of building peer support and offering ongoing training and technical assistance to build capacity to implement effective programs for the prevention of teen pregnancy.

Background

Hawai'i has the 12th highest rate of teen pregnancies in the United States.¹ Native Hawaiians and Pacific Islanders experience the greatest risk for teen pregnancy, accounting for more than 60% of the total births to mothers under age eighteen in 2005.² According to the 2006 Guttmacher Institute report, publicly funded family planning clinics serve only 15% of eligible women and girls. Hawai'i ranked 47th in availability of and 50th in the amount of public funding for family planning services.³ Mothers who have a baby in their teens are less likely to complete high school; have lower rates of labor force participation, lower earning, and less prestigious jobs with fewer opportunities for career advancement; and are at high risk of poverty and welfare dependence throughout life.⁴ Hawai'i's teen births cost taxpayers \$22 million per year.⁵

Efforts to prevent teen pregnancy in Hawai'i have been inadequately funded since the mid-1990's when an economic downturn forced the State of Hawaii to reduce funding for many health and social service programs. Many teens did not have access to pregnancy-prevention education programs as many schools did not offer reproductive health education opportunities, and the few programs that existed in Hawai'i had not been proven through rigorous evaluation to be effective.

Twenty-six programs have been proven effective by rigorous evaluation that demonstrated that the program led to at least two positive behavior changes among program youth, relative to controls, such as:

- Postponement or delay of sexual initiation;
- Reduction in the frequency of sexual intercourse;
- Reduction in the number of sexual partners / increase in monogamy;
- Increase in the use, or consistency of use, of effective methods of contraception and/or condoms;
- Reduction in the incidence of unprotected sex.

or:

- Showed effectiveness in reducing rates of pregnancy, STIs, or HIV in intervention youth, relative to controls.

¹Hawai'i Youth Services Network

These include programs that are school-based (example – Reducing the Risk), community-based (example – Be Proud Be Responsible), and clinic-based (example-Project Safe). They vary in terms of the number and length of sessions, target populations (e.g., inner city African-American youth), age of participants, and activities. None are specifically designed for or have been tested extensively with Asian and Pacific Islander youth.⁶⁻⁷

To begin to address this problem, the Hawai'i Youth Services Network (HYSN) applied for and received a 5-year Promoting Science-Based Approaches (PSBA) grant in 2005 from the Centers for Disease Control and Prevention (CDC). HYSN is a statewide coalition of more than 50 youth-serving organizations established in 1980. The goals of the PSBA project are to: 1) assist youth-serving organizations to select, implement, and evaluate a science-based approach to prevent teen pregnancies; 2) build the capacity of a 14-member statewide teen pregnancy prevention leadership team, called the Healthy Youth Hawai'i (HYH), created in 2005 to guide the project; and 3) disseminate information on science-based approaches to teen pregnancy prevention to youth workers and youth-serving organizations statewide. Elements of the scientific approach to programming include conducting needs assessment, selecting and adapting proven interventions to fit the population to be served, implementing programs with fidelity, and conducting evaluation to measure changes in knowledge, attitudes, and behavior of the population served.

HYSN is using a culturally competent approach that emphasizes peer support as well as identification and alleviation of barriers to establish norms that support science-based practices. The needs assessment conducted at the beginning of the 5-year program determined that participating organizations lacked capacity to conduct needs assessments, select and implement appropriate science-based approaches, and evaluate their results. They specifically wanted:

- Assessment tools to assess teen pregnancy prevention needs and identify strategies for using the data for planning.
- Technical assistance and training to identify science-based curricula, determining which approach or curriculum would be a good fit for the youth with whom they work, and making culturally competent adaptations that did not alter or eliminate the key components that made the curriculum effective in preventing teen pregnancies.
- Adequate funds to purchase curricula and supplies.

- Training for staff and volunteers in the science-based teen pregnancy prevention curricula and development of more locally trained expertise as the cost of out-of-state training was prohibitive for most agencies.
- Technical assistance and training to culturally tailor curricula and programs that are developed elsewhere. Organizations needed guidance to adapt materials to fit Hawai'i's unique cultural and ethnic mix, while maintaining fidelity with critical elements that made the approach effective in preventing pregnancy.
- Resources (both financial and people) to conduct process and outcome evaluations and applying the results to fine tune and improve their programs.

Method

In this section, we outline the activities we have undertaken toward our goals: 1) assisting organizations to select, implement, and evaluate science-based approaches; 2) building leadership in teen pregnancy prevention; and 3) disseminating information.

Assisting Organizations

HYSN began by identifying organizations that were providing services in communities with high teen pregnancy rates or working with youth populations at high risk for teen pregnancy (e.g., Native Hawaiians) and offered to work intensively with them over a 5-year period. These organizations were willing to select, implement, and evaluate a science-based approach or curriculum, to accept intensive assistance from project staff and consultants, and comply with CDC project requirements Hawai'i (Table 1).

Table 1. Criteria for Selecting Curricula for Promoting Science-Based Approaches (PSBA) Project.

Organization's goals and objectives
Demonstrated effectiveness with similar populations
Appropriate for setting (e.g., school-based, community-based)
Fits agency's time frame (e.g., number of sessions, length of sessions)
Selected organization's staff competencies and comfort level with approach
Ability to implement (or adapt if needed) with fidelity
Cost effectiveness
Addresses identified risk and protective factors

HYSN then worked with our leadership team, Healthy Youth Hawaii (HYH), to develop criteria for selecting curricula to use their youth audience. The group sought curricula for young people in grades 7-12 that could be used in a school-based or community setting. Desired characteristics for the curricula were: 1) total curriculum length preferably 10 hours or less; 2) activities and lessons that could fit within a 45-60-minute classroom or after-school instruction period; 3) a high level of interactivity; 4) appropriateness for Polynesian and Asian youth; 5) emphasizing abstinence as the preferred choice for pregnancy prevention while covering alternatives for those youth who become sexually active; and 6) addressing decision making and communication skills.

Participants reviewed three programs, Making Proud Choices, Reducing the Risk, and Teen Outreach Program. Making Proud Choices, developed in Pennsylvania by John Jemmott III, PhD and Loretta Sweet Jemmott, PhD, was the initial curriculum selected and implemented by most project participants. It can be presented in only 8 sessions, works with the full range of age groups, and is easy for facilitators/health educators to learn to use. Although not designed for or evaluated with Asians and Pacific Islanders, potential adopters felt it would need minimal adaptation for use with the populations they served and were committed to conducting evaluation to determine its effectiveness with this population. The other 2 programs require a much greater time commitment; for example, Reducing the Risk has 18 sessions.

In December 2006, HYSN sponsored its first training of trainers on Making Proud Choices. To address concerns about cultural competence while assuring that users retained elements critical for success, HYSN invited all potential users to an adaptation session where all parties came to agreement on what adaptations were necessary. The main changes were in role plays—changing names of characters, settings, and language—to make them more familiar, such as changing slang terms to Hawaiian pidgin. A Hawaiian language-immersion charter school was the first to begin implementation of the curriculum in late January 2007.

Later in 2007, HYSN offered training on the Teen Outreach Program, developed by the Wyman Center in St. Louis, Missouri. Several organizations are planning, but have not yet started, to implement this program, which features a strong service learning component. One organization is now using Reducing the Risk.

During the initial trials of these curricula in Hawai'i, project staff maintained regular contact via telephone, e-mail, and on-site visits. For example, HYSN staff co-facilitated the initial use of the pregnancy prevention curriculum and met with workers after pregnancy curriculum sessions to identify what worked and what didn't and why. To address financial limitations of organizations, HYSN purchased curricula and videos for users, provided funds to laminate posters for durability, and purchased student supplies where needed.

HYSN also worked with partners to address community and school concerns about the use of a comprehensive pregnancy prevention curriculum. For example, at one school, administrators refused to allow students to practice putting condoms on wooden models. HYSN and the partner organization's staff met with school administrators to discuss why that part of the curriculum was essential for success, and the school is now allowing the full curriculum to be used. At several schools, parent meetings are held to inform and share with parents the material that would be used with their children. This has helped to alleviate parent concerns about sexual content.

Our findings showed that "adopters," or organizations that implemented curricula, wanted to know if their pregnancy prevention efforts were effective, but they lacked skill and resources to conduct a formal evaluation. HYSN's evaluator designed pre- and post-tests and follow-up surveys for use by all adopters, trained health educators on how to use the materials, and analyzed data. At the same time, workshops were offered and individual assistance was provided to our intensive partner agencies. As users become more skilled and accustomed to conducting evaluations, we anticipate that evaluation of programs will become a routine part of program development and agencies will take more responsibility for this.

Building Leadership in Teen Pregnancy Prevention

In July 2006, HYSN convened a teen pregnancy prevention leadership team, known as Healthy Youth Hawai'i (HYH). Members represent entities providing services, advocacy, or government leadership in teen pregnancy. As HYH members, they agreed to incorporate science-based approaches or programs in his/her teen pregnancy prevention work; promote science-based approaches among his/her peers; and help HYSN meet the requirements of the CDC cooperative agreement. The composition of this group reflects Hawai'i's ethnic, gender, cultural diversity and represents all geographic areas of Hawai'i. Several, but not all, of the members are representatives from organizations receiving intensive assistance (Table 2).

Table 2. Healthy Youth Hawai'i (HYH)teen pregnancy prevention leadership team composition.

Participating organizations and individuals	Receiving intensive assistance	HYH member	Adopted science-based approach	Promotes science-based approaches	Trains others
Planned Parenthood of Hawai'i	X	X	X	X	X
Ka Hale Ola Makamae	X	X	X	X	
Child and Family Service		X		X	
Parents and Children Together	X	X	X	X	
Bay Clinic	X	X	X	X	X
Catholic Charities Hawai'i	X				
Hawai'i Department of Education		X		X	
Hawai'i State Dept. of Health		X		X	
Healthy Mothers Healthy Babies Coalition of Hawai'i		X		X	X
Hale Kipa	X	X	X	X	
Kokua Kalihi Valley	X	X	X	X	
Kalihi YMCA		X		X	
Kauai Rural Health Association		X		X	
Waimanalo Health Center	X		X		
Tia Robert, Social Work Student		X	X*	X	X

*Used science-based curriculum in former job before entering graduate program.

With assistance from facilitators, the group established its name (HYH), wrote its mission (Table 3), adopted a set of common values, and developed a work plan. At quarterly meetings, members review progress toward accomplishing tasks in the work plan. For example, as noted above, this group developed criteria for curriculum selection, reviewed science-based teen pregnancy curricula, and worked with HYSN staff to identify and test culturally appropriate adaptations for Making Proud Choices. Most HYH members that work directly with youth have implemented a science-based curriculum or are in the process of selecting a curriculum, and all are actively promoting science-based approaches among their peers. Several HYH members also have become trainers of trainers. Finally, HYH members identified barriers related to talking to teens and educators about sex, and thus designed two workshops: 1) "Avoiding the Giggles and Wide-Eyed Stares," on how to talk about sex with youth and 2) "Sex Education 101 for Educators," an introduction to puberty and contraception.

Table 3. Hawai'i Youth Services Network Mission Statement.

"Creating networks and promoting effective programs for Hawai'i's youth that support healthy and informed choices."

We Believe...

Youth are a vital part of our community and should have a voice in making decisions that affect their lives

In promoting, implementing, and evaluating effective, science-based, culturally competent pregnancy prevention programs for Hawai'i's youth.

Youth, when informed, educated, and empowered will make healthy choices regarding sexual expression.

Responsibility goes hand in hand with honoring sexuality as part of the natural human experience

It is important to respect the diversity of values and beliefs about human sexuality and reproductive health.

Each community member can have a positive influence on social norms that affect teen sexual health.

Every community member deserves access to accurate and complete reproductive health information and care.

Teen pregnancy prevention efforts need to be holistic and address multiple risk and protective factors.

Through our leadership work, we can help support agencies and communities to make a difference in the lives of young people.

HYSN has established incentives for participating in HYH that are greatly valued by members and designed to further the project goals. Incentives include funds to attend out-of-state training programs or conferences, for which their respective organizations have little if any funding. Since many of the out-of-state training programs are designed as training of trainers, this practice helps to develop a pool of skilled trainers in Hawai'i. Also, quarterly HYH meeting includes training customized to meet the needs of members. For example, when members questioned why some pregnancy prevention curricula were identified as "promising" rather than "science based," HYSN conducted training in which participants reviewed evaluation reports for several promising curricula and identified flaws in the evaluation methodology or conclusions.

Dissemination of Information

HYSN disseminates information on science-based approaches to teen pregnancy prevention broadly through a wide variety of venues. This includes an e-mail listserv with 250 members who receive information weekly on research and best practices, funding and training opportunities, and other useful data. To build the listserv, HYSN sent invitations to its member organization staff; individuals from the non-profit, government, and faith-based sectors who had participated in previous HYSN-sponsored training and networking programs; and members of the Teen Pregnancy, Prevention, and Parenting Council. The listserv has continued to grow as HYSN teen pregnancy prevention work has become known throughout the state.

HYSN also seeks opportunities to share information through media coverage, newsletter articles, and informal networking at meetings or conferences. This is a low intensity effort, involving no more than twenty percent of project resources.

Findings and Accomplishments 2005-2008

HYSN has gained widespread acceptance for science-based teen pregnancy prevention programs in its first three years and garnered national recognition for its work in making culturally appropriate adaptations to pregnancy prevention programs and materials. Eight of its partner organizations are offering a science-based pregnancy prevention program to teens in school and community settings. HYSN has begun to identify what works in pregnancy prevention with Asian and Pacific Islander youth in Hawai'i and has shared its evaluation data with the CDC and other national organizations. In 2008, HYSN created a culturally competent HIV prevention video. Specific accomplishments are discussed below.

Adoption of Science-Based Curricula

Eight organizations on three islands have selected, implemented with fidelity, and are evaluating a science-based curriculum with initial training and ongoing support and encouragement provided by HYSN. Two curricula are in use in public and charter schools, after-school youth development programs, and residential care settings. All are conducting pre- and post-tests and expect to do follow-up surveys to track changes in knowledge, attitudes, and behavior. More than 100 youth workers, health educators and teachers from additional organizations have participated in training in either Making Proud Choices or Teen Outreach Program (See Table 2).

Finding Out What Works with Asian and Pacific Island Populations

Research on what is effective in preventing teen pregnancy has largely ignored Asian, Native Hawaiian and Pacific Island populations. Because all adopters are conducting evaluation of their efforts and more than 1,000 youth have participated to date, thus creating an adequate sample size, this project provides opportunities to find out what really works with these often overlooked minorities. Initial post-intervention data show substantial increases in knowledge and changes in attitudes about teen pregnancy and sexually-transmitted infection prevention that was sustained in the 3-month follow-up survey. A sampling of evaluation data is shown in the following chart.

Developing Leadership in Pregnancy Prevention

The influence of dynamic leadership is critical in establishing social norms that influence attitudes and policies related to adolescent reproductive health. The individuals invited to form HYH were selected because they were already recognized as leaders in teen pregnancy prevention. HYSN has helped these individuals to form a cohesive group with common goals and values, while enhancing and building skills in such areas as managing controversy, group facilitation, and planning.

Increasing Local Training Capacity

HYSN is establishing a cadre of skilled local trainers on topics specifically related to teen pregnancy prevention (e.g., trainers on specific pregnancy prevention curricula) as well as the skills needed for thorough needs assessment, planning, and evaluation of programs. Whenever possible, HYSN conducts training of trainers. It has invested in out-of-state training for five HYH members who, in turn, are training others. HYH members have already contributed approximately 100 hours of training to the project, e.g. on Making Proud Choices, logic modeling, evaluation, "Avoiding the Giggles and Wide-Eyed Stares," and "Sex Ed 101 for Educators."

Developing Culturally Appropriate Materials

In 2008, HYSN partnered with Hawai'i Student Television (HSTV) to create a DVD on HIV prevention designed specifically for Hawai'i's unique ethnic and cultural mix. *You Cannot Get HIV Ladatt* featured ordinary activities (hula class), multi-ethnic characters, familiar settings (school, tattoo shop), appropriate clothing (rubber slippers), and local speech patterns and dialect. It addressed risk factors specific to the culture. For example, IV drug use is not common among Hawaii teens, but tattooing is common. The video debuted in July 2008 and HYSN has begun to evaluate the impact with youth.

Table 4. Making Proud Choices Pre-Post Test — All Reporting Schools Fall 2007 and Spring 2008

Total Gender: 341 Female, 346 Male, 1 other
 Age/Grade: 64 (9%) High School (shaded in gray in table) and 624 (91%) Middle School Students
 Total Ethnicity: 333 (48%) Native Hawaiian/Pacific Islander; 205 (30%) Asian; 77 (11%) Caucasian, 73 (11%) Other

	<i>% with correct answer pretest/posttest</i>						
	<i>Moloka'i HS (n=15)</i>	<i>Baldwin HS (n=49)</i>	<i>Wash MS F07 (n=115)</i>	<i>Wash MS S08 (n=120)</i>	<i>PACT after-MS (n=6)</i>	<i>Ilima MS F07 (n=187)</i>	<i>Ilima MS S08 (n=196)</i>
1. A girl can get pregnant the first time she has sex, even if she hasn't had her first period yet.	Pre=20 Post=100	Pre=33 Post=86	Pre=20 Post=54	Pre=28 Post=74	Pre=17 Post=100	Pre=30 Post=57	Pre=31 Post=64
2. Becoming a teen parent makes you an adult.	Pre=73 Post=100	Pre=79 Post=76	Pre=70 Post=77	Pre=73 Post=97	Pre=50 Post=100	Pre=66 Post=72	Pre=66 Post=76
3. When a boy and a girl have a baby together, it means that they will be in love forever.	Pre=93 Post=100	Pre=98 Post=98	Pre=90 Post=93	Pre=85 Post=90	Pre=100 Post=100	Pre=86 Post=93	Pre=88 Post=93
4. If you feel uncomfortable with the way someone is touching you, you have the right to say "no."	Pre=87 Post=100	Pre=98 Post=100	Pre=97 Post=97	Pre=93 Post=96	Pre=100 Post=100	Pre=98 Post=98	Pre=98 Post=99
5. Boys should worry about teen pregnancy, even though they can't get pregnant.	Pre=93 Post=100	Pre=96 Post=96	Pre=86 Post=91	Pre=78 Post=88	Pre=83 Post=100	Pre=76 Post=91	Pre=78 Post=93
6. Being a teen parent can be hard and can cost a lot of money.	Pre=100 Post=100	Pre=98 Post=98	Pre=97 Post=98	Pre=87 Post=93	Pre=50 Post=100	Pre=80 Post=90	Pre=87 Post=97
7. Being a teen parent makes it harder to reach your goals.	Pre=93 Post=100	Pre=98 Post=100	Pre=95 Post=98	Pre=91 Post=98	Pre=50 Post=100	Pre=96 Post=94	Pre=83 Post=96
8. Because teen girls' bodies are still growing, having a baby can be harder on the body.	Pre=87 Post=100	Pre=76 Post=90	Pre=77 Post=87	Pre=63 Post=88	Pre=50 Post=67	Pre=56 Post=74	Pre=62 Post=85
9. I know where to get or buy condoms.	Pre=80 Post=100	Pre=86 Post=98	Pre=37 Post=88	Pre=53 Post=89	Pre=17 Post=100	Pre=48 Post=86	Pre=60 Post=97
10. I know how to put on a condom correctly.	Pre=10 Post=100	Pre=53 Post=94	Pre=15 Post=96	Pre=18 Post=93	Pre=0 Post=100	Pre=16 Post=80	Pre=21 Post=99
11. If I don't use condoms or birth control, I have a higher chance of getting pregnant or getting a girl pregnant.	Pre=100 Post=100	Pre=98 Post=96	Pre=76 Post=95	Pre=74 Post=90	Pre=67 Post=100	Pre=78 Post=91	Pre=84 Post=97
12. If I don't use condoms, I have a higher chance of getting an STD, including HIV and AIDS.	Pre=100 Post=100	Pre=98 Post=98	Pre=70 Post=97	Pre=73 Post=95	Pre=50 Post=100	Pre=72 Post=98	Pre=70 Post=99

Awards

In September 2008, the US Centers for Disease Control recognized HYSN capacity building work in teen pregnancy prevention with the Horizon Award for Excellence in Health Education. The video, *You Cannot*

Get HIV Ladatt, was a winner in the Annual Creativity Awards, an international student video competition.

Hawai'i Next Steps 2009 and Beyond

While sustaining and expanding the initiatives described above, in the next two years HYSN will

expand its reach to include Micronesian Youth Service Network members in the outer Pacific Islands, work to include involve youth in pregnancy prevention efforts, and plan for sustainability. Increased funding for training, technical assistance, and evaluation received in 2008 will enable HYSN to provide intensive support to eight to ten additional organizations that want to implement a science-based teen pregnancy prevention program, build a stronger partnership with the State Department of Education, and conduct more comprehensive evaluation.

HYSN staff will conduct training on program planning, science-based approaches to teen pregnancy and STI prevention, and an overview of science-based programs at the 2009 Micronesian Youth Services Network conference. Staff will make follow-up site visits to two Pacific Island organizations that decide to implement a science-based pregnancy prevention program.

HYSN and HYH members plan to establish a youth group that will promote teen pregnancy and STD prevention with their peers, families, schools, communities, and public policy makers. Youth that participate in the project will have opportunities to develop leadership and advocacy skills, conduct needs assessments, set goals, develop strategic plans, and create marketing campaigns.

HYSN will evaluate the effectiveness of its HIV video through focus groups, feedback from users, and comparison of pre/post-tests and follow-up surveys prior to and after inclusion of *You Cannot Get HIV Ladatt*. HYSN will also review other video and print materials in use in pregnancy prevention programs to identify needs for additional adaptations to improve effectiveness with Hawai'i adolescents.

HYH members have begun discussion of sustainability options in the event that CDC support does not continue past this 5-year period or to fund projects that are beyond the scope of the Promoting Science-Based Approaches Project. For example, the group has begun discussion with senior staff at Aloha United Way about possible financial support.

Discussion

HYSN's approach to organizational capacity building features several key elements that were critical to success: building relationships and trust, removing barriers, ensuring that interventions are culturally competent, and providing ongoing support and encouragement after initial training and implementation.

Without trusting relationships, our messages about the importance of using a science-based approach to teen pregnancy prevention would not have been heard and believed. It was equally important for HYSN to address barriers such as lack of training or funding to

purchase curricula and supplies, the lack of curricula tailored for Hawai'i's unique ethnic and cultural mix, and the lack of locally-based trainers. Guiding adopters in identifying appropriate adaptations without eliminating elements critical to desired outcomes was an important step in gaining buy-in and implementation with fidelity.

Finally, we know that ongoing support and technical assistance is important for successful and sustained implementation. Workers may become discouraged if supports are not available when problems arise. With ongoing monitoring and support, fidelity to essential elements is more likely to occur, leading to more effective outcomes for youth at risk of pregnancy.

Key factors to HYSN's success to teen pregnancy prevention capacity building include:

1. Listen to what service providers and community members have to tell you about their needs, goals, resources, and capacities. Remember and respect their expertise. Do not assume that you know what is needed.
2. Recognize that each individual and organization is unique. You may need to adapt your methods to fit the organization and community.
3. Take time to build trusting relationships. If people do not know and respect you, they will be less willing to accept what you have to offer. Especially in minority communities, many people are wary of outsiders offering "help."
4. Adopt a barrier-removal approach. Determine what is keeping individuals and organizations adopting the desired approach or program and figure out what you and others can do to address it. Be flexible and willing to adapt to address perceived needs and barriers. Avoid the words, "We've always done it this way,"
5. Avoid developing dependency on your expertise. Encourage participants to build their own skills and help them develop the skills to train others. Make sure that participants are capable of sustaining their efforts after you have moved on.
6. Build peer support systems.

The effectiveness of HYSN's approach to organizational capacity building for teen pregnancy prevention is demonstrated by the number of organizations that have successfully adopted and are sustaining science-based approaches, and evaluation findings that demonstrate positive changes in knowledge, attitudes, and behavior among participating teens. Equally important is the positive feedback from organizations and individuals that have received intensive training and technical assistance from HYSN. In closing we would like to share a comment from one of our partners in this project.

“Because of the support that HYSN and HYH have provided—we feel prepared and supported to do the work. MPC (Making Proud Choices) has really taken off—thanks to Darlene and the support of HYSN (in providing the materials, training & tools). We’re moving forward with the program!”

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Examination of Bed Bug (*Cimex lectularius* Linnaeus) Infestations on the Island of Oahu, Hawai'i

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Abstract

Bed bug (Cimex lectularius Linnaeus) infestations have been increasing over the past several years in the continental United States. This study identified a similar rise in bed bug infestations on the island of Oahu, Hawai'i and followed up to characterize the local situation. The amount of calls and complaints regarding bed bugs to the Hawai'i State Department of Health, Oahu Vector Control Branch (DOHVCB) and Pest Control Companies (PCCs) increased in 2007 as compared to 2006. Eighteen pest management professionals (PMPs) were interviewed by phone in follow up. The number of sites treated for a company ranged from 2 to 650 in 2007, with a mean of 95.31 sites treated. Residential facilities were most commonly serviced by PMPs, shelters much less often. Eighteen employees from 16 shelters were then also interviewed using a different, in-person survey form. Eleven of these shelters had experienced a bed bug infestation, two of which were still affected at the time of the interview. Sixty-four percent of shelters' infestations were limited to one incident, 87.50% of these were able to quickly eliminate infestations. To be able to contain an infestation in shelters such as these, training staff on prevention measures is critical. With the overall rise in infestations, updated public information is essential.

Introduction

One of the most popular topics in pest control today is the resurgence of bed bugs². Pest management professionals (PMPs) and public health officials are receiving an increasing amount of questions about bed bugs across North America, and Hawai'i should be no exception². People of all social and economic classes are affected by bed bugs, and even people who have not had an infestation find themselves worrying about getting one and what they can do to prevent such a situation. Across North America, a plethora of institutions have been directly affected by bed bugs, from motels to four-star hotels, from houses to apartments, and even homeless shelters, movie theaters, cruise ships and public transportation^{2,3}. The species of bed bug that accounts for the vast majority of infestation in the United States, as well as the only species found on O'ahu, is the common bed bug, *Cimex lectularius* Linnaeus.

Like many blood-sucking insects, bed bugs' saliva has anticoagulant properties, which causes the itchy sensations many people experience after a bite⁴. A

typical bed bug bite results in an itchy welt. However, responses to bites have been reported ranging from no reaction at all to severe discomfort, possibly to the point of giant urticaria and hemorrhagic bullous eruptions². Anaphylaxis has occurred in very sensitive allergy patients⁵. Bed bugs have been suspected of transmitting over 40 human diseases, but attempts to prove that they are vectors of disease have been unsuccessful^{6,7}. They do, however, present a severe nuisance and cause residents to call to Pest Control Companies (PCCs) and the Hawai'i State Department of Health, Vector Control Branch (DOHVCB) about their sleepless nights and mental anguish. The purpose of this study was to get a sense of the scope of bed bug infestations on the island of Oahu and further characterize the problem, particularly in homeless, transitional, and emergency housing shelters, so that we can more effectively increase public awareness about bed bugs.

Methods

The record of calls in 2006 and 2007 to the DOHVCB was reviewed for bed bug inquiries. This included, but was not limited to, calls requesting information, assistance with control and prevention, inspections for bed bugs and bed bug identifications.

In a survey, interviews were conducted with PMPs as well as employees and volunteers working for O'ahu's homeless, transitional, and emergency shelters. The survey forms in this study were the same survey forms written for "Bed bug infestations in an urban environment"² and used in this study with permission from the lead researcher and author of that paper. Participants were assured complete anonymity for themselves and their PCC/shelter.

The survey was conducted by telephone with the PMPs on O'ahu. All pest control companies (PCCs) listed in the 2007 phone book were contacted (n=42) and of these, 18 PMPs (each from a different company) participated in this phone survey. The remaining 24 PCCs were either unavailable for comment or declined to interview. Interviewed parties were asked if the number of calls and/or treatments had increased in 2007 as compared to 2006. They were also asked a series of questions which included how many facilities and of what type they treated, how many treatments were needed per site, and the methodology which they used for bed bug infestations.

Twenty-four shelters on O'ahu were then contacted for this study, of which 18 individuals from 16 different

¹Hawaii State Department of Health, Vector Control Branch

shelters participated in an in-person survey different from the one given to PMPs. Shelter interviewees included management staff from all participating shelters, and non-management staff from 2 of the shelters. The survey included information about previous and current infestations, action items taken, and the effects of these items on residents.

Results

Department of Health

The O'ahu DOHVCB recorded more than twice as many bed bugs in 2007 (n=69) as the branch did in 2006 (n=30). In both years, more than half of these calls were residential complaints. Shelter complaints went down from 10.0% in 2006 to 4.57% in 2007.

Pest Control Companies

Of the eighteen PMPs interviewed, 72.0 % reported a strong increase in the number of calls and treatments pertaining to bed bugs they received in 2007 versus 2006, while the other 28.0% responded that they will not treat for bed bugs and therefore did not have any record of how many calls were made. One of the PMPs reported stopping bed bug treatments in 2006 because demand was too high and profits were unpredictable, while another PMP reported only treating for bed bugs from long-time customers.

Of the companies that did treat for bed bugs, the number of sites treated ranged from 2 to 650 in 2007 (n=1203), with a mean of 95.30 sites treated. No specific data was able to be collected from 2006. Number of treatments per site ranged from 1 to 9, with a mean of 2.89, though this varied depending on the type of site (table 1). While all PMPs reported

inspecting thoroughly for bed bugs before treatment, less than one-third reported monitoring for bed bugs between services.

Table 1. The mean and range of treatments used by pest management professionals (PMPs) to treat different types of facilities for bed bugs.

Facility	Mean	Min	Max
Apt. buildings	3.95	1	9
Commercial	2.0	2	2
Health care fac.	3.87	3	4
Hotels	3.03	1	4
Private dwellings	2.81	1	4
Shelters	2.0	2	2
Other	4.0	4	4
Overall	2.89	1	

Residential facilities (houses, condos and apartments) were the type of facility most commonly serviced by PMPs (74%), followed by hotels (15%). Shelters comprised 0.42% of facilities serviced by PMPs in 2007 (figure 1). Other facilities infested included health care facilities such as nursing homes and assisted care living (7% in 2006, 9% in 2007) and less commonly affected places: cruise ships, businesses and even a fire station (figure 1).

Heat and cold treatments were recommended by one PMP, but no PMPs reported using these methods themselves. Steam and fumigation were reported in 23.08% and 38.46%, respectively, of the surveys, while contact pesticides were universally used by all PCCs. The Suspend SC (Deltamethrin) was more commonly reported (n=5) than other non-fumigant pesticides (figure 2).

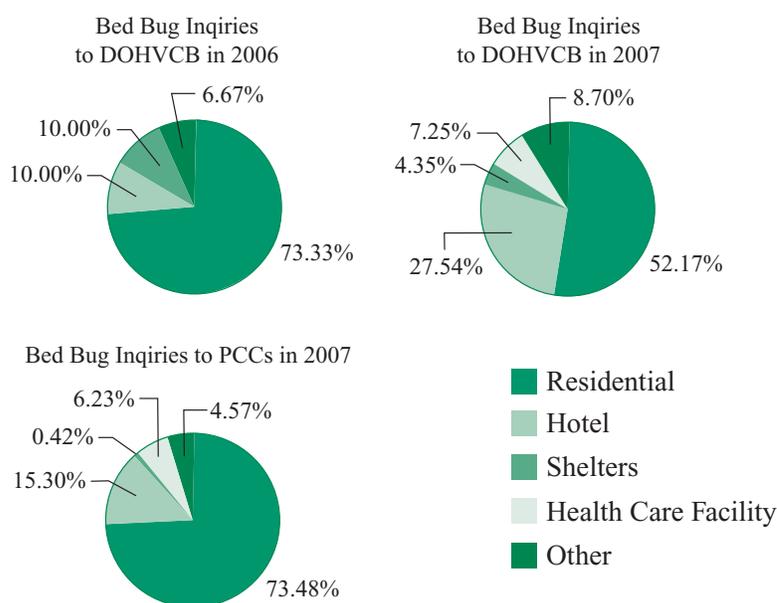


Figure 1. Summary of bed-bug related inquiries to the Hawai'i State Department of Health , Oahu Vector Control Branch in 2006 (n=30) and 2007 (n=69) and to Oahu pest control companies (PCCs) in 2007 (n=1203).

Shelters

Although shelters were such a small focus of attention for PMPs, they are a critical public health concern. DOHVCB personnel conducted an additional survey to get a sense of the scope of bed bug infestations in emergency, transitional, and homeless shelters. Of the 16 shelters that participated in this study, 68.75% had been affected by bed bugs in the past 2 years. Forty percent of shelters were infested in 2007. Twelve and a half percent were infested at the time of the interview. Two shelters had infestations on and off since the time the shelter opened (one of these was currently infested). Of the infested shelters (n=11), 64% had only one infestation of bed bugs. All shelters examined had mattresses and sheets that were infested, while only 69.23% had bed frames infested and 61.53% had other furniture infested. Bed bugs were sighted on 61.53% of the shelters' walls and floors.

The interviewees were asked how much knowledge they thought they had about bed bugs. Twenty-five percent claimed to have a large amount, 37.50% had a moderate amount, 25.0% had a small amount and 12.50% had no knowledge of bed bugs (this excludes 2 interviewees who declined to comment on this question). More interviewees used the Internet to gain knowledge about bed bugs than any other method (figure 3). Two-thirds of interviewees could correctly identify a bed bug from a series of pictures shown to them. When faced with the first sign of an infestation, 100% of interviewees reported that it was first suspected when residents complained of bites. Follow up inspections allowed 45.50% of the shelter personnel to recognize bed bugs from previous experience, while 54.50% called in PMPs and referred to books.

Of all the shelters that experienced infestations, 75.0% consulted a PCC for the treatment of bed bugs. Of these, 77.78% were satisfied with their first company, while the other 22.22% contacted a second.

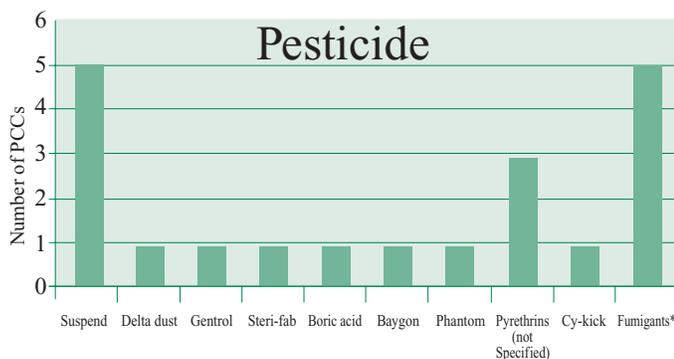


Figure 2. Types of pesticides used from bed bug control by pest control companies (PCCs) on Oahu.

*Fumigants used were either Vikane or its generic form Zythor, both of which have sulfuranyl fluoride as the active ingredient.

All PCCs sprayed affected rooms, two of which also sprayed adjacent rooms as a precautionary measure. Mattresses and other infested furniture at 90.90% of shelter were disposed of after each infestation. Traditional mattresses were banned from one shelter and replaced by air mattresses in an attempt to suppress the infestation. This action did not eliminate the infestation, although many of the residents reported a decrease in the number of bites following the enforcement of this rule. Almost 31% of affected shelters kept written records of their infestation and 38.46% kept educational materials about bed bugs.

About 64% of shelters had the bed bugs spread from the room originally containing the infestation. They were seen traveling on people, laundry bags, along hallways, across walls and through vents. The vast majority of shelters (93.31%) had only a handful of rooms affected by bed bugs, averaging only 2.1 rooms per shelter. One shelter, however, had every room and every bed infested with bed bugs. The spread of the infestation in this shelter may have been due to the short walls separating units. Whereas all other shelters examined had separate rooms for every family, this shelter used cubicles with 4ft walls to separate families. Only three shelters, including the one previously mentioned, had common rooms affected by the bed bugs. Forty-five percent of infested shelters had staff that were bitten by bed bugs and three of these shelters had staff whose homes were subsequently infested.

Of the shelters surveyed, 25.0% had hygiene requirements and 41.67% had mandatory room inspections prior to the bed bug infestations. Room inspections consisted of making sure that rooms were kept clean; they were not inspections for bed bugs. Only one shelter had rules regarding the washing of sheets and no shelters had any policy about cleaning mattresses. No shelters made changes in the rules regarding residents' personal hygiene or washing of their clothing due to the bed bug issue. However, one shelter increased the frequency in which they did room inspections, while a different shelter limited the amount of personal items residents could keep and installed new washers and dryers.

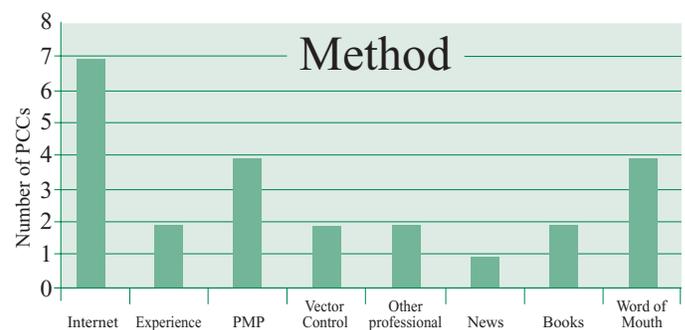


Figure 3. How different shelter interviewees obtained their knowledge of bed bugs.

Discussion

This study indicates that bed bug infestations are increasing on the island of O'ahu, Hawai'i, echoing the national trend. The relative amount of types of facilities that suffered bed bug infestations reported to Oahu pest control companies in 2007 was similar to those reports from the DOHVCB in 2006, although these reports differed substantially from DOHVCB's data from 2007, (figure 1).

Infestations of bed bugs in shelters are high. However, because the vast majority were able to quickly eradicate the infestation (87.50%), this study suggests that bed bug infestations in these shelters can be eliminated if proper procedures are followed. This study also suggests that "cube-farm" style shelters may have a difficult time maintaining control due to low walls and an inability to quarantine an infested room. This same shelter was also not able to receive professional pest control help until nearly two months after the initial infestation was discovered. Reasons for this slow response and control include the need to get several quotes and the lack of available funds for the purpose of pest control. Since the shelter in question was the only shelter of its kind surveyed, it cannot be concluded that cubicles are a problem. However, due to the fact bed bugs were seen crawling over the 4ft walls, this is likely the case.

Preventing bed bug infestations is critical in public health-sensitive environments like shelters and education is key to gaining quick control when an infestation does occur. Shelter staff and residents must learn to notice and quickly respond to bed bug infestations. It is important that staff learn the signs and symptoms of bed bugs, including spots on sheets and mattresses, complaints of bites from residents and the actual recognition of a bed bug.

Even though bed bugs can infest nearly any facility, they do thrive in cluttered areas and therefore maintaining a clean living space is critical (Pinto et al., 2007). Room inspections may be necessary to encourage residents to not provide harborage for bed bugs and other pests. Providing laundry facilities may also encourage resident to wash their items more frequently.

It would also be wise to thoroughly inspect all donations that are given to the shelter, and any furniture that enters the facility. The seams and crevasses should be carefully inspected for evidence of bed bugs. If the means are available, it would also be preferable for all personal items to be briefly inspected. Any items showing signs of bed bug infestation should be treated and quarantined or discarded. If items are disposed of, they should be treated to prevent the spread of the insects and they should be defaced or destroyed to prevent other people from picking up the infested items. One shelter on the Big Island of Hawai'i was given a large walk-in freezer and pre-freezes all items for several days before they enter the facility.

Shelters should have a protocol to treat for bed bugs should an infestation occur. This protocol should include the names of pest control companies or companies to contact and it should be assured that funds are available for bed bug and other pest control needs.

The DOHVCB intends to increase public awareness about bed bugs, including biology, behavior, prevention and control. The branch is currently updating bed bug brochures and factsheets with the goal of having these items translated into the languages most commonly spoken in Hawai'i. The DOHVCB also offers advice and talks about bed bugs to interested parties.

Acknowledgements

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Lack of Prenatal Care—A Re-Emerging Health Problem on Guam

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Abstract

Objective: A study was conducted to determine the ethnic profile of new mothers on Guam, their use of prenatal care services, causes for the failure of some women to receive any prenatal care, and suggestions to improve participation in this important health care measure.

Methods: Data from birth certificates for the period 1970-2004 were reviewed to determine the ethnicity of mothers and their prenatal care. In addition, a survey of mothers who delivered without any prenatal care was conducted to learn their reasons for not receiving prenatal care, where they would prefer to receive such care in the future, and their suggestions for encouraging participation in prenatal care programs.

Results: The percent of Micronesian mothers who received no prenatal care during their pregnancies increased by more than 4 times (461%) over the study period. Lack of medical insurance (24.3% of respondents) and lack of transportation (22.6% of respondents) were the leading reasons given for not receiving prenatal care during their pregnancies. Nearly half (48.2%) of respondents indicated they would prefer to receive prenatal care at public health clinics, the number favoring North, Central, or Southern clinics roughly reflecting population numbers of the areas served by those clinics.

Conclusions: Targeted measures should be taken to assure that basic prenatal care is accessible to mothers who do not have health insurance and have limited transportation resources.

Introduction

Guam is a multi-ethnic island community in the Western Pacific where no ethnic group constitutes as much as 50% of the population. In the 2000 census native Guamanians (Chamorros) constituted 37 percent of the island's population, Filipinos constituted 26 percent, 7 percent were White, 4 percent were Chuukese, 14 percent identified with 2 or more races and 12 percent identified with other racial or ethnic groups (3). Several cases of congenital syphilis were reported on Guam recently after having been absent

from the island for many years. Beyond the fact that these cases indicate that the spread of sexually transmitted disease continues to be a problem on Guam, they also suggest that prenatal care for some women giving birth on Guam has been inadequate.

Since timely, high-quality prenatal care can both help to prevent poor birth outcomes and improve maternal health¹, a study was initiated to determine the Guam populations most lacking of prenatal care, the reasons pregnant women failed to obtain prenatal care, and possible means to improve utilization of this important preventive health practice.

Methods

To assess the nature and magnitude of the problem of inadequate prenatal care on Guam, data obtained from birth certificates of infants born on Guam from 1970 through 2004 and summarized in Annual Statistical Reports prepared by the Office of Vital Statistics (1970-1997) and additional computerized data provided by the Office of Planning and Evaluation, Department of Public Health and Social Services (1998-2004) were reviewed. This data included self-reported ethnicity of mother, village of mother's residence at time of delivery, marital status, and month of first pre-natal physician visit. In the context of this study, the term "Micronesian" ethnicity meant Micronesians other than Guam Chamorros and included women of the Republic of the Marshall Islands, the Federated States of Micronesia (Kosrae, Pohnpei, Chuuk and Yap States), the Commonwealth of the Northern Mariana Islands, and the Republic of Belau ethnicity.

In addition to reviewing birth certificate data, a survey of mothers who delivered without any prenatal care during their pregnancy was conducted to learn their reasons for not receiving this care, where they would prefer to receive such care in the future and suggestions for encouraging women to participate in prenatal care programs. The survey instrument was prepared by consultation between the Territorial Epidemiologist, the administrator of Guam's Maternal and Child Health Program, and a Program Planner experienced in conducting surveys. Mothers requesting birth certificates at Guam's Office of Vital Statistics who had received no prenatal care were asked to participate in the survey while they waited (fathers or other

Office of Epidemiology and Research

²Maternal and Child Health Program

³Office of Planning and Evaluation

⁴Office of Vital Statistics

relatives requesting birth certificates did not participate in the survey). Participation was strictly voluntary with lack of prenatal care being the only qualification for selection. No attempt was made to assure that respondents were geographically, ethnically or otherwise representative of the island as a whole. A total of 201 questionnaires were completed. Data were entered and analyzed using EpiInfo-6 software⁶.

Results

Prenatal care data for women delivering on Guam from 1970 through 2004 is summarized by 5-year periods in Table 1. The data reveal that for Chamorro and Micronesian mothers as well as all mothers of Guam in general, the percent of both those initiating prenatal care during the first trimester of their pregnancy and those who received no prenatal care at all increased during the period studied. The data clearly show that the population most at risk of failing to receive any prenatal care is Micronesian mothers, with Chamorro mothers showing a similar but somewhat less dramatic recent trend. Although the Chamorro population of Guam is larger than the Micronesian population, Micronesian births with a history of no prenatal care exceed those of Chamorro births in absolute numbers as well as rate. Micronesian women constitute only about 9% of women of childbearing age

on Guam³ but in 2004 they accounted for 54% of deliveries with no prenatal care.

Lack of medical insurance and lack of transportation were the leading reasons given by survey respondents for not receiving prenatal care (Table 2, Question 1).

For the period 2000-2004 women of the southern Guam village of Umatac had the highest rate of delivery with no prenatal care at 12.2% of births. According to the 2000 census this village also had the lowest per capita income of any village on Guam. (Table 3).

Almost half (48.2%) of survey respondents indicated that they would prefer to receive prenatal care services at a public health clinic (Table 2, Question 2) but almost all indicated that they were not aware that these services were available without charge (Table 2, Question 3).

Discussion

The results of this study suggest that while adequate prenatal care has been available to some segments of Guam's population, certain other segments of the population have been unable or unwilling to access appropriate prenatal care. It is apparent that Chamorro and Micronesian populations of Guam are those most likely to belong to the latter group. Mothers of the predominantly Chamorro southern Guam village

Table 1: Percent for Guam mothers initiating prenatal care during first trimester or lacking any prenatal care by ethnicity for 5-year periods, 1970-2004¹

1 st Visit (%)	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
All Races							
1 st Trimester	42.0	56.1	62.3	59.4	60.3	64.4	61.4
No Prenatal	1.2	2.7	1.3	3.2	3.5	6.0	7.3
Total Births	15,609	15,071	15,254	16,974	20,821	21,131	17,253
Micronesian							
1 st Trimester	20.8	32.8	44.1	36.3	40.4	39.7	34.9
No Prenatal	3.1	7.8	3.9	6.9	13.9	14.6	17.4
Total Births	683	714	1,014	1,244	2,347	3,713	3,541
Chamorro							
1 st Trimester	27.4	47.7	57.5	52.9	62.3	61.7	59.6
No Prenatal	1.8	3.1	1.5	3.7	3.4	6.6	6.9
Total Births	7,801	6,763	6,797	7,648	8,926	8,923	7,298
Filipino							
1 st Trimester	45.5	62.3	69.2	61.9	74.2	78.6	76.8
No Prenatal	0.6	1.1	1.1	2.4	1.2	1.2	2.0
Total Births	2,733	3,101	3,082	3,711	4,974	4,869	3,725
Caucasian							
1 st Trimester	73.0	72.8	70.1	78.4	80.7	82.0	87.7
No Prenatal	0.1	0.4	0.5	1.4	0.6	1.9	0.5
Total Births	3,592	2,944	2,884	2,737	2,408	1,802	1,108
Asian							
1 st Trimester	52.4	61.0	73.6	69.6	74.7	88.7	77.5
No Prenatal	1.5	9.3	0.6	3.2	1.5	1.9	1.7
Total Births	481	793	527	496	854	927	821

¹This table has been compiled from data extracted from Annual Statistical Reports, Office of Vital Statistics (1970-1997), and from additional data provided by the Office of Planning and Evaluation, Department of Public Health and Social Services.

Table 2: Number of responses (and percent of respondents) to questions in a survey of mothers who received no prenatal care (201 respondents).

Question 1: Why did you NOT receive any prenatal medical care (no doctor appointment while you were pregnant)? Please circle all answers that apply.

	NUMBER	PERCENT
a. I did not know I was pregnant.	59	17.5%
b. I was unable to afford a doctor appointment.	47	14.0%
c. I did not have transportation.	82	24.3%
d. I do not have health insurance.	76	22.6%
e. I have already had children before and was not worried.	27	8.0%
f. A relative (mother, sister, aunt, etc.) helped and advised me regarding my pregnancy.	18	5.3%
g. I did not want anyone else to know I was pregnant.	19	5.6%
h. My husband (boyfriend) did not want me to see a doctor.	5	1.5%
i. I saw a midwife (<i>pattera</i>) for my care during pregnancy.	4	1.2%
j. Other	0	0.0%
TOTAL RESPONSES	337	100%

Question 2: From whom would you prefer to receive medical care during future pregnancies?

a. Private physician	57	34.3%
b. Public Health clinic		
1. Dededo	38	22.9%
2. Mangilao	37	22.3%
3. Inarajan	5	3.0%
c. Guam Memorial Hospital	27	16.3%
d. Midwife (<i>pattera</i>)	2	1.2%
e. Other	0	0.0%
TOTAL RESPONSES	166	100%

Question 3: Were you aware of the Maternal and Child Health program at Mangilao PublicHealth that offers free prenatal care services?

a. Yes	5	3.5%
b. No	139	96.5%
TOTAL RESPONSES	144	100%

Question 4. If you answered “Yes” to question #3 above, what was the most important reason why you did not participate in this program?

No transportation	14	48.3%
No baby sitter	5	17.2%
No insurance	3	10.3%
Wasn't worried, had previous kids.	2	6.9%
Had help from a relative.	1	3.5%
Family doesn't believe in prenatal care.	1	3.5%
Didn't know I was pregnant.	1	3.5%
Scared to go to Public Health	1	3.5%
Uncomfortable with male doctor	1	3.5%
TOTAL RESPONSES	29	100%

Question 5. What can Public Health do to encourage participation in their prenatal care program?

The most frequent responses (19) related to publicizing services through the mass media. Other responses included the following:

- Provide universal health insurance.
- Provide prenatal care at home.
- Have prenatal clinics on weekends.
- Provide more appointment slots.
- Make classes mandatory or lose [welfare] benefits
- Have translators for people who can't speak English.
- Have female physicians.
- Provide classes in schools on the importance of prenatal care.

of Umatac had the highest rate of birthing without any prenatal care during the period 2000-2004. The low utilization of prenatal care even in a village served by a Public Health Clinic is of particular concern. The principal idea behind establishing the Southern Region Community Health Center (SRCHC) in the neighboring village of Inarajan was to assure access to adequate health care for residents of the more traditional and less populated southern villages of Guam. While Guam is a relatively small island (approximately 35 miles long by 5-8 miles wide and 210 sq. miles in area), the distances involved in reaching health care services may still be daunting to those without access to adequate transportation. The SRCHC is approximately 10.75 miles from the village of Umatac suggesting that even what many people in a mobile society would consider a modest distance may be a substantial obstacle to mothers without access to adequate transportation. According to the 2000 census of Guam, Umatac also had the lowest per capita income of any village on Guam further suggesting that lack of prenatal care is related to economic issues.

Although Guam has a public transportation system, it is limited in scope and routes are not readily accessible to many lower-income communities. This is particularly the case of those only accessed by unpaved roads since bus companies only traverse paved roads (although a paved road passes through Umatac, there is only 1 bus daily in each direction between Umatac and Inarajan). An effort to assure that public transportation is accessible within reasonable

Table 3: Average annual percent of births with no prenatal care 2000-2004¹, population in 2000² and average per capita income (thousands) in 1999² for Guam Villages.

Guam Villages	No Prenatal Care Percent	Population	Per Capita Income
Yigo	8.3	19,474	9.3
Dededo	8.2	42,980	8.4
Tamuning	8.0	18,012	13.7
Mangilao	8.6	13,313	9.3
Barrigada	5.7	8,652	10.6
Mongmong-Toto-Maite	9.5	5,845	10.5
Hagatna	6.9	1,100	12.2
Agana Heights	4.4	3,940	11.6
Sinajana	6.5	2,853	10.1
Chalan Pago-Ordot	6.9	5,923	9.0
Asan-Maina	5.4	2,090	12.1
Piti	4.9	1,666	14.5
Santa Rita	5.2	7,500	9.7
Agat	6.5	5,656	7.9
Yona	7.5	6,484	9.8
Talofoto	6.9	3,215	9.6
Inarajan	7.7	3,052	7.5
Merizo	5.7	2,163	8.2
Umatac	12.5	887	6.7

¹Office of Vital Statistics, Guam Department of Public Health and Social Services.

²U.S. Census Bureau 2000. Census of Population and Housing: Guam.

walking distance of every Guam household would do much to solve the problem of lack of access to primary health care due to lack of transportation.

In 1956 a total of 17 village-based public health clinics providing complete pre-natal, well-child and maternal care outpatient services as well as some cancer detection services, family planning information and home care supervision were serving Guam's civilian communities² but by the early 1970's, encouraged by federal grants, a policy of providing more comprehensive services in centralized locations was inaugurated. The SRCHC, located in the largely rural village of Inarajan, opened its doors in 1971 and the Northern Region Community Health Center (NRCHC), located in the village of Dededo, the island's most populous village, opened in 1984. In addition to the traditional public health services provided by the village clinics, these centers offered dental health and communicable disease control services as well as chronic disease care and some crippled children services. Unfortunately, as financial resources to support public health staffing dwindled with the hard economic times associated with a Japanese economic downturn and the resulting decline of Guam's tourism revenues, the readily accessible village public health clinics have been closed. During the same period the public health nursing staff, backbone of all public health activities, fell from 48 (including 39 RN's) in 1970 when Guam's population was 84,996 to only 23 (including 16 RN's) in 2005 when the island's population had increased to 168,564^{2,5}.

In 2005 23% of Guam's population had no medical insurance⁴. This figure is in agreement with questionnaire responses "I was not able to afford a doctor's appointment" (14% of respondents) and "I do not have health insurance" (22.6% of respondents), and further supports the view that a lack of financial



resources is a leading cause of women on Guam failing to obtain any prenatal care.

In deciding where health services are most needed, total patient load could be the most important factor. This study has shown that the village with the greatest total number of mothers without prenatal care was Dededo, also the site of the NRCHC. Dededo village is also the most populous village on Guam and because it is also the largest in area as well (approximately 30 sq. miles), women from remote locations may have to travel more than 6 miles to reach their nearest health center.

The fact that many women were not aware of free prenatal care available from Guam public health clinics was both discouraging and enlightening (Table 2, Question 3). As might be anticipated, many of the responses to the question, "What can Public Health do to encourage participation in their prenatal care program?" (Table 2, Question 5) related to the need for better communication about the services available to pregnant women.

Conclusions

The dual problems of financing basic health care for all and assuring access to these services are not unique to Guam and, as elsewhere, solutions are likely to be both complex and costly. While searching for solutions to these problems, however, increased effort should be made in less problematic areas such as more effectively targeting information about the availability of existing prenatal care services to the communities and ethnic populations most in need of these services.

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Examining the Predictive Value of the Theory of Planned Behavior and Stages of Change on Fruit and Vegetable Intake

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Abstract

Objective: Most research examining the Theory of Planned Behavior (TPB) and the Transtheoretical model's stages of change (SOC) in predicting fruit and vegetable (FV) intake has been cross-sectional in nature. The aim of this study was to investigate the strength of these variables in predicting FV consumption and SOC after one year.

Methods: A random-digit dial phone panel survey was administered in spring of 2006 (T1) and followed up in fall of 2007 (T2). Participants were English-speaking adults residing in the state of Hawai'i. Data included the 722 participants who were not meeting the 5-a-day recommendation at baseline. TPB variables (attitudes, perceived behavioral control (PBC), and social norms) were assessed, with stage of change (SOC), substituted for intention. Self efficacy, barriers, and dietary behavior were also measured. Various analyses were run investigating the predictive value of these variables on future FV intake.

Results: Without accounting for baseline FV intake, self efficacy and PBC significantly predicted whether or not the 5-a-day recommendation was reached, and self efficacy and barriers significantly predicted the number of servings consumed at follow up. However, when previous FV intake was accounted for, this variable explained most of the variance in behavior, rendering all other variables non-significant predictors. Some evidence was found supporting the temporal notion inherent in the SOC construct, namely that more people progressed forward through the stages than regressed backward. However, the majority of people in both the precontemplation and preparation stages tended to remain in that stage at T2.

Conclusion: After controlling for potential confounding variables, the TPB constructs and stages of change were not significant predictors of future FV intake. Some support was seen for SOC progression.

Implications: Results indicate that these constructs may not be the best option for the implementation of a long-term intervention, and more research is necessary in order to determine which theoretical constructs are strong predictors over time.

Introduction

One of the greatest challenges faced by public health today is the task of reducing chronic disease prevalence by shifting individuals toward healthy behaviors. Eating sufficient quantities of fruits and vegetables is one of these behaviors, with abundant research suggesting that increasing intake reduces the risk of cancer, diabetes, obesity and cardiovascular diseases¹⁻³. High prevalence rates for these chronic conditions have prompted multiple health organizations to set minimum recommendations for daily fruit and vegetable consumption. A minimum of five servings daily has been recommended for health benefits with more recent recommendations for even larger amounts⁴. However, according to the Behavioral Risk Factor Surveillance System's (BRFSS) 2000 data, only 24.6% of U.S. adults meet this recommendation, with the average number of servings eaten daily amounting to only 3.4⁵.

Theoretical Framework

A number of different theoretical models have been proposed which seek to explain the mediating variables contributing to behavior change. The Theory of Planned Behavior⁶ has arguably been one of the most extensively researched of these models, and has been useful in predicting a wide range of behaviors, including fruit and vegetable consumption⁷⁻¹⁰. The key premise of this model is that behavior is determined based on an individual's intention to perform or not perform an action. Intention is subsequently influenced by three theoretical constructs: 1) attitude (the combined set of beliefs one holds about the behavior), 2) subjective norm (an assessment of the amount of social pressure one feels regarding the behavior), and 3) perceived behavioral control (PBC –the degree one feels that they can control their behavior). Fundamentally, the TPB attempts to understand the "why" of an individual's behavior, and can be helpful in tailoring an intervention that addresses these specific variables^{11,12}.

Most research using the TPB can be categorized in two ways. Intervention-based TPB studies are designed to influence the variables through motivation and education¹²⁻¹⁴, and cross-sectional validation studies assess whether the four psychosocial variables predict fruit and vegetable consumption^{15,16}. Very little research has examined the predictive value of the model over time. Kvaavik and others¹⁷ found strong evidence

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supporting the model's predictive power over a period of eight years. However, most research usually operated in a relatively short time frame (i.e. ≤ 6 months)^{8,18}. In a review of the literature, Baranowski, Cullen and Baranowski¹⁰ conclude that "the relationship of intention to behavior needs to be tested prospectively, rather than cross-sectionally, because intention refers to future behavior."

In addition, a magnitude of research has sought to explain behaviors by using a stage model¹¹. The most commonly used is the Stage of Change Construct (SOC) from the Transtheoretical Model, which consists of 5 stages of change: pre-contemplation (no intention of changing behavior) contemplation (considering a change) preparation (planning to change and may have made small attempts), action (actively involved in changing behavior) and maintenance (behavior change sustained over time)¹⁹. Although the model was initially designed to describe the progression toward smoking cessation²⁰, it has been adapted to numerous other health behaviors, including fruit and vegetable consumption^{21,22}. This model provides information on "when" behavior change is to occur. SOC is a construct of the larger Transtheoretical model, which, like the TPB, also facilitates assessment of certain "why" variables. These variables, which include decisional balance, self efficacy, and various "processes of change," are conceptually similar to the TPB constructs of attitudes and PBC, but do not include an assessment of subjective norms. Therefore, it is feasible and perhaps even advantageous to examine SOC in terms of the TPB. This can be accomplished by thinking of an individual's stage as the temporal distance from the present time to the time that the individual *intends* to change their behavior. Thus, intention becomes a *progression* to behavior, rather than a dichotomous outcome variable. Previous research has suggested that these two models suitably compliment each other^{11,23,24}, although Courneya (1998) "questioned the utility of including both intention and stage as predictors... over time." This suggests that stage of change may provide an appropriate substitute for intention in the TPB, and perhaps even a more inclusive measure. The purpose of this study is to examine the efficacy of a combined TPB-SOC in predicting future fruit and vegetable intake. Stage progression is also explored.

Methods

Selection and procedure

Participants were selected from a target population of the entire state of Hawai'i, and were contacted by a random-digit dial telephone survey conducted in spring of 2006 (n=3495). Stratified random selection of participants assured that the sample reflected the correct percentage of the state's population living in

each county. This longitudinal study used survey data from a larger intervention project, known as the Healthy Hawai'i Initiative. The survey covered demographic data and various health behavior questions. A follow up was conducted the following year, utilizing the same cohort (n=1554). Alternative contacts were collected and contacted in the instance that a participant had moved or changed phone numbers. Follow up data was compared to baseline data in order to investigate changes that may have taken place over time. Participants were included if they responded to both of the following questions: "how many servings of fruits do you eat each day?" and "how many servings of vegetables do you eat each day?" at both time points. For the purpose of this study, only at-risk participants (those not meeting the 5-a-day recommendation at recruitment), were included in the analysis. Permission to conduct this survey was granted by the University of Hawai'i at Mānoa institutional review board, and consent was obtained verbally from participants before the start of the survey.

Measures

This study focused specifically on a subset of survey questions regarding a modified Theory of Planned Behavior (TPB) and stages of change (SOC) as they relate to fruit and vegetable (FV) intake. Attitudes and subjective norms were both measured on 5 point Likert scales, with 1 being "not at all important," and 5 being "extremely important." *Attitude* was measured by two items: "How important is it to you..." 1) "that eating more fruits and vegetables would provide more vitamins and minerals?" and 2) "...that you would feel good about looking after your health by eating more fruits and vegetables?" and *subjective norm* was measured with a single item, "How important is it that your family would be pleased if you ate more fruits and vegetables?" *Perceived behavioral control* was measured with two items: 1) "On a scale of 1 to 10, how much control do you have over the number of servings of F&V you eat per day?" 1 being "very little control" and 10 being "complete control," and 2) "On a scale of 1 to 10, how would you rate your ability to eat 5-a-day on a regular basis?" 1 being "extremely difficult" and 10 being "extremely easy."

In addition, self efficacy and barriers were assessed. Both were measured with three items, each employing a 5-point Likert scale. *Self efficacy* was assessed by the questions, "How confident are you that you can eat five or more servings of fruit and vegetables... on the weekends?" "...during the week?" and "...when you are on vacation?" Scores could range from 1 ("not at all confident") to 5 ("completely confident"). *Barriers* were assessed with the question, "How important is it that...eating more fruits and vegetables would be expensive?" "...preparing and cooking vegetables would be time consuming?" and

“...cooking more vegetables would make meal planning more difficult for my family?” These scores could range from 1 (“not at all important”) to 5 (“extremely important”). These items were designed in accordance with psychosocial evidence brought to light in focus groups²⁵⁻²⁷. Answers to each subset of questions were averaged to yield a single number representing the strength of that construct for each participant.

Intention was not measured as a dichotomous variable; instead, we substituted SOC as a representation of different levels of intention. This variable was measured using the following criteria: “not intending to eat 5 a day within the next six months” (precontemplation), “intending to start eating 5 a day in the next six months” (contemplation phase), “intending to eat 5 a day in the next 30 days” (preparation phase), “already eating 5 a day” (action) or “have been eating 5 a day for at least six months” (maintenance). Responses were initially coded either “yes” or “no,” and then assembled into a single categorical variable in order to assess SOC.

Previous behavior was defined as the number of servings of fruits and vegetables eaten daily at baseline (<5). The outcome variable, behavior at time 2 (T2), was evaluated on a continuous scale (number of servings of FV consumed daily), and also as a dichotomized variable (ate <5 a day/ate ?5 a day). Cronbach’s alpha was computed in order to assess the reliability of the constructs.

Data analysis

The Statistical Package for Social Sciences (SPSS), version 16.0, was used for data analysis. To assess differential dropout, independent-sample t-tests were run to compare psychosocial and demographic variables between those who completed both time points and those who did not. Correlations between all variables were analyzed. In order to investigate the strength of the psychosocial variables in predicting whether or not participants met 5 a day at follow up (a dichotomous outcome), a logistic regression was performed. We also assessed the predictive power of these variables on the number of servings of fruits and vegetables eaten daily (a continuous outcome) using multiple linear regression. Finally, progression through the stages of change was explored using a cross tabulation of stage at each time point.

Results

Participants

Of the initial 3451 participants recruited into the study, 1700(49.3%) were not included in the analysis because they already met the 5-a-day recommendation at baseline. This left an at-risk population of 1751 at baseline(T1). Of these, 1029(58.8%) could not be contacted at follow up(T2), leaving a final study

Table 1. Descriptive statistics and assessment of differential dropout

Variable (range)	# of items	.a	Completed both time points n=722		Completed T1 only n=1029	
			Mean	Std. Dev.	Mean	Std. Dev.
Attitude (Likert: 1-5)	2	0.799	3.74	0.90	3.85*	0.83
Subjective Norm (Likert: 1-5)	1	na	3.29	1.31	3.42*	1.27
PBC (Likert: 1-10)	2	0.455	7.06	2.01	7.01	2.21
Barriers (Likert: 1-5)	3	0.639	2.12	1.00	2.27**	1.08
Self Efficacy (Likert: 1-5)	3	0.782	2.86	1.03	2.90	1.07
Baseline Fruit consumption (Self-report: 0-4)	1	na	1.39	0.77	1.39	0.73
Baseline Vegetable consumption (Self-report: 0-4)	1	na	1.57	0.68	1.57	0.70
Years of education (1-22)	1	na	14.89	3.09	14.2***	3.1
Age (18-102)	1	na	53.69	15.44	49.5***	18
BMI (15-67)	2	na	27.16	6.02	26.7	5.70
Gender						
Male			42.2%		46.6%	
Female			57.8%		53.4%	
Ethnicity						
Caucasian			34.1%		31.1%	
Asian			32.5%		23.0%	
Hawaiian/Pacific Islander			27.0%		35.3%	
Other			6.4%		10.3%	

^a Cronbach’s alpha

*Significantly different at $p<0.05$ (independent samples t-test)

**Significantly different at $p<0.01$ (independent samples t-test)

***Significantly different at $p<0.001$ (independent samples t-test)

population of 722. Despite the high attrition rate, there were no significant differences between those who completed the study and those who did not in terms of self efficacy, perceived behavioral control, or fruit and vegetable consumption at T1. Slight differences were seen in education level, age, barriers, subjective norms and attitudes between the two groups(See table 1). Descriptive statistics of demographics, attitudes, self-efficacy, behavioral control, and daily fruit and

vegetable intake of the 722 participants who completed the study are presented.

This sample was 42% male and 58% female. This discrepancy was also seen in the larger sample (n=3451: 40% male, 60% female). The mean age of the participants was 53.7 years(SD 15.4). Mean BMI was 27.2(SD 6.0), which is above the cutoff of 25 for being considered overweight. This is consistent with BRFSS data that suggest that more than half of Hawai'i's population is overweight or obese²⁸. Sixty three percent were either married or living with their partner, only 5% did not complete high school, and most (65%) had some college(≥ 1 year).

Predicting fruit and vegetable intake

When Pearson's correlation coefficients were examined, all four of the continuous psychosocial variables (attitudes, self efficacy, barriers and perceived

behavioral control) were significantly correlated with future behavior. Correlation coefficients are seen in Table 2.

A stepwise linear regression that controlled for age, gender, education level, BMI, and ethnicity then found that perceived behavioral control (RR=0.895; 95% CI: 0.808-0.991, p<0.05), self efficacy (RR=0.799; 95% CI: 0.648-0.984, p<0.05) and barriers (RR=1.220; 95% CI: 1.001-1.487, p<0.05) significantly predicted future behavior. This further analysis found that attitudes, subjective norms and stage were insignificant predictors follow up FV intake. However, this model predicted only 5.7% of the variance in behavior. When previous behavior (number of daily servings of FV at recruitment) was entered, this variable explained most of the variance (RR=0.451, 95% CI: 0.353-0.575, p<0.001), and increased the predictive power of the

Table 2. Pearson correlation coefficients between psychosocial and demographic variables

		Attitude	Subjective Norm	PBC	Self Efficacy	Barriers	BMI	Age	Education	Baseline FV intake	Follow-Up FV intake
Attitude	Pearson Correlation	1	.454**	.103**	.371**	.129**	.003	-.044	.001	.150**	.073*
	N	719	711	712	710	719	695	719	717	719	719
Subj. Norm	Pearson Correlation		1	-.002	.215**	.148**	.073	-.102**	-.081*	-.024	-.037
	N		713	707	704	713	689	713	711	713	713
PBC	Pearson Correlation			1	.238**	-.133**	-.102**	-.007	.097**	.218**	.123**
	N			715	707	715	691	715	713	715	715
Self Efficacy	Pearson Correlation				1	.080*	-.048	.017	-.012	.193**	.151**
	N				713	713	690	713	711	713	713
Barriers	Pearson Correlation					1	.058	-.015	-.176**	-.078*	-.103**
	N					722	698	722	720	722	722
BMI	Pearson Correlation						1	-.054	-.062	-.069	-.033
	N						698	698	697	698	698
Age	Pearson Correlation							1	-.058	.040	.025
	N							722	720	722	722
Education	Pearson Correlation								1	.059	.077*
	N								720	720	720
Baseline FV intake	Pearson Correlation									1	.385**
	N									722	722
Follow-Up FV intake	Pearson Correlation										1
	N										722

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 3. Stages of change cross tabulation (T1 & T2)

		Stage at T2					
		Pre-contemplation	contemplation	preparation	action	maintenance	
Stage at T1	Pre-contemplation	Count	213	11	52	40	44
		%	59.2%	3.1%	14.4%	11.1%	12.2%
	Contemplation	Count	16	6	17	6	8
		%	30.2%	11.3%	32.1%	11.3%	15.1%
	Preparation	Count	65	12	100	33	45
		%	25.5%	4.7%	39.2%	12.9%	17.6%

²(8)=89.1, $p<0.001$

model to 12.6%. This model predicted 76.9% correct classification.

Similar results were seen when we changed the dependent variable from a continuous (number of servings eaten daily) to a dichotomous (met 5 a day/did not meet 5 a day) outcome variable with a logistic regression. Without accounting for previous intake (T1), two of the constructs predicted future behavior: self efficacy (RR=0.116; $p<0.01$), and barriers (RR=-0.105, $p<0.01$). This model explained only 5.5% of the variance. However, when previous daily intake was included in the analysis, this variable accounted for most of the variance in behavior (RR=0.364; $p<0.001$) and the prediction of the variance increased to 17.1%. In this analysis, attitudes, subjective norms, PCB, and stage were not significant, even without accounting for previous behavior.

Progression through stages of change

Over half (53.3%) of participants were in the precontemplation phase at recruitment. Only 8.3% were in the contemplation phase, and 38.4% claimed to be in the preparation phase. Since the sample was limited to those that did not meet the 5 a day recommendation, no one was in action or maintenance. One year later, the percentage of precontemplators decreased to 42.7. Contemplation and preparation had both decreased, to 4.3% of the sample and 26.8% of the sample, correspondingly. However, 11.5% had moved into the action phase and 14.8 into maintenance. Contemplation accounted for the smallest proportion of the population in both time points, and precontemplation accounted for the largest. These results are outlined in Table 3.

Overall, 47.8% of the sample remained in the same stage that they had been in at T1. Thirty eight percent moved forward one or more stages, and only 12.9% regressed through the stages.

Discussion

By implementing a longitudinal design and controlling for sociodemographic variables as well as FV intake at baseline, our results strongly suggest that attitudes, subjective norms, and stage of change are not significant predictors of future FV intake. Although

some evidence was found for the predictive value of barriers, self-efficacy, and PBC over one year, this evidence was confounded by previous intake. These results are consistent with other findings suggesting that increased time intervals between assessments can decrease associations between thoughts and behaviors²⁹. However, the literature on this phenomenon shows mixed results, with some studies reporting strong correlations^{11,17}.

Our finding that stage does not predict future behavior is revealing in that it may suggest that stage of change is not an appropriate substitute for intention in the TPB. Since intention was not measured as a distinct variable in this study, further research examining the comparative predictability of both of these variables is recommended.

Our study also found that people moved through the stages of change over the time period. Though the study could not define whether SOC occurs in a series for example, from pre-contemplation to contemplation and contemplation to preparation and so on, it was identified that overall, most people remained in the same stage over a one year period. About a third moved forward one or more stages, and only 13% regressed one or more stages. This is consistent with findings by Prochaska¹⁹, in which people either remain in the same stage for longer periods of time than indicated (hence the term “chronic contemplation”), or slip backward from the action phase after a short time. Our findings may actually indicate a more aggressive progression through the stages than other studies, due to simultaneous social marketing campaigns at the population level.

Limitations

The high attrition rate seen in this study was due to the difficulty in tracking individuals whom had moved or changed phone numbers over the course of the study. However, no significant differences were seen between those who completed the study and those who did not in terms of baseline self efficacy, perceived behavioral control, or FV consumption. Significant differences were seen with regard to age, education, and attitudes, but, as shown in table 1, these differences are miniscule

and unlikely to have any great confounding effect on study results.

Subjective norms are typically measured by a single item in the literature¹¹. However, in a meta-analysis of TPB studies, Armitage and Conner⁷ assert that this is a limiting factor and potentially the reason why subjective norms seem to be the weakest predictor of intention, and therefore behavior^{16,30,31}. Although this could, in theory, threaten the study's internal validity, it is doubtful since none of the other variables were found significant either.

This study examined the stages of change over a one year time period. Since SOC is usually defined in six-month increments^{19,22,32}, we were unable to track whether or not the stages were followed explicitly as defined by Prochaska¹⁹. In addition, simultaneous interventions regarding fruit and vegetable intake could have potentially contributed to this progression through stages. Future studies will directly assess the impact that these large scale interventions may have had in relation to the stages of change as well as the other psychosocial variables analyzed in this study.

Conclusion

The results of this longitudinal study suggest that, although people do tend to progress chronologically through the stages of change, the psychological variables of the TPB, self-efficacy and SOC may not be sufficient predictors of future behavior change among populations already at-risk. Previous behavior was the only true predictor over time, and this is a variable that cannot be targeted through interventions.

Since empirical studies regarding this phenomenon are rare and show mixed results^{10,17}, further exploration is recommended. Future research should focus on the development of an appropriate survey tool based upon the Theory of Planned Behavior while incorporating stage of change and intention as distinguishable variables.

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Evidence-based Youth Drug Prevention: A Critique with Implications for Practice-Based Contextually Relevant Prevention in Hawai'i

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Abstract

Objective. Publicly funded health and human services increasingly require the use of nationally-endorsed programs, therefore we review these youth drug prevention programs through the lens of Hawaii-based practitioners. This review indicated a chasm in contextually relevant programs and practices created for or by Native Hawaiian, Asian-American, and other Pacific Peoples. This problem is outlined and then we describe a rationale for using participatory research to develop practice-based evidence in drug prevention that is contextually relevant to youth, their families and communities, and youth-serving organizations in Hawai'i. Practice-based evidence refers to locally designed, implemented, and evaluated practice; thus providing evidence about what is working (and how) for a specific context. Contextual relevance refers both to ethnocultural significance, and place-based neighborhood and community dynamics.

Methods: We conducted a detailed examination of Substance Abuse and Mental Health Administration's national registers of evidence-based youth drug prevention. We sampled programs designated as appropriate for Asian-American, Native Hawaiian, or Pacific Islanders, and analyzed for contextual relevance.

Results: Results indicated that nationally-endorsed youth drug prevention programs are not contextually relevant to Hawai'i. As of December 2007, we had identified six programs listed as relevant for Asian Americans, Native Hawaiians, and Pacific Islander youth on the national evidence-based practices directory. In spite of this, five of these programs' evaluations did not include sample populations that reflect the majority ethnocultural groups in Hawai'i. Only one program was implemented and evaluated in Hawai'i, thus reflecting Hawai'i's diverse population, albeit a cultural adaptation

Conclusion: Participatory research can mitigate this gap through practice-based evidence. We view this as an opportunity for Hawai'i and the Pacific to chart the course for participatory prevention science, in other words, a prevention paradigm that is practice-based and contextually relevant. Several organizations have embarked on this journey, and are briefly described.

Introduction

Purpose. Publicly funded health and human services increasingly require the use of nationally-endorsed programs, therefore we sought to review these programs through the lens of Hawai'i-based practitioners and organizations. Our review of nationally-endorsed substance abuse programs unequivocally demonstrated that youth programming in the United States is devoid of culturally grounded programs and practices created for or by Native Hawaiian, Asian-American, and other Pacific Peoples. Therefore, this paper outlines the pressing need for practice-based evidence in substance abuse prevention that is contextually relevant to youth, their families, communities, and youth-serving organizations in Hawai'i. To begin this endeavor, relevant background, concepts, and issues germane to youth drug prevention are described.

Background. First, this project was initiated through an evaluation contract commissioned by the State of Hawai'i Department of Health, Alcohol and Drug Abuse Division. An objective was to identify evidence-based practices for a school complex area service delivery model of youth drug prevention services in Hawai'i. These services may be delivered in a school or community setting. The main finding was the lack of nationally recognized evidence-based youth prevention programs and practices that were validated with samples reflective of the youth population and communities in ethnoculturally diverse Hawai'i. This is important because, as already noted, federal and state funding streams for youth prevention efforts increasingly are inclined to support organizations that select nationally recognized evidence-based programs. This creates a quandary for youth and youth-serving organizations in Hawai'i. On the other hand, important contributions to public health are underway in the field of youth substance abuse prevention in Hawai'i that are ethnoculturally relevant and based in local community dynamics.

Defining Practice-Based Evidence and Contextual Relevance. Practice-based evidence refers to locally designed, implemented, and evaluated practice; thus providing evidence about what is working (and how) for a specific context. In contrast, evidence-based practice refers to externally initiated prevention that is adopted or adapted by a community other than

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the one in which it was designed. The former is founded on active local participation and *kuleana*, while the latter is not. The former embraces contextual relevance, where as the latter embraces generalizability and generic applicability. For the purpose of this paper, contextual relevance in Hawai'i refers to and simultaneously includes two concepts:

Ethnocultural significance as defined by Native Hawaiians, Pacific Peoples, Asian-Americans, and others in Hawai'i; and

Place-based neighborhood and community dynamics.

Standards of Quality in Prevention. There are a variety of standards by which to measure the quality of prevention. For example, the Society for Prevention Research (SPR) recently outlined "standards of evidence" to include interventions that are "efficacious", "effective", or ready for "dissemination".¹ Although a number of nationally disseminated guidelines had existed already, the authors noted an insufficient overlap between them; and therefore, a new system of standards was developed and endorsed by SPR.

- The three-tiered system of standards begins with interventions that meet criteria for "efficacy"; meaning that two or more trials have 1) defined samples and population; 2) valid psychometric properties and methods; 3) statistically rigorous analyses; 4) positive effects, and 5) at least one long term impact. Efficacious prevention refers to rigorously tested programs in "optimal" (i.e. scientifically controlled) conditions.
- The second tier, or "effective" prevention, means that positive outcomes have been demonstrated in both controlled and real world conditions, such as would be expected in youth-serving organizations and schools across Hawai'i. While the intent of such standards may be to help prevention practitioners make decisions about expending prevention resources on programs that work, adapting such programs for use in Hawai'i schools and communities may prove to be contextually irrelevant.
- On the third tier are programs that meet the standard for "dissemination". These programs have been tested in optimal scientific conditions, in real world applications, and have created program materials that other organizations can implement with sufficient fidelity.

While these standards may ensure that valid scientific practices have occurred, these scientific practices do not ensure contextual relevance. Instead, other scientific practices are required in order to ensure

contextual relevance. Therefore, an alternative standard by which to measure the quality of prevention in Hawai'i must address the extent to which a program or practice is rooted in the community context. Achieving this standard means using participatory research practices that are based in real world practice, and in real world experiences of youth, families, and communities. Hawai'i youth would be served better by programs that have been endorsed through such practice-based, contextually relevant evidence.

Summary. To emphasize the imminent need for practice-based contextually relevant prevention and the associated importance of participatory research, a review and critique of nationally recognized evidence-based practices is presented. The methods describe the criteria by which evidence-based practices for this review were selected. Results are organized around the six nationally recognized evidence-based practices selected from those listed on the U.S. Substance Abuse and Mental Health Administration's (SAMHSA) directory. These six were listed on SAMHSA's website as applicable for Asian-Americans, Native Hawaiians, or Pacific Islanders. We discuss the paradox that while nationally endorsed contextually relevant prevention practices are lacking for Hawai'i, the prevailing prevention science paradigm likely will not mitigate this dilemma. We view this as an opportunity for Hawai'i to chart the course for participatory prevention science, in other words, a prevention paradigm that is practice-based and contextually relevant.

Methods

Sample and Procedures. The two national websites listing evidence-based practices in youth substance use prevention were reviewed for content added through December 2007, both of which are administered through SAMHSA:

1. Center for Substance Abuse Prevention (CSAP), Model Programs
2. National Registry of Evidence Based Practices and Programs (NREPP).

Search 1: CSAP. An online search of CSAP's webpage was conducted. CSAP's "implementation" page listed "effective prevention programs for various groups and settings", and provided a link to "Model Programs: Information on science-based model prevention programs that have been rigorously evaluated".² However, according to the webpage, CSAP's model programs initiative was deactivated³ when SAMHSA replaced it with a system with a stronger focus on specific outcomes. NREPP has replaced CSAP's directory.

¹ Programs that did not have a broad substance abuse prevention goal were excluded; for example steroids only, tobacco only, or suicide.

² It is still possible to view Model Program information on this webpage, and these programs will be re-reviewed as a potential NREPP "evidence-based" program. Promising and effective programs will be listed as legacy programs on the NREPP webpage for historical purposes.⁴

Search 2: NREPP. Due to the deactivation of CSAP’s Model Program directory, the search for evidence-based substance abuse prevention programs focused on the NREPP directory.³ According to the website, NREPP functions as a source of readily available, scientifically-tested prevention programs. In addition to demonstrating significant positive impacts on youth drug prevention, programs considered for review by NREPP must have met two other minimum criteria: a) peer reviewed findings (or comprehensive evaluation); and b) public access to information for proper implementation (dissemination materials). Programs accepted for review by NREPP have been independently assessed using six indicators of quality research, which align closely with SPR’s standards described previously.

The NREPP database organizes interventions based on seven key programmatic elements.⁵ Of interest to this paper are “topics” which include substance abuse prevention, and “populations”, which are organized by “age”, and “ethnicity/race”ⁱⁱⁱ. Therefore, the NREPP directory of substance abuse prevention was searched specifically for these population elements:

School-Age Youth: ages “6-12 Childhood” and “13-17 Adolescent”;

Majority Ethnocultural Groups in Hawai’i^{iv}: “Asian-American” and “Native Hawaiian or other Pacific Islander”.

Based on these elements, six NREPP-listed programs were selected for review and critique. It should be noted that more than six programs fit our age and ethnocultural criteria, however some programs were excluded because they were drug-specific, for example steroid use or cigarettes only. We also excluded programs in which substance abuse prevention was not the primary purpose, for example suicide prevention. As stated previously, this review only includes programs that were added to NREPP through December 2007.

Results

Evidence-Based Prevention. Table 1 lists in alphabetical order the six prevention programs organized by: 1) the evidence used to demonstrate significant positive impacts, and 2) the age group to which the program may be applied. Columns are split into age ranges (6-12 and 13-17) as organized by NREPP. However, specific program related data in each cell reflects either the age range, grade in school, or school level as reported in the supporting literature. Therefore, there may not be an exact match between

program elements reported in the literature and those reported by NREPP. These age group columns are further split to indicate the target outcome measure; either direct changes in substance use (alcohol, tobacco, other drugs; ATOD), or indirect changes in the related risk and protective factors (RPF). Table 1 indicates the following:

1. **All Stars** provided evidence for positive impact on substance use onset, specifically alcohol, marijuana, cigarettes, and inhalant use. There are several age groups targeted, though primarily middle school aged youth. Although the program was designed and evaluated for 6th and 7th grades, there are curricula for 4th through 12th grades.
2. **Lions Quest Skills for Adolescents** provided evidence of positive effects on ATOD use from 6th to 8th grade. The evidence corresponds with the grades to which its curriculum is applied.
3. **Positive Action** showed evidence of positive effects on RPFs from 1st-4th grade, and ATOD use from 5th-12th grade; though its curriculum has been designed for grades K-12.
4. **Project ALERT** indicated evidence of positive effects on ATOD use from 7th to 9th grade; and its curriculum may be applied to middle through 9th grade students.
5. **Project Toward No Drug Abuse** specified evidence showing positive effects on ATOD use in both alternative and general high schools, mirroring the age range to which its curriculum is applied.
6. **Second Step** had evidence for positive effects on RPFs from 2nd to 6th grade; and its curriculum was designed for elementary and extended through middle school.

Asian-American, Native Hawaiian, and other Pacific Islander Youth Underrepresented. A main objective of this study was to assess the extent to which nationally endorsed evidence-based practices might be useful in a school complex service delivery model in Hawai’i. Therefore, we reviewed the evidence listed on the NREPP website for each of the six programs identified as relevant to Asian-American, Native Hawaiian, or Pacific Islander youth. We analyzed the extent to which these nationally endorsed evidence-based practices are contextually relevant to Hawai’i. This includes whether the program had been 1) evaluated with samples reflective of the youth population in Hawai’i (ethnoculturally relevant); and 2) originated and developed in Hawai’i (place-based). In some cases, studies listed on NREPP were not publicly

ⁱⁱⁱ As outlined in the introduction, the current prevention paradigm uses the 3-tier system for standards in prevention. Beginning on the first tier with efficacious programs, high quality programs are founded on the idea that the sample and population have been properly defined

^{iv} An important point regarding Filipino-Americans: While the 2000 US Census classifies Filipinos as Asians and not as Pacific Islanders^{6,7}, this distinction is not clear among Filipinos and Filipino scholars.^{8,9}

Table 1. Selected NREPP Prevention Programs

Evidence and Application	6-12 (childhood)		13-17 (adolescent)	
	RPF	ATOD	RPF	ATOD
All Stars				
Evidence				Studies of 6 th and 7 th grade
Application				Curriculum from 4 th -12 th grade
Lions-Quest “Skills for Adolescence”				
Evidence	Studies of 6 th -8 th grade		Studies of 6 th -8 th grade	
Application	Curriculum from 6 th -8 th grade		Curriculum from 6 th -8 th grade	
Positive Action				
Evidence	Studies of 1 st -4 th grade	Studies of 5 th -6 th grade	Studies of 7 th -12 th grade	
Application	Curriculum from K-12 th grade	Curriculum from K-12 th grade	Curriculum from K-12 th grade	
Project ALERT				
Evidence				Studies of 7 th -9 th grade
Application				Curriculum from middle school-9 th grade
Project Towards No Drug Abuse				
Evidence				Studies of ages 14-19
Application				Curriculum for high school
Second Step				
Evidence	Studies of 2 nd -6 th grade		None provided by NREPP	
Application	Curriculum from elementary-middle school		Curriculum from elementary-middle school	

available. In other cases, the literature did not provide details regarding ethnocultural demographic information of analytic samples. Therefore, we conducted additional literature searches by visiting program websites and conducting standard academic literature searches. We also contacted some authors for additional information.

A summary of these findings is presented in order of most contextually relevant to Hawai'i, to least contextually relevant in Hawai'i (Refer to Table 2). None of the six programs were developed in Hawai'i, so none of the programs can be considered place-based.

Positive Action. Of the six selected programs, Positive Action was the only program implemented in Hawai'i (in addition to other parts of the US). The Flay and colleague studies, presented in Table 2, used the school as the unit of analysis as opposed to individual students. Therefore, the ethnic breakdown for this program is reported differently than the other five programs reviewed here. The percent of participation per ethnic group represents the average number of students of that ethnic group attending the participating school. Studies in which Asian-American, Native Hawaiian, and Pacific Islanders participated were: Flay 2006¹⁰ (62%), and Flay 2001¹¹ (with 38% Japanese or Chinese, and 17% NH youth participation). Asian-American, Native Hawaiian, and Pacific Islanders did not participate in the Flay 2003¹² evaluation.

Second Step. Of the five articles listed for Second Step, none included Native Hawaiian youth, while two

included Asian-American and Pacific Island youth. Frey 2005¹³ reported 18% Asian-American youth participation, and Grossman 1997¹⁴ reported a combination of 11% Asian-American and Pacific Island youth participation. Three studies were provided on NREPP, while the other two studies, Cooke 2007¹⁵ and Edwards 2005¹⁶, were found through our literature search.

Lions Quest Skills for Adolescents. Evidence listed on NREPP indicated that neither Native Hawaiians nor Pacific Islanders participated in Skills for Adolescents evaluation studies. Two out of the three studies listed by NREPP were publicly available: Eisen 2003¹⁷ and 2002¹⁸. Both reported findings from the same data set, which included 7% Asian-American youth participation (n=526 out of a total sample of 7426).

Project Towards No Drug Abuse. Three articles reported Asian-American youth participation at very low rates: Sussman 2003¹⁹, 7%; Simon 2002²⁰, 4%; and Sussman 1998²¹, 4%. None of the studies listed on NREPP concerning Towards Not Drugs included Native Hawaiian or Pacific Islander youth.

All Stars. Five articles were reviewed, representing four different data sets beginning with the pilot study through ongoing replications and evaluations. None of these studies included Native Hawaiians or Pacific Islanders in their samples. Two of the five studies included Asian-Americans, but at very low participation rates. Hansen 1996²² reported 10%

Table 2. Ethnic breakdown of selected programs

Evidence	Asian-American	Native Hawaiian	Pacific Islander
Postive Action			
Flay et al. 2006 ¹⁰	11% + 16% Filipinos	35%	5% + 16% Filipinos
Flay et al. 2003 ¹²	N/A	N/A	N/A
Flay et al. 2001 ¹¹	38% (Japanese/Chinese)	17%	N/A
Second Step			
Cooke et al. 2007 ¹⁵	N/A	N/A	N/A
Edwards et al. 2005 ¹⁶	N/A	N/A	N/A
Frey et al. 2005 ¹³	18%	N/A	N/A
Taub 2001 ⁵²	Not reported	Not reported	Not reported
Grossman et al. 1997 ¹⁴	11% (combined)	N/A	11% (combined)
Lions-Quest “Skills for Adolescence”			
Eisen et al. 2003 ¹⁷	7% (n=526)	N/A	N/A
Eisen et al. 2002 ¹⁸	7% (n=526)	N/A	N/A
Laird 1992	Not publicly available	Not publicly avail.	Not publicly avail.
Project Towards No Drug Abuse			
Sun et al. 2006 ⁵³	N/A	N/A	N/A
Sussman et al. 2003 ¹⁹	7%	N/A	N/A
Simon et al. 2002 ²⁰	4%	N/A	N/A
Dent et al. 2001 ⁵⁴	N/A	N/A	N/A
Sussman et al. 1998 ²¹	4%	N/A	N/A
All Stars			
Slater et al. 2006 ⁵⁵	3.4% other (n=4216)	N/A	N/A
Hansen et al. 2004 ²³	2% (n=632)	N/A	N/A
McNeal et al. 2004 ⁵⁶	7.7% other (n=1822)	N/A	N/A
Harrington et al. 2001 ⁵⁷	N/A	N/A	N/A
Hansen 1996 ²²	10% girls; 5.5% boys (n=102)	N/A	N/A
Project Alert			
Ellickson et al. 2003 ²⁷	Not reported	Not reported	Not reported
Ellickson, Bell, Harrison 1993 ⁵⁸	Not reported	Not reported	Not reported
Ellickson, Bell, McGuigan 1993 ⁵⁹	Not reported	Not reported	Not reported
Ellickson et al. 1990 ⁶⁰	Not reported	Not reported	Not reported
Ellickson et al. 1988	Not publicly available	Not publicly avail.	Not publicly avail

Legend

Japanese/Chinese: Evaluator did not have an Asian category

N/A: Not Applicable. Ethnicity was not part of the sample size

Not publicly available: Study provided by NREPP, but unable to find because it’s either an internal document or an unpublished manuscript, therefore it’s not listed in reference section.

Not reported: Ethnic breakdown of sample size was not provided.

Asian-American girls and 5.5% Asian-American boys, but the total sample size for this pilot study was just over 100 youth. In a second pilot study, Hansen and Dusenbury 2004²³ reported 2% Asian-American participation in a study with 632 youth in the sample.

Project ALERT. Surprisingly, none of the studies listed on NREPP concerning ALERT included Asian-American, Native Hawaiian, or Pacific Islander youth. Therefore, further literature searches were conducted beyond NREPP, but still insufficient evidence was found for this designation. Longshore 2007²⁴ and St. Pierre 2005²⁵ were not listed on NREPP but were publicly accessible. Only St. Pierre 2005²⁵ reported

Asian-American involvement, accounting for 1% of the sample. Ellickson (1988) was not a publicly available study. Longshore 2007²⁴, Ghosh-Dastidar 2004²⁶, and Ellickson 2003²⁷ reported findings from the same data set.

Contextual Relevance Continuum. Based on these findings, we developed a contextual relevance continuum, ranging from no contextual relevance on the left-hand side, to Hawai’i-oriented contextual relevance on the right hand side (Figure 1). A score of zero reflects programs that are neither place-based nor applicable to ethnocultural groups beyond Euro-American or White populations. A score of one

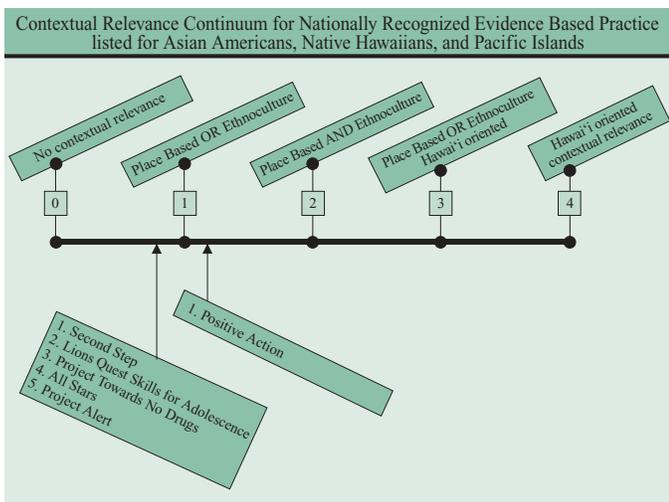


Figure 1. Contextual Relevance Continuum: National Programs

represents programs that are either place-based or were designed for populations including one or more minority groups. A score of 2 represents programs that are both place-based and ethnoculturally relevant, but not with respect to Hawai'i. A score of 3 represents programs that are either Hawai'i place-based or ethnoculturally relevant to Hawai'i. A maximum score of 4 represents programs that are both place-based and ethnoculturally relevant for Hawai'i.

We have placed each of the six programs on this continuum based on our analysis. Our findings indicate that most lacked ethnocultural relevance to Hawai'i, but the samples studied suggest that these programs may be relevant for other ethnocultural groups, and therefore are ranked below a score of 1. Only Positive Action has potential relevance for Hawai'i, and therefore is placed just above a score of 1.

Conclusion

Our review of the literature indicated that nationally-endorsed youth drug prevention programs are not contextually relevant to Hawai'i. As of December 2007, we had identified six programs listed as relevant for Asian-Americans, Native Hawaiians, and Pacific Islander youth on the national evidence-based practices directory. In spite of this, five of these programs' evaluations did not include sample populations that reflect the majority ethnocultural groups in Hawai'i: Second Step, Skills for Adolescents, Towards No Drug Abuse, All Stars, ALERT. Positive Action was an exception in that effectiveness trials had been conducted in Hawai'i, and thus the study samples were reflective of the majority ethnocultural groups in Hawai'i. However, Positive Action has been designed as a cultural adaptation, and is not place-based or ethnocultural-based in Hawai'i.

Implications

Our critique of nationally endorsed evidence-based youth substance abuse programs has identified a lack of cultural and place-based relevance for the youth population in Hawai'i. This was not surprising, considering that preliminary findings from a large scale, systematic content analysis of peer reviewed research on the topic of substance abuse among Asian-Americans and Pacific Islanders since 1970 resulted in only 43 empirical studies.²⁸ Although this study was limited (empirical research on alcohol only was not included and literature search terms may have eliminated empirical work using identifiers such as Native Hawaiian rather than Pacific Islander) findings indicated that in a timeframe spanning over three decades, Asians and Pacific Islanders had been grossly under-researched in the topic of substance abuse. Clearly, this lack of contextually relevant research impedes innovative and effective public health practices in Hawai'i.

As stated in the introduction, a paradox exists in that nationally endorsed contextually relevant prevention practices are lacking for Hawai'i, yet the prevailing prevention science paradigm likely will not mitigate this problem, and may inadvertently contribute to it. While prevention science has made great strides in improving the criteria by which programs and practices are deemed effective¹, the current scientific progress has left many Hawai'i communities behind. Hawai'i communities take pride in their cultural strengths, yet such cultural strengths are not at the core of nationally recognized prevention programs. As a result, Hawai'i communities may need to compromise their commitment to cultural integrity by adopting or adapting other practices, or to opt out of prevention funding that requires implementation of nationally recognized programs.²⁹ Though culturally adapted programs have been shown to be effective with some populations and places, including among Native Hawaiians, Asian-Americans, and Pacific Islanders, these programs have not been sustainable, in large part, because they were derived from external, western epistemologies.

We view this as an opportunity to chart the course for improved public health and prevention science through participatory research. We have highlighted current and possible courses of action that would result in Hawai'i-oriented contextually-relevant substance abuse prevention, e.g. a score of 4 on the continuum.

Participatory research includes a variety of styles that can be located on a continuum from relatively low community participation, with a high degree of distinction between community participants and professional researchers; to fully engaged participation where the community-professional distinction is more equitable.³⁰⁻³² Community-based participatory research

efforts often represent a collaboration between health professionals and community members to redress health disparities.³³⁻³⁷ There also are more community-driven, grassroots efforts referred to as participatory action research, that grew out of social movements in response to historical injustices perpetuated through colonization and other forms of oppression and discrimination.³⁸⁻⁴¹ (For examples of participatory action research with youth in Hawai'i, refer to the work of Helm.^{42,43})

With these basic concepts in mind, we offer a few possible courses of action for improved public health. Our intent is to demonstrate the ways in which participatory research can advance a prevention paradigm that is practice-based and contextually relevant for Hawai'i.

Pono Curriculum, an Exemplar of Practice-Based Evidence in Hawai'i. To get a glimpse of the promise and potential of the practice-based evidence approach, we can look at existing programs that exemplify the concept of participatory action research. Developed by Mr. Wayne Lee and a group of community stakeholders on Molokai, the *Pono Curriculum* is a culture-specific, school-based interactive prevention program that utilizes 21 Native Hawaiian values.⁴⁴ Central to the implementation and success of the program, emphasis is placed on practicing and living the 21 cultural and spiritual principles to increase cultural identity, improve self esteem, improve family and social communication skills, and recognize the dangers of substance abuse. A program outcomes evaluation study published in 2007 found that the *Pono Curriculum* as implemented in selected Hawai'i public schools demonstrated significant positive effects on student school commitment, self esteem, and perception of harmful drugs, along with decreases in drug use.⁴⁴ In addition, this curriculum has facilitated the basis for a culturally grounded residential substance abuse intervention targeting drug-involved youth. The program was developed, in part, through the use of participatory evaluation in a formal community-university partnership spearheaded by Mr. Lee and rural health practitioners.⁴⁵ The *Pono Curriculum* therefore provides a model for locally-initiated and culture-based program initiatives that point toward a contextually relevant prevention paradigm. Though there may be others, based on our extensive review of the literature, this appears to be the first contextually relevant program in Hawai'i that is undergoing rigorous outcomes evaluation. This program scores a 4 on the contextual relevance continuum.

Community-University Research and Action. Another Hawai'i exemplar is the *Promoting Social Competence and Resilience among Native Hawaiian Youth* project.^{46,47} A Big Island community with a well developed strategic plan for combating the drug problem in their area was at a loss for culturally

relevant programs. As a result, they contacted the principal investigator of the *Promoting Social Competence and Resilience among Native Hawaiian Youth* project and invited the research team to work with their community to develop their own program. The goal of this community-university project is to shed light on drug offer scenarios faced by rural Native Hawaiian middle school youth, and then to work with community leaders to identify contextually relevant ways to negotiate these scenarios in a drug-free manner. This program scores a 3.25 on the contextual relevance continuum, although it is place-oriented and culturally relevant, it is a replication study and still relies heavily on conventional research practices.

Participatory Organizational Development. This is another way to integrate the most critical and dynamic programmatic elements that engender success in our local context. It is designed to mitigate the problem of using standardized evidence-based outcomes derived from externally driven (e.g. not local, not place-based) processes. Like empowerment evaluation⁴⁸ and utilization-focused evaluation⁴⁹, the purpose of participatory organizational development is to improve one's own policies and practices. A subtle difference in participatory organizational development is that the standards by which progress is assessed are internally rather than externally defined. The process of defining those standards is participatory among the formal members of the group and the group's beneficiaries. In the case of youth substance abuse prevention, direct service personnel along with the youth members and their families would define those policies, practices, and outcomes.

One such participatory organizational development project has been proposed to prevent underage drinking in Hawai'i, and is actively pursuing funding from federal sources. The *Hulali Kou'ao*²⁹ project proposes to advance underage drinking prevention

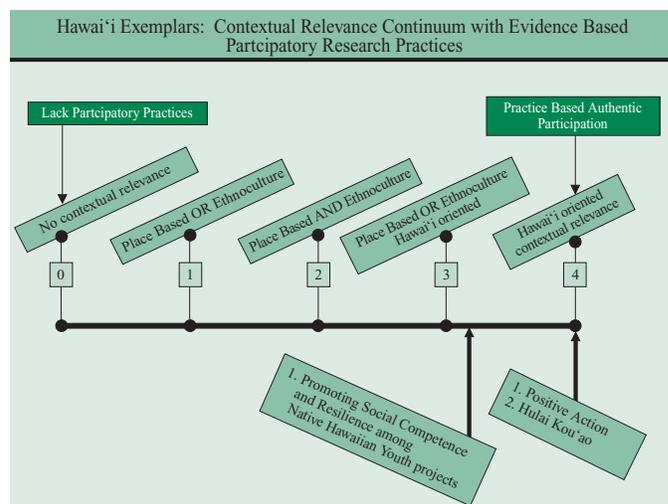


Figure 2. Contextual Relevance Continuum: Charting a Course with Participatory Practice Based Evidence

science by exploring the ways in which their own community-based organizations have designed, implemented, and evaluated underage drinking prevention programs, with culture at the core. Though their project will be place-based, the *Hulali Kou'ao* project expects that their participatory research approach to capacity building and cultural identification may be useful for other Native Hawaiian, indigenous, or culture-specific communities and organizations. In the long-term, their goal is to establish nationally recognized practice-based evidence with cultural practices and cultural epistemology as central. By listing their own program on a database such as NREPP, this community would be able to implement their own program using state or federal funds and under state and federal quality guidelines. This program scores a 4 on the contextual relevance continuum.

Figure 2 shows the contextual relevance continuum with these three Hawai'i programs. Each are culturally relevant to Hawai'i. Each is place-based, though the Pono Curriculum and *Hulali Kou'ao* are more so. The defining characteristic with the latter two initiatives is that they are practice-based as opposed to derived from evidence-based practices. All three programs have been developed with participatory principles, though the latter two are much more so.

In conclusion, this lack of contextually relevant research not only impedes innovative and effective public health practices in Hawai'i, but also nationally. For example, the federal Office of Minority Health has been coordinating the National Partnership for Action to end health disparities for minority populations.⁵⁰ Through their regional conversations among representative health practitioners (from community, government, and academia), priority actions have been identified to eliminate ethnocultural health disparities. During the 2008 western region meeting a participatory research priority was identified: to create and implement a local community-driven process of research. More specifically, this priority focused on (1) increasing federal funding for (2) ethical partnerships in which (3) community-identified issues would drive the research agenda, (4) support authentic participation of community researchers such that (5) an action-oriented intervention would result in (6) clear and direct community benefits.⁵¹ While such a national agenda has yet to be put in motion, the Hawai'i-based examples cited above can serve as a guide.

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Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA)

Investigation on a United States Navy Ship

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Abstract

Objective: Investigate colonization and risk factors associated with an outbreak of community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) skin and soft tissue infections (SSTI) on a United States Navy surface ship.

Methods: Descriptive survey of outbreak population characteristics and culture-based surveillance of the ship population for colonization with *Staphylococcus aureus*.

Results: Eighty-five percent (266/313; 85%) of the crew were included in the study, although all 296 available members consented to surveillance questionnaire and cultures (296/313; 94.6%). Seventy-three (73/266; 27.4%) were colonized with *S. aureus*, 18 of which were MRSA (18/73; 24% and 18/266; 6.8%). Pulsed-field gel electrophoresis (PFGE) revealed all strains were pulsed-field type (PFT) USA 300. Key factors within the past 12 months included antibiotic use (OR=2.88, p=0.036), medical care (OR=3.32, p=0.011), or history of skin problems (OR=2.73, p=0.032).

Conclusions: Surveillance indicated a surprising rate of CA-MRSA carriage among sailors assigned to this ship, which was likely associated with the SSTI infections among crew members while previously at sea. Important risk factors in this confined population included recent access to outpatient healthcare services. The PFGE types were USA 300, which is commonly community-associated, and not a healthcare-associated strain by definition.

Implications: In addition to its established public health importance in SSTI within civilian communities, this report demonstrates the increasing role of CA-MRSA as an emerging pathogen among military populations. Hawaii's large military population and strategic location underscores the potential impact of drug-resistant staphylococcus infections on military readiness in the Pacific.

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) represents an emerging pathogen of increasing military¹ and civilian importance.^{2,3,4} Among the general U.S. population, the percentage of individuals who carry *Staphylococcus aureus* which are resistant to beta lactamase-resistant penicillins such as methicillin and oxacillin has been reported as 0.2 to 7.3%^{5,6,7,8} and has been increasing nationally⁹. Community-associated MRSA (CA-MRSA) strains typically differ from hospital-associated (HA-MRSA) strains in several characteristics, including limited antimicrobial resistance (beta-lactam and macrolide antimicrobics) and possession of *mec* staphylococcal cassette chromosome (*SSCmec*) and Panton-Valentine leucocidin (PVL) genes.^{10,11,12} Direct person-to-person contact is most commonly implicated in spread of staphylococcal infections, especially when the skin barrier is compromised, living conditions are crowded, and/or suboptimal hygiene; although environmental objects such as shared clothing, towels and gym equipment may also play an important role.^{13,14} Asymptomatic colonization of nares with MRSA, as opposed to methicillin-susceptible *Staphylococcus aureus* (MSSA), is an important risk factor in healthcare settings;^{15,16,17} however, the association is less clear in communities.¹⁸

Outbreaks of CA-MRSA have been recorded in military recruits, special warfare trainees, and active duty Army and Marine Corps personnel.^{1,18,19} This report documents the investigation of risk factors associated with an outbreak of CA-MRSA skin and wound infections among personnel assigned to a single Navy ship during a routine deployment to the western Pacific during subsequent home-port at Pearl Harbor, Hawai'i. Although the prevalence of CA-MRSA has been increasing in Hawai'i,^{20,21,22} an 11% prevalence of SSTI among these sailors far exceeded that which would be expected during a routine deployment (approximately 2%, D. Buxton, Fleet Surgeon, Naval Forces Mid-Pacific, personal communication). Unfortunately, no microbiology laboratory services were available to assess the etiology of wound infections for any of the cases while at sea. Each case was empirically treated with antimicrobics, with most cases requiring two or

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three courses to obtain resolution. Upon return of the ship to homeport, an investigation was conducted to assess risk factors for SSTI and CA-MRSA carriage, the prevalence of CA-MRSA among shipboard personnel, and analysis of CA-MRSA isolates from colonized personnel.

Methods

Study Population

The crew was assigned to an *Arleigh Burke*-class destroyer based out of Pearl Harbor, Hawai'i that had returned from a routine six-month deployment to the western Pacific region (WESTPAC) in December 2004. The crew consisted of 313 officers and enlisted sailors, both men and women. At the time of the investigation the ship was participating in routine operations. It was not dry-docked or in the shipyards undergoing maintenance work.

Surveillance Studies

Participation was voluntary, and each crewmember was informed of the purpose of the investigation and desired information outcomes. Those willing to participate signed an informed consent form prior to enrollment.

This investigation consisted of two parts. The first was a questionnaire of basic demographic and on-board personal hygiene habits. The second part consisted of surveillance cultures collected from both nares and the left axilla of each crew member to assess colonization rates. Specimen collection was performed during a two day "underway period", when the ship was conducting local operations in the vicinity of O'ahu. Swab specimens were cultured specifically for *S. aureus*, and susceptibility testing was performed on isolates.

Laboratory Characterization of CA-MRSA Strains

Swabs from axilla and nares were plated to 5% sheep blood agar plates (REMEL Inc, Lenexa, KS or Hardy Diagnostics, Santa Maria, CA) and incubated for 48 hours in 5-7% CO₂. Identification (Vitek system, bioMerieux Inc., Hazelwood, MO) and broth dilution susceptibility testing to ampicillin/sulbactam, cefazolin, clindamycin, erythromycin, oxacillin, penicillin, trimethoprim-sulfamethoxazole, and vancomycin was

conducted on the according to standard methods²³. Oxacillin resistance was confirmed using MRSA Screen Agar (REMEL Inc). If broth dilution indicated erythromycin resistance and clindamycin susceptibility, isolates were evaluated for inducible macrolide-lincosamide-streptogramin B resistance (iMLS) by "D-zone" test.²⁴

PFGE of CA-MRSA isolates

Seventeen CA-MRSA isolates were analyzed. Preparation and data analysis were as described by McDougal, *et. al.*,²⁵ with minor modifications. PFGE typing of MSSA was not conducted. PFGE gels were photographed (Gel Doc 1000, BioRad, Hercules, CA) and saved as a TIFF file for analysis (BioNumerics v3.5, Applied Maths, Austin, TX). Reference standard *S. aureus* NCTC #8325 in lanes one, five, ten, and fifteen were used to normalize each gel, and percent similarities were calculated using the Dice coefficient with an optimization of 0.50% and band tolerances of 1.5%. The resulting matrix was used to generate a dendrogram using the unweighted paired group method using arithmetic mean (UPGMA).

Population Statistical Analyses

Descriptive population characteristics were analyzed to assess the significance of the associations between CA-MRSA carriage, demographic, and hygiene variables. Chi-square and Fisher's exact tests were used to determine significance between proportions at p<0.05, and logistic regression was conducted, with variables considered for inclusion if initial significance was p<0.05 from univariate analysis. STATA software (version 8.0, 2003) was used for analyses.

Results

All 296 of crew members present at the time of the screening consented to participate, which was 94.6% of the total population (296/313). Of the crew who participated, swabs from 266/296 (89.9%) were included in the study; the others were discarded administratively because those crew members had been assigned to the ship less than 2 weeks prior to screening, which was subsequent to the deployment outbreak. Overall, 266/313 (85.0%) crew members

Table 1. Antimicrobial susceptibility patterns of *Staphylococcus aureus* isolates.

Antimicrobial	Susceptibility, n (%)					
	Ampicillin/ Sulbactam	Cefazolin	Clindamycin	Erythromycin	Penicillin	Trimethoprim/ Sulfamethoxazole
MSSA	55 (100%)	55(100%)	50 (91%)	32 (58%)	18 (33%)	55 (100%)
CA-MRSA	0 (0%)	0 (0%)	18 (100%)	14 (78%)	0 (0%)	18 (100%)

73 isolates had complete susceptibility testing

MSSA: Methicillin-susceptible *Staphylococcus aureus*

CA-MRSA: Community-associated methicillin-resistant *Staphylococcus aureus*

were included. *Staphylococcus aureus* was isolated from seventy-three crew members (27.1%), which is consistent with national prevalence data for that time period.⁹ Eighteen of those isolates were MRSA (18/73, 24.7%) with an overall prevalence of 6.8% (18/266), which is about 4 times the expected colonization rate.⁹

Table 1 shows the *S. aureus* and MRSA susceptibility patterns for the antimicrobics tested. Among all isolates (MSSA and MRSA), 100% were susceptible to trimethoprim/sulfamethoxazole (Table 2). All MRSA were susceptible to clindamycin, although 5 MSSA isolates possessed iMLS based on “D-zone” test. All of the MRSA isolates tested except one were USA300 Pulsed-Field Types (PFT). The predominant pattern was USA300.0114 along with some common variants, which is a widely disseminated strain of community-associated MRSA (CA-MRSA) in the U.S.^{13,25} and Hawai‘i.²²

Table 2 lists statistical analysis of key demographics. There was a significantly higher risk of CA-MRSA carriage (but not MSSA carriage) associated with a history of taking antimicrobics within the past 12 months (OR=2.88, p=0.036), at least one visit to the medical department within the past 12 months (OR=3.32, p=0.011), and self-reported history of skin problems within the previous 12 months (OR=2.73, p=0.032).

Higher *S. aureus* carriage (MRSA or MSSA) was not associated with infrequent changing of bed linens (< 1 time / mo), showering (≤ every other day), or uniform laundering (≤ every other day). Neither age, smoking, surgery in the previous 12 months, nor number of months aboard the ship were significant predictors for either type of *S. aureus* colonization.

There was no significant association between hot-racking (workers from different shift using the same bed) or berthing space and either type of *S. aureus* carriage. There was no statistically significant increase in either type of *S. aureus* carriage associated with any self-reported primary workspace, although crew members who reported working “all over the ship” (n=12, 4.51%) had increased MRSA carriage (OR=4.65, p=0.031).

Discussion

This report identified a high prevalence of CA-MRSA (24.7% of isolates) carriage among sailors (6.8% overall) following an outbreak of SSTI while on 6-month sea duty aboard a ship home-ported at Pearl Harbor. Even though carriage rates nationally had increased from 0.8% in 2001-2002 to 1.5% in 2003-2004 (9), the 6.8% prevalence is four times the expected value. Specific factors were associated with increased CA-MRSA carriage in this group, the most important of which appeared to be outpatient health care and a recent history of skin problems. Colonization

Table 2. Statistical Analysis of Potential Colonization Factors

Workspace	OR:MRSA	p	OR:MSSA	p
Topside duty	0.15	0.699	5.18	0.023
Duty throughout the ship	5.52	0.019	0.19	0.663
Engineering	0.01	0.913	3.08	0.79
Galley	2.89	0.089	1.28	0.257
Sonar	1.22	0.270	0.06	0.808

Personal Factors

Antibiotics within 12 months	4.75	0.029	0.47	0.492
Sick call visit within 12 months	7.07	0.008	0.01	0.909
Skin problem* within 12 months	4.88	0.027	0.67	0.415
Hospitalized within 12 months	1.88	0.171	4.08	0.043
Surgery within 12 months	1.02	0.312	1.20	0.273
Shower < once every other day	0.85	0.358	0.31	0.574
Change bed linens < once per month	0.06	0.813	0.45	0.500
Change uniform < once every other day	0.76	0.382	0.15	0.699

Logistic Regression Analysis

Topside duty	N/A	N/A	0.13	0.051
Duty throughout the ship	4.65	0.031	N/A	N/A
Antibiotics within 12 months	2.88	0.036	N/A	N/A
Sick call visit within 12 months	3.32	0.011	N/A	N/A
Skin problem* within 12 months	2.73	0.032	N/A	N/A
Hospitalized within 12 months	N/A	N/A	3.30	0.055

MSSA: Methicillin-susceptible *Staphylococcus aureus*
 CA-MRSA: Community-associated methicillin-resistant *Staphylococcus aureus*

*Self-reported skin problems (n; %) included abscess (9; 3.4%), acne (18; 6.8%), boil (7; 2.3%), infection (31; 11.7%), razor bumps (17; 6.4%), rash (25; 9.4%), other (18; 6.8%)

with MRSA can significantly increase outcome risk factor for infection in various healthcare settings;^{14,15,16} however, its role in predisposing individuals to community-associated infections is not clear.^{3,18} Other investigators have documented problems with current definitions,²⁶ and perhaps this indicates that present classifications are too simplistic to categorize the behavior of this microorganism in populations. It may be appropriate to expand the accepted definition of HA-MRSA beyond such recent risk factors as hospitalization, surgery, long-term care residency, dialysis, and invasive medical devices,¹³ or acknowledge absence of these criteria do not exclude significant interaction with healthcare systems.

Surprisingly, suboptimal personal hygiene practices such as not showering on a regular basis or infrequent uniform laundering were not statistically associated with colonization. Crew members in cramped workspaces such as Sonar and Engineering were not statistically more likely to have nasal colonization with *S. aureus* than crew members of other workspaces even though working in warm moist environments could potentially predispose people to colonization and/or higher bacterial densities on skin or mucosal surfaces. Furthermore, contamination of crowded workplace environments with multi-user fomites such as keyboards, tools, and other equipment may also lead to higher colonization of individuals, but the only statistically significant workplace trend for MRSA carriage were duties that required presence throughout the ship. Consequently while general sanitation measures are still advisable, controlling staphylococci based on berthing, military occupation, or workspace need more study before targeted control strategies would be supported by data. Crew members should be monitored by medical or public health personnel knowledgeable in the operation and maintenance of naval vessels in an effort to identify trends and institute/enforce personal hygiene or environmental sanitation countermeasures to decrease the impact of *S. aureus* colonization or infection.

Genetic analysis by PFGE confirmed that the predominate CA-MRSA strain colonizing the crew was USA300 PFT. The USA300 PFT is typical of those associated with community-acquired skin and soft tissue infections in the U.S.^{4,13,14,25} and Hawai'i,²² and has been associated with outbreaks in prisons,^{27,28} team athletics,^{29,30,31} and military training.¹ This is the first documentation of high colonization rates of CA-MRSA on a military surface ship subsequent to outbreak levels of SSTI at sea. Decolonization regimens with topical agents and/or antibacterial washes is controversial in both healthcare^{32,33,34} and community environments^{35,36} especially considering frequent recolonization³³ and growing concern over development of antimicrobial resistance.³⁴

Genetic analysis was consistent with retrospective PFGE strain characterization of CA-MRSA in Hawai'i during 2001-2003.²² The colonization strain was typical of mainland USA300 CA-MRSA phenotypes in that most (70%) isolates were resistant to erythromycin and did not have inducible clindamycin resistance,^{24,25} although 5 MSSA isolates were shown to have inducible macrolide-lincosamide-streptogramin B resistance (iMLS).

Establishment and transmission of CA-MRSA, or even MSSA, into closed environments such as military transport vessels constitutes a potential risk to both crewmember health and the operational readiness of their units. Severe clinical manifestations of CA-MRSA SSTI can rapidly affect the effectiveness of a military workforce, and adequate treatment that often requires surgical drainage in combination with aggressive antimicrobial therapy which can be problematic, especially in remote locations. Infection control audit of *S. aureus* isolates by submission location at the tertiary treatment facility for military forces in the Pacific demonstrated a dramatic 12.8-fold surge in outpatient isolates from 2002 (n=22) through 2003 (n=106) to 2004 (n=282), while inpatient isolates increased a challenging, but much smaller 31% during the same 3-year period (n=52, 65, and 68, respectively). Further breakdown of risk factors was not available; however, the increase may be partially explained by increased awareness of CA-MRSA leading to more aggressive cultivation practices, as well as demand for management of recurrent or recalcitrant infections. Even more alarming is data indicating that a clone of CA-MRSA first described in the southwest Pacific is actually a re-emerging descendant of the notorious phage-type 80/81 which caused pandemic hospital disease in the 1950s and 1960s.³⁷

Careful surveillance of cellulites and wound infections may lead to the first indication that general sanitation measures must be emphasized and enforced. The baseline rate of CA-MRSA carriage among personnel may predispose crews to infection, but more study is needed to supply data to support this hypothesis and the credibility of targeted interventions. Personal hygiene improvement programs and epidemiologic trending, along with laboratory analysis of implicated microbial isolates, are critical components in disease control and should be standard measures in order to counter infectious disease threats.

Disclaimer

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BRIEF REPORTS

Brief Introduction to Health Disparities By Gender and Marital Status.

Kathleen Kromer Baker¹, PhD, Alvin T. Onaka¹, PhD, Brian Horiuchi¹, MPH, James Dannemiller², MA

The Hawai'i Health Survey (HHS) provides useful information to document health disparities. Prior published information from the HHS indicated health disparities by ethnicity, income, geographic area, and insurance. However, gender and marital status are less well documented. Introductory information provided

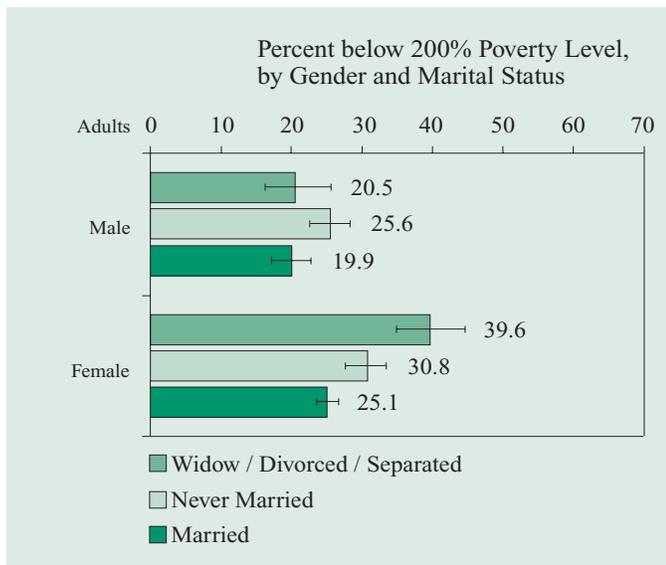


Figure 1. Percentage of Adults* Living Below 200% of the Poverty Level** By Gender and Marital Status, Hawai'i Health Survey, 2004-2007.

below illustrates that gender and marital status can also be important factors in the health of Hawai'i adults.

Gender and marital status are associated with income. Among adults in Hawai'i, females that are widowed, divorced, or separated have the highest percent living below 200% of the federal poverty level.^a Next highest are females that have never married.

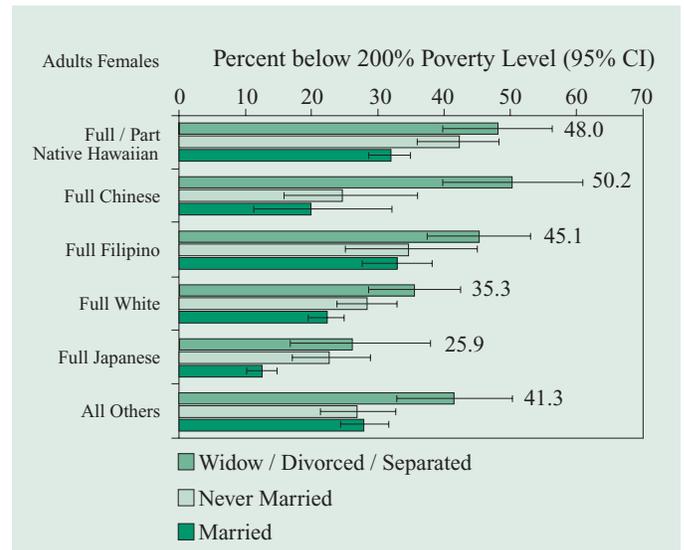


Figure 2. Percentage of Women* Living Below 200% of the Poverty Level** By Ethnicity† and Marital Status, Hawai'i Health Survey, 2004-2007.

Similar patterns are present among women by ethnicity. Women that are widowed, divorced, or separated have the highest percent living below 200% of the federal poverty level for all ethnic groups listed. Percent differences between females that are widowed, divorced, or separated compared to women that are married are statistically significant for all ethnic groups except Full Filipino.

Women that are widowed, divorced, or separated are not only more likely to be living with lower incomes but are also more likely to have at least one health condition (arthritis, asthma, diabetes, high blood pressure, high blood cholesterol). Women that are widowed, divorced, or separated and living below 200% poverty level have the highest percent of living with at least one chronic health condition (62.2%, 55.7-68.3 - 95% CL) compared to any other group of women. Differences are statistically significant except for women who never married living below 200% poverty level (51.8%, 47.4-56.1 - 95% CL).

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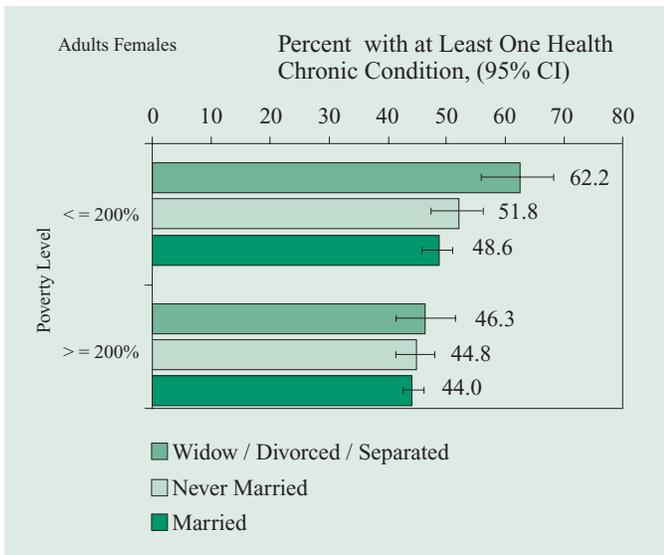


Figure 3. Percentage of Women* with at least One Chronic Health Condition By Poverty Level** and Marital Status, Hawaii Health Survey, 2004-2007.

Women, particularly divorced, separated, or widowed, may be disadvantaged in relation to income and health. More detailed information on women's issues (e.g. children in the household) and also men's health disparities from the Hawaii Health Survey will be forthcoming. Further information on the Hawaii Health Survey can be accessed at: <http://hawaii.gov/health/statistics/hhs/index.html>

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a The 2008 federal poverty level for a single person is \$11,960. U.S. Department of Health and Human Services [homepage on the internet]. Washington: the Department; 2008 [cited 6 Nov 2008.]

* Adults >17 years from respondent information. All data age-adjusted to the 2000 standard population using five age groups: 20—34 years, 35—44 years, 45—54 years, 55—64 years, and ≥65 years. Data from survey respondents are provisionally weighted, adjusted, and averaged over the four year period to estimate Hawaii's non-institutionalized adult population. Data are adjusted as group quarters, households without telephones, homeless, and the island of Ni'ihau are not represented.

** Poverty status is determined by using the "poverty guidelines" and takes into account not only income but also household size supported by the income. Thus, it is a more useful indicator of actual personal income. It is reported for the household and/or the household members. Poverty guidelines are updated annually in the Federal Register by the U.S. Department of Health and Human Services.

† The Respondent can list over four ethnicities for both their mother and their father in response to the question "Of what ethnic background is your mother (separate question for father)?" These

responses can be coded using different methodologies. Here full/part are presented for Native Hawaiians, and full for the other ethnic groups (only that response listed in each group). All others include other one ethnic group responses, mixed group responses, and don't know/refused. Only groups with sample sizes greater than 50 and relative standard error <30 are included in the present analysis.

Improving Cultural Competency: Smart Strategies for Working with Filipinos

Jeny Bissell¹, RN

Issue:

The issues and concerns in the Filipino community are best illustrated in the following “WE BELIEVE STATEMENTS” by the Maui Filipino Working Group comprised of Jeny Bissell, Virginia Cantorna, Kim Compoc and Cornelia Soberano.

We believe that pride in one’s culture and identity is important for everyone, from youth to seniors. We believe that culture should be celebrated, not pathologized.

We believe language and cultural interpretation are crucial to affording true access to services. Interpreters must be certified, and use ordinary language to communicate with a wide variety of reading levels.

We believe a person’s language and accent do not reflect one’s intelligence or capabilities.

We believe that everyone deserves respect and dignity. We believe in strengths-based services for all people.

We believe that stereotypes are hurtful. We believe that racism must end, along with all other forms of oppression. As Hawaii is a multicultural society, we believe we must break out from our own stereotypes we have developed against others.

We believe that Filipinos should be recognized as a diverse community, especially with regard to geography, language group, immigration status, educational achievement, gender, class, sexual orientation and other factors.

We believe in family-centered, culturally competent services. While there is no recipe in how to interact with all Filipinos, we believe that through careful study and reflection service providers can improve skills.

One of the primary concerns is that Filipinos are not accessing services and that there is a provisional need for culturally appropriate services in the Filipino community.

Intervention:

In August 2007, the Hawai’i State Department of Health Maui Family Health Services Division (FHSD) partnered with the Maui Filipino Working Group to

coordinate and organize a workshop on Maui entitled, “Filipino Cultural Competency: Smart Strategies for working with Filipinos.” The objectives of the workshop were to: 1) Acquire tools for effective delivery of services to a diverse Filipino community. 2) Improve understanding of the socioeconomic, educational, mental health, substance use and psycho-physiological factors which may affect the health and well-being of the Filipino community; and 3) Gain a better understanding of the Filipino historical background and cultural value systems.

The workshop was funded and sponsored by the Hawaii People’s Fund: “Change, Not Charity.”, the Department of Education English Language Learning Program, the County of Maui Mayor’s Office on Economic Development, and the National Federation of Filipino American Association Region XII.

At the beginning of the workshop, Virgilio Felipe, a historian and author of “Hawaii” A Pilipino Dream,” said “Language is the DNA of culture, “ setting the foundation for the other presenters. These speakers included Dr. Marconi Dioso, retired Maui Filipino Physician, military historian, and the author of “A Trilogy of Wars.” This book recounts, with a high level of detail the period from 1896 to 1902, when the Philippines fought the Spanish, then the Americans, losing hundreds of thousands of Filipino civilians, in the hopes of gaining independence. Cornelia Soberano, Toronto Lawyer, then spoke of the need for awareness of Filipino cultural values. Dr. Virginia Cantorna, Clinical Psychologist from the Hawai’i State Department of Education (DOE) on Maui, presented on stages of acculturation, and cultural sensitivity versus cultural competency. Dr. Amy Agbayani, Professor of Political Science at the University of Hawai’i at Mānoa opined that the school system has been unable to fully meet the needs of its Filipino students. Many of the speakers shared from the experiences of their own families, such as when Jeny Bissell, FHSD Coordinator on Maui, presented Filipino health and disease statistics. She expanded on these data by including a photo of her extended family when they first arrived in Hawai’i. The topic of language interpretation was emphasized throughout the day, perhaps most eloquently in the two skits which were presented by “Talking Stories”, which Kim Compoc, Executive Director of the Maui Mediation Services wrote and directed.

¹Maui District Health Office, Hawai’i State Department of Health.

Impact:

Two hundred workshop attendees filled the Kahili Golf Club Conference Room. The DOE comprised 30% of the workshop audience. Further, an estimated one-third of the audience was Filipino while two-thirds was non-Filipino. The audience of the workshop comprised 30% from the DOE. Also represented were dozens of health and social service agencies across the state, including several non-profit Executive Directors, Dept. of Health personnel, lawyers, judiciary staff, activists, artists and academics. Further, the audience estimated to be approximately one third Filipino and two-thirds non-Filipino. At the end of the workshop, the audience was invited to come to the microphone with questions or comments. Some of the participants spoke through tears about how meaningful the day had been for them. Several participants spoke to how the information and knowledge learned from the workshop could actually be used to improve their practice in their respective organizations. They all spoke, in one way or another, about their own “debt or gratitude.” Other comments from participants include, “17 years I’ve been on Lāna‘i. This is the first workshop on Filipinos I’ve ever heard about.” Other participants added that, it’s so inspiring because this is a workshop about Filipinos and all the leadership is Filipino. That’s really saying something.” Another workshop member related, “what they have done is welcome us in to to show us who they are. This is beautiful.”

Dr. Cantorna reminds all that the workshop was simply an invitation for service providers and the Filipino community to open their eyes to the problems facing the community. However, cultural competency means not just being sensitive or aware. It means making a commitment to change. In her writing, she adds, “[f]our women can’t do it alone. A variety of approaches, resources and community inputs are needed to continue to create effective change and positive growth. Growing support in the form of financial resources, vision and manpower is needed.” Dr. Agbayani wrote, “I want to take this opportunity to commend the Filipino Working Group for their vision and hard work. It is obvious to me and all those present at the workshop that many valuable lessons were learned and should help improve attitudes and services for Filipinos, a large and growing segment of Maui and the State.”

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Mutual Aid Agreements Between Public and Private-Sector Laboratories

Christopher Lum Lee, BA¹

Objective

The purpose of this discussion is to explain the importance of mutual aid agreements between public and private-sector laboratories in public health incident preparedness and response. This discussion also incorporates the elements of an effective mutual aid agreement, how a mutual aid agreement becomes implemented, and at which point it can be concluded that mutual aid agreements are a best practice today.

Implications

The issue of improved working relationships between public and private health laboratories is important to Hawai'i and the Pacific because Hawai'i can be a gateway for diseases, viruses, or other biohazard incidents which could travel across international boundaries. Since mutual aid agreements are commonly used in the Emergency Management field, with incidents also having public health implications, mutual aid agreements would work well in Hawai'i.

In recent years, the public health and emergency management professions have combined forces when natural, man-made, or technological emergencies have resulted in public health-related incidents. For example, the threat of bioterrorism isn't solely a homeland security issue. Because the health of the communities is also put at risk, public health agencies become key response players. The most prominent recent example where public health and emergency management resources have collaborated was at the peak of the threat of the Avian Flu, subtype H5N1- A(H5N1). The purpose of this discussion is to delineate the individual functions of private-sector laboratories and government-run laboratories, and then identify how, through the use of mutual aid agreements, both sectors can collaborate to better prepare for biohazard situations where response is required.

The Different Laboratories

Private-sector laboratories — both profit-making firms and non-profit firms— provide medical testing services. Most firms provide a full-range of services including phlebotomy, genetics, chemistry, toxicology/drug testing, microbiology, cytology, and even consultations, as well as other services. In some instances, these laboratories are functional divisions of pharmaceutical companies, and in other instances they

are stand-alone firms. In private-sector laboratories, the budgetary planning is dependent on revenues from goods and services and expenditures forecasted from previous fiscal years, whether it be one fiscal year or over a multi-year fiscal period, depending on the individual laboratory's business plan.

Public sector laboratories are different in several ways, which all are derived from their primary mission. These government-owned laboratories conduct testing in some of the same areas that private-sector laboratories do, except that they are charged with supporting environmental health, the monitoring of communicable diseases and preventative/control activities. With their main focus being on disease prevention and control, they are not profit-driven as opposed to private-sector laboratories. Therefore, their budgetary planning is predicated on the previous fiscal year's governmental revenues and other economic factors, including inflation and the role of Capital Improvement Projects (CIP), requiring the approval of the jurisdiction's respective legislative body.

Mutual Aid Agreements

Although these two types of laboratories perform some of the same types of testing and look to accomplish the same goals in terms of identifying a health hazard, such as a bacterium or virus, in finding the treatment for the pathogen, the private-sector laboratory works for profits the public-sector laboratory works for program support. However, in times of a major public health emergency, which can include a pandemic or a bioterrorism incident, mutual aid agreements may become important, in order to allow the two different laboratory sectors to be able to combine their human resources, technology, and logistical support. This cooperation will expedite the public health response in a judicious manner. Mutual aid agreements are a common managerial practice in both sectors because these agreements in public and private sector laboratories allows for the sharing of all resources across political and corporate atmospheres. The cooperation of public and private laboratories improves public health by ensuring the timely arrival of aid, by minimizing administrative conflict and litigation, by recovering the costs of response, and by maximizing the use of all resources.

Mutual aid agreements have proven to be an effective tool in helping with the response to not only health crises, but also natural disasters and terrorist

¹Hawaii State Judiciary

incidents. Both government and private-sector entities typically have liaisons that interface with each other to coordinate planning and preparedness activities such as designing exercises, classifying resources, and creating and implementing preparedness and safety training programs.

The establishment of mutual aid agreements has barriers in both public and private sectors. These barriers may include mutual mistrust, an unwillingness to concede that support is needed, and a misunderstanding or lack of knowledge of mutual aid agreements. To overcome these issues, first, a mutual aid agreement needs to be established, and the rest of the barriers can be overcome through educating the groups involved of the successes of mutual aid agreements in the history of incident response, and by taking existing mutual aid agreements and adapting them to be jurisdiction-specific.

For mutual aid agreements to be successful, there are several areas that need to be defined, but like all agreements, they need to specifically outline the purposes, definitions, authorities and roles/responsibilities, the effects on existing agreements, training methodology, liability, and other terms and conditions. Once these aspects have been defined, the existing agreements need to be reviewed, a hazard identification and vulnerability assessment needs to be conducted or re-evaluated, a capability assessment needs to be done, emergency operation plans and resource inventories need to be updated, resource needs and gaps need to be identified, and finally, based on all of these steps, a new agreement or update of a previous agreement can be developed. After this process has been completed, a mutual aid operation plan that provides a framework for the agreement's implementation needs to be created based on training, accountability, activation, after-action review, and plan maintenance. Once this operation plan has been created, mutual aid agreements can be implemented and accepted with best practices in the public health community.

Final Thought

Public and private laboratories have a major role to play in preparing, planning, and responding to public health emergencies. Because of this reason alone, there exists a need to be able to bring these two types of entities together to be able to most effectively respond to any emergency that may arise. Therefore, the best managerial practice to incorporate is a mutual aid agreement between these two entities, so they can best plan the use of their resources. The mutual aid agreement is a complex document that details the complete relationship needed to be able to respond to an incident, but it cannot take effect without the implementation framework provided by the mutual aid

operational plan. These two elements can take a practical aspect of planning and response and make it a best practice to be used in the future. Mutual aid agreements have a proven history of effectiveness and can only benefit the public health arena, which is why the importance of them has been highlighted here. The question isn't if a public health emergency happens, it's when a public health emergency will happen.

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DISCUSSION

Mālama I Nā Keiki, Ending Non-therapeutic Infant Circumcision Through Education

Joseph Kassel, N.D., L.Ac¹, Misha Kassel, MD², Clare Loprinzi, Traditional Midwife, CPM³

The object of our discussion is not that your words will gain victory over mine, or that mine will triumph over yours, but that together, we may discover the perfect truth.”

Socrates

Abstract

Medical non-therapeutic infant circumcision began in the nineteenth century to prevent masturbation, which was believed to cause disease, by excising the most sensitive part of the genitals, as well as inflicting psychological and physical pain to discourage the practice. Subsequently there have been a number of rationales provided for this procedure, including prevention of sexually transmitted infections, urinary tract infections and, most recently, HIV transmission. These rationales for the procedure have either limited support from flawed research or often contradictory evidence. The surgical removal of healthy tissue from a nonconsenting infant raises ethical and human rights concerns. The foreskin is of importance to male genital health and function throughout the lifespan. The loss of these functions, the pain and potential complications of the procedure, in addition to the above concerns, make it necessary for us to reevaluate and discontinue this procedure.

Our goal as healthcare providers is to optimize the psychological, spiritual and physical health of all those in our care. While the negative physiological effects of circumcision have been documented, its harm to the psychological and spiritual health of the previously intact baby is immeasurable. These concerns often are not adequately discussed when educating parents about circumcision. Circumcision also has a profound negative impact on the psychological health of providers, immediate family and society. Circumcision negatively affects breastfeeding and bonding. Many arguments have been presented to support this traumatic practice. However, there is a preponderance of evidence that supports preservation of genital integrity for both male and female infants.

Circumcision is a traumatic event

Until recently, the myth was promulgated that infants' nervous systems were not adequately developed to feel the pain of circumcision. The truth, with regard to the perception of pain, is that the nervous system of an infant is fully developed by the third trimester.¹ Newborn responses to pain, in fact, are greater than those in adult subjects.² Fifty percent increases in heart rate and three- to four-fold increases in cortisol levels have been documented in response to circumcision.³ Many parents and practitioners point to the reduction of crying when a pacifier is used during circumcision, believing, with less crying, pain and stress are reduced. The truth is that, although babies do cry less with a pacifier, their stress response and cortisol production are unchanged.⁴ For some time, there has been a strong trend to return to non-traumatic births and nurturance of our newborns and infants. Women are encouraged to eat well and reduce stress for the health of their babies. Parents talk to their babies, sing and read to their children before they have even entered this world. Yet, shortly after birth, many baby boys are met with a scalpel. The Midwifery Model of Care in Holland has become an international birth model because of the low maternal and infant mortality and morbidity rates. The standard of care in Holland is optimal outcome with minimal intervention.⁵ Circumcision stands in stark contrast to this concept of harm reduction, nurturance, optimal outcome and minimal intervention. Circumcision meets the definition of a traumatic event and a baby can go into shock in response to the procedure. The absence of crying can be part of the shock response and is not an indication that there is no pain. Bodily signs show that severe pain is always present.³

More recently, medical doctors have admitted that infants do feel pain, and local anesthesia is often used now prior to circumcision. While this reduces certain responses to pain during the procedure, it does not eliminate them, and it introduces another painful

¹Private practice, Holualoa, Hawai'i

²Stanford University School of Medicine

³Mālama I Nā Keiki, Captain Cook, Hawai'i

procedure, the injection of the anesthesia. The effects of the local anesthesia wear off in a matter of hours.⁶ The pain experienced in the subsequent hours, days, and weeks is not affected by this anesthesia. This pain interferes with mother/infant bonding and breastfeeding.

The very act of breastfeeding and maternal contact has been shown to attenuate the physiological responses to stress. According to Dr. McGaff at North Hawai'i Community Hospital, "In the last five years, purely through prenatal education, we have been able to drastically lower the circumcision rate in our birthing unit at North Hawai'i Community Hospital on the Big Island. There are several noticeable improvements. Our staff is calmer, breastfeeding and bonding seem to proceed more easily, and the baby boy remains protected, respected and whole. Since circumcision conceivably may interfere with bonding and breastfeeding, and these naturally and wonderfully attenuate the stress response, it quickly becomes clear that this single, medically unnecessary, mutilating act may initiate a cascade of events that leads to a downward spiral in multiple aspects of the health of the child, mother and family. During and after circumcision the child is in severe pain. Due to this pain, the baby often has more trouble nursing. Failure to successfully nurse prevents the assimilation of passive immunity from antibodies in the colostrum and breastmilk. This passive immunity results in significant disease prevention in the first six months of life. The pain of circumcision also results in elevated cortisol levels, which further suppresses the newborn's immune response."^{7,8}

The distress of the newborn from the traumatic experience of circumcision has a deep impact on the parents' ability to successfully nurture and care for their baby. The inability to nurse is not only due to the impact on the newborn, it also is related to the stress the mother feels when caring for her distressed baby, unlike the comparatively peaceful experience of nursing a happy, untraumatized baby. This series of events leave a baby more vulnerable to infection (which can result in otherwise unnecessary spinal taps) and the mother more susceptible to postpartum depression.

"Circumcision causes pain, trauma and a permanent loss of protective and erogenous tissue. Removing normal, healthy, functioning tissue violates the United Nations Declaration of Human Rights (Article 5) and the United Nations Declaration on the Rights of the Child (Article 13)," Dr. Leo Sorger.⁹ There are many other articles in the United Nations Declaration of Human Rights that relate to circumcision. They include, but are not limited to, abolishing traditional practices that are harmful to the health of the child, protecting children from all forms of violence, injury or abuse, protecting children from sexual abuse, and not allowing children to be subjected to torture or cruel inhuman treatment.⁹

The Myths and Risks of Circumcision

Confronting the myths of circumcision and healing the pain it has inflicted on our society is crucial. Early medical justifications for circumcision, in fact, were hardly medical or scientific at all, but were based on conservative, punitive religious judgments about sexuality and masturbation. In 1860, *The Lancet* reported that male circumcision was a procedure needed to break the habit of masturbation. Dr. Athol Johnson stated that the procedure needed to cause much local suffering so that the "practice" would not continue.¹⁰ Dr. Harvey Kellogg also talked about the benefit of circumcision as having "a salutary effect upon the mind, especially if it be connected to the idea of punishment."¹⁰ What followed for the next century-and-a-half has been one justification after the other, each of which has failed to unequivocally stand up to objective evaluation.

At the same time, the complication rates for infant circumcision have never been adequately researched.¹¹ Complications from circumcision have been estimated to range from 0.6% to 55% in different studies.¹² Worldwide, routine infant circumcision is the exception, not the rule, and is rarely practiced in Europe, Central and South America and Asia.¹¹ Complications due to circumcision are extensive, underreported for reasons of litigation and include surgical mistakes that can include damage (beyond the damage of circumcision itself) to or loss of the penis, hemorrhage, infection (as frequently as in 10% of all circumcisions), and death.¹² One of the authors, Clare Loprinzi, has witnessed a healthy baby boy dying as a result of bleeding from circumcision. There is no central registry of circumcision deaths. In the 1940's when circumcision was common in England, there were 16 deaths-a-year reported.⁹

There is an increasing incidence of virulent antibiotic resistant microbial strains such as Methicillin-Resistant *Staphylococcus Aureas* (MRSA). The unnecessary infliction of an open wound, in an area constantly exposed to and possibly colonized by potentially pathogenic microbes, in a newborn baby that has an underdeveloped immune system, is not rational. Circumcised boys have a twelve-times greater risk of community acquired-MRSA.¹³ Dr. Sydney Gellis, at the Department of Pediatrics, New England Medical Center Hospital, states that physicians should be more vociferous than ever to stop circumcision because the circumcised infant is at greater risk than ever before.¹⁴ He adds that it is an uncontestable fact that there are more deaths from complications of circumcision than that of cancer of the penis (more than 200 deaths per year).^{9,15}

Circumcision has been promoted to prevent urinary tract infections (UTIs). The American Academy of Pediatrics (AAP) Task Force on Circumcision, in their

1999 evidence-based statement, reported serious methodological flaws in all existing studies, and declined to recommend circumcision to reduce UTI's.¹⁵ The AAP reported that previous studies, showing that circumcision reduces UTI's, were retrospective, may have had methodological flaws, and were or may have been influenced by selection bias. The studies about intact males having a greater rate of UTI's failed to control for confounding factors, which included maternal infection, perinatal anoxia, high or low birthrate, prematurity of birth, rooming-in, method of urine sample collection, type of hygienic care and breastfeeding. UTI's are easily treated and even circumcision advocates only estimate an incidence of 1% in intact infants, so it is unreasonable to subject the remaining babies to the trauma, pain, risks, and loss of this procedure to prevent the occasional UTI.

Phimosis (a nonretractable foreskin) is another reason given for circumcision. There is a reason why the foreskin is adherent to the glans at birth. It is protecting the glans from exposure and irritation, the urinary tract from contamination, and the nonretractability makes cleaning under the foreskin unnecessary. At rates that vary for each child, the foreskin will become retractable between infancy and 18-25 years of age. Clearly, phimosis cannot be diagnosed in infancy or early childhood. That would be premature and poor practice.

Education for healthcare providers and parents about not retracting the adhered foreskin is important because doing so results in unnecessary injury and possible problems with infection and adhesions. Premature retraction is based on antiquated information that is still being promulgated. Perhaps more importantly, the incomplete amputation of foreskin during circumcision can result in post-circumcision, iatrogenic phimosis. Circumcision can cause a condition it is intended to treat or prevent. There are gentle, alternative ways to get the foreskin to retract in the rare case of a young man for whom this is a concern.(12,8)

The notion that circumcision prevents sexually transmitted infections (STIs) predates any studies conducted on the subject. Studies that have been conducted do not verify the notion. We are not aware of a meta-analysis of the studies that have looked into this subject. Looked at individually, these studies show little difference between circumcised and intact men. Some studies show small increases for different STI's in each group, another showed no statistically significant difference.¹⁵⁻¹⁹ It is clear to all concerned health-care providers, including the 1999 AAP Task Force on Circumcision, that behavioral factors are far more important than circumcision status in affecting STI acquisition. This fact should be remembered when considering circumcision status and HIV transmission.

The latest claim of is that circumcision will help prevent HIV. There have been several thorough critical

evaluations of these studies and they suffer from several methodological flaws, in execution and evaluation.²⁰ These flaws include, early termination of all three studies, lack of long-term follow-up (and eliminating of the possibility of long-term follow up by circumcising control-group participants after early study termination), failure to account for non-sexual HIV transmission, failure to assess sexual exposure rates (which would presumably be reduced in the circumcised group due to time necessary to heal from the surgery).²⁰ There are many reasons that this approach is a bad idea as a disease-prevention modality. They include, but are not limited to, circumcision and medical procedures being leading causes of HIV spread in Africa, increased HIV transmission to sexual partners of recently circumcised HIV positive men, and diversion of limited resources from proven preventative methods, such as universal condom use.

Circumcision status does not affect male-to-female or male-to-male transmission rates. A false sense of security could undermine proven effective preventative measures. As Dr. Dean Edell has stated, "The foreskin is one of several possible entrance points for the AIDS virus to infect the body, but that does not mean that you should cut the entrance off. It means that you should protect the entrance, either by using condoms or by practicing safe sex." Dr. Haanah Kibuuka of the Makerere University Walter Reed Project in Uganda has made the following recommendation to his countrymen, "Do not expose yourself to danger in the mistaken belief that since you are circumcised, you will not catch HIV."

In Thailand, it has been shown that behavior change, such as abstinence before marriage and fidelity after marriage, provision of condoms, treatment of other sexually transmitted infections, treatment of genital ulcer disease, control of malaria, and provision of safe healthcare, produces beneficial results.¹⁶ Circumcision has not prevented the spread of HIV in the U.S. or Israel, where the circumcision rates are high. None of the information regarding HIV transmission in Africa, regardless of how erroneously it is interpreted, should be used to support the practice of circumcising a nonconsenting newborn baby. His body is *his*; allow him to decide. It is his human right. If a grown man decides that he wants to surgically remove a significant and sensitive part of his own genitalia that is his right. To make that choice for another person, especially a non-consenting minor, is unethical. The procedure can be done later, it can never be undone. Foreskin "restoration" is more difficult, time consuming and imperfect (though worth the effort for those men who wish to regain their body image, sensitivity, and what was taken from them without their permission).

Intact Male Genitalia Cannot Be Improved Upon

The uninterrupted bonding and nursing that occurs between mother and whole, normal, intact child is the foundation for healthy children and families. These children rarely have significant illnesses prior to six months of age. The early months of life are the most precarious for unhealthy children. The first erections of a baby in utero and the intact newborn are a sensual pleasure, not, as is the case of the circumcised baby, a painful source of distress. These contrasting experiences are a precedent for a toddler, experiencing his genitals with a natural and gentle retraction of his foreskin through touch and play.

The foreskin in the mature male serves multiple purposes that are lost with circumcision. It contains thousands of nerve endings that communicate messages to the sympathetic and parasympathetic nervous systems, which profoundly affect sexual response. It protects the mucosal membrane and sensitivity of the glans. It maintains elasticity and flexibility of penile shaft skin. These dramatically affect sexual function and experience for men and their female partners, allowing sex to be experienced as it was designed to be.

From the perspective of Asian medicine, circumcision removes the yin (female) aspect of the male genitals, much like female circumcision removes the yang (male) aspect of the female genitalia. Asian medicine recognizes and honors the yin within yang and the yang within yin.²¹ Circumcised men and their partners suffer from a number of handicaps in their sexual experiences. The glans is changed from a sensitive moist mucous membrane to a dry, calloused, less sensitive organ. Circumcised men suffer from a loss of penile girth and a restriction to the movement of penile shaft skin. Factored together, these influences significantly compromise the experience for both partners throughout life.

Thousands upon thousands of circumcised men in the United States, Canada, England, and Australia have undertaken foreskin restoration. They have regained much of what was lost for them and their partners and done their best to conquer the trauma that was inflicted upon them. They are well equipped to testify to the advantages in function that a foreskin allows and what is lost to circumcision.

As an intact son and circumcised restoring father, the authors are grateful that the father's defenses were overcome and his sons remained intact. As one of the son notes, "[a]t no time did this difference affect our deeply bonded relationship." Not only did this protect the sons but it also allows healing for the father, which continues to this day.

Conclusion

There is a preponderance of evidence and sound logic that support the preservation of the healthy, normal, intact foreskin in newborn and infant boys. Any *potential* benefits of non-therapeutic infant circumcision suggested by flawed research are outweighed by the risks, pain, trauma, sequelae and loss of function incurred by the surgery. Worldwide, the majority of healthcare providers recognize that non-therapeutic infant circumcision violates the fundamental medical principal, Primum No Nocere (First do no harm) and refuse to perform this surgery. It is essential to adequately educate healthcare providers and families to break the cycle of harm that non-therapeutic infant circumcision has inflicted on our sons, families and society for the past 150 years.

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The Protective Effect of Circumcision in the Transmission of HIV: A New Perspective on an Old Procedure

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In this paper, we set out to address the topic of adult male circumcision as it is used in the prevention of HIV transmission. As with most issues related to circumcision, arguments on both sides of the debate can be quite compelling. We hope to infuse the discussion with some of the relevant published data on circumcision in southern Africa. In this way, we hope to raise the level of understanding of the subject generally, and in the process new ideas and concerns might be brought to light on this new application of an historically dynamic and controversial procedure. Since early in the epidemic of HIV/AIDS, large discrepancies in HIV prevalence within and between countries on the continent of Africa have been noted, and these disparities cannot be readily explained by differences in sexual behavior patterns or the differential presence of sexually transmitted infections (STI's). Neither can the age of the epidemic in the country, nor differences in circulating strains of the virus explain this variation.¹ There is an area of the African continent that has been widely described as the "AIDS Belt", meaning that the highest prevalence of HIV infection can be found in this area. What has been demonstrated in many cases is that this area of the continent is comprised of societies that do not practice male circumcision.

Male circumcision is widely practiced in West Africa, where HIV prevalence tends to be lower. The exceptions are ethnic groups centering on Abidjan and Cote d'Ivoire, where HIV prevalence is highest in West Africa. Thirty percent of major sub-Saharan African societies do not traditionally practice male circumcision. Most of these tribes are clustered in eastern and southern Africa, where it appears that HIV prevalence is the highest. In Botswana, for example, male circumcision was once universally practiced, but was abandoned during colonial rule, and now the country has one of the highest rates of HIV in the world.²

This kind of association between male circumcision and HIV transmission is not seen in Europe, where most men are not circumcised, or in North America, where most men are circumcised. This is presumed to be in part because in these areas, HIV transmission is primarily related to intravenous drug use (IVDU) or receptive anal sex, most commonly seen in homosexual relationships. In Africa and parts of Asia, however, the epidemic is driven by heterosexual sex. Countries with less than twenty percent of men

circumcised have HIV prevalence rates several times higher than countries in which more than eighty percent of men get circumcised.³

There is biological evidence that circumcision may be protective. In the mid-nineteenth century, the removal of foreskin was shown to decrease susceptibility of men to STI's.⁴ The foreskin is a moist, warm area that can harbor bacteria and viruses. It is an area that is vulnerable to micro abrasions during intercourse. Moreover, the foreskin area contains high concentrations of CD4+ T-Lymphocytes, Langerhan cells, and macrophages. These types of cells are particularly receptive to the uptake of HIV particles⁵. Rates of sexually transmitted diseases such as genital herpes, syphilis, human papilloma, and chancroid are higher in uncircumcised men.⁶

It has long been understood that the presence of an STI greatly increases the risk of HIV transmission. This is why the treatment of STI's has been adopted as part of the global strategy to prevent HIV.¹ The positive effect of circumcision in the protection against HIV is especially strong among groups that have high rates of STI's, reinforcing the relationship between HIV and STI's, and establishing a possible rationale for the protective power of male circumcision. A study of transport workers in Kenya found a significantly lower incidence of genital ulcer disease in circumcised men (6.5/1000) than in uncircumcised men (15.2/1000), after adjusting for confounders. The primary demonstrated cause for elevated rates of HIV transmission through sexual contact is the presence of genital ulcer diseases and this seems to be the backdrop in southern Africa and a raging heterosexual epidemic not duplicated in other parts of the continent and, for instance, in poor people in wealthier nations.⁷

The Orange Farm study, a randomized controlled trial assessing the effectiveness of male circumcision in preventing HIV transmission, was conducted in a semiurban region near Johannesburg, South Africa. The dramatic results of this study showed that circumcision conferred a high level of protection against HIV transmission on heterosexual men. The level of protection was equal to that of a highly effective vaccine.⁸ Indeed, the protective effect was so high that the study was halted early and the control group was offered the procedure.

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The international health community felt it was prudent to wait for the results of two other active randomized, controlled studies to publish their results before they made recommendations.¹ Those two studies, one in Uganda and one in Kenya, have now published their results. It would seem that the relationship between male circumcision and transmission of HIV from females to males was confirmed in these studies.^{4,9} These three randomized controlled trials demonstrated that male circumcision decreased the incidence of HIV acquisition by 48 to 60% over the mean follow-up of 18 months.¹⁰

There has recently been a study looking into the feasibility of cheap and easy (and safe) circumcision. A group of urologists developed a procedure that they were able to utilize effectively in an African medical setting, in Kisumu District, Kenya.¹¹ The surgeons developed a single-use, disposable device, with no electrocautery. All of the instruments and supplies were purchased locally. They used, widely available technology. Very little training was necessary to teach local clinicians how to perform this procedure. Their infection rate was 1.3% and their excess bleeding rate was 0.8%, which is comparable to the rates in the developed world. Circumcision may be one of the keys to reducing the number of HIV infections in a population that is experiencing a generalized epidemic. Indeed, mathematical modeling of future HIV prevalence rates assumes that 100% of men get circumcised, but it does not assume that anyone changes behavior. This amounts to a public health measure that is not carried out for the benefit of the person who undergoes the procedure as much as it is done for future generations.

Male circumcision MC could avert 2.0 (1.1–3.8) million new HIV infections and 0.3 (0.1–0.5) million deaths over the next ten years in sub-Saharan Africa. In the ten years after that, it could avert a further 3.7 (1.9–7.5) million new HIV infections and 2.7 (1.5–5.3) million deaths, with about one quarter of all the incident cases prevented and the deaths averted occurring in South Africa.¹²

Male circumcision can prevent between 2 to 8 million new HIV infection, producing savings of \$2 billion over the next 20 years.^{8,14} In their publications recommending the addition of adult male circumcision to the list of strategies used against the spread of HIV, the Joint United Nation Programme on HIV/AIDS (UNAIDS) emphasizes that this procedure is not meant to replace any existing prevention programs. They stress that circumcision must only be carried out with the knowledge that the protection is partial. The policies advocating the correct and consistent use of condoms, delayed sexual debut, limited of number of sexual partners, avoidance of penetrative sex, and voluntary counseling and testing are meant to continue unabated.¹⁵ The procedure is to be incorporated into

prevention programs where appropriate and safe medical care can be carried out. The institution, and in many cases the reinstitution, of circumcision into the lives of millions of African men will not be brought about without first surmounting enormous cultural, economic, and logistical challenges. Healthcare in many resource poor areas of the world is disturbingly under funded, understaffed, and unsafe. As a result, circumcisions carried out in medical facilities can in some parts of Africa have similar rates of complications as those procedures done in the community by a traditional healer.⁴

Additionally, circumcision has historically occurred as part of lengthy and involved event that plays an important role in the ritual transition from boys to responsible, respectful men, though this rite of passage has been eroded by changes brought about by globalization.^{17,18} Medical circumcision, as opposed to traditional circumcision, does not incorporate the aspects of social development, and thus does not in itself influence sexual behavior.

Despite the myriad challenges, many men in areas of historically low rates of circumcision are willing to be circumcised.³ It may be that the specter of a continuing or worsening epidemic in many communities is enough to bring about a fundamental transformation in the current understanding of circumcision.

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