

## Early Childhood Caries Among Hawaii Public School Children, 1989 vs. 1999

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**Abstract:** Utilizing a standardized oral health assessment tool, public school children ages 5 through 9 were evaluated Statewide in 1989 and 1999. In both samples, it was demonstrated that Asian & Pacific Islander children (as a group), by contrast with Caucasian, African American or Hispanic children, suffered from disproportionately high rates of dental caries, were more likely to have unmet treatment needs and less likely to utilize dental sealants. Significant variance among oral health/ oral disease indicators was found among ethnic and regional groups and all Hawaii cohorts were found to have poorer oral health indicators by contrast with U.S. national findings. Data was not found to follow any particular pattern with regards to urban vs. rural settings. This report shows the value of considering a variety of oral health indicators in evaluating the health of a community. More research needs to be done in evaluating the influence of socioeconomic status and cultural beliefs and practices on the oral health of young children in Hawai'i. (PHD, 2003; 10 (1), Pages 17-22)

### Introduction

The State of Hawaii is an ethnically, culturally and socially diverse island community and is the fourth smallest state in land mass; larger than Connecticut, Delaware and Rhode Island. With an estimated 1,211,537 residents, according to the 2000 United States (U.S.) Census, Hawai'i ranks 42nd in population size.<sup>1</sup> The State extends from the Island of Hawai'i in the southeast to Kure Atoll in the northwest, a distance of about 1,500 miles. However, only seven islands house residents. The majority, 72.3 percent, of residents live on the Island of O'ahu, followed in census by the Islands of Hawai'i, Maui, Kaua'i, Moloka'i, Lanai and Ni'ihau.<sup>2</sup>

Hawai'i holds the distinction of being the only state in the nation where Asians and Pacific Islanders, 50.9 percent of the State population, are the ethnic majority. Based upon the 2000 census, Caucasians represent the largest (unmixed) ethnic group, making up 24.3 percent of the population, followed by Japanese, 16.6 percent, Filipinos, 14.1 percent and Chinese, 4.7 percent. Persons of mixed ethnic heritage account for 21.4 percent and Native Hawaiians (pure and part Hawaiians) account for 9.4 percent of the population.

In 1995, per capita personal income among Hawai'i residents exceeded the national mean by 7 percent and the cost of living index exceeded the U.S. mean by 20.5 percent. The cost of living in urban O'ahu exceeded the urban U.S. mean by 35.1 percent and Honolulu placed second highest in living costs among metropolitan areas, above Washington, D.C. and below Manhattan. (By contrast with New York City as a whole, Honolulu had the highest cost of living index.)<sup>2</sup>

Based upon 1994 findings, Hawai'i is ranked very high among states as having a very favorable dentist to population ratio. With 81.0 dentists per 100,000 residents, Hawai'i is second highest on the national list,

below New York State (82.7 per 100,000) and above Massachusetts (80.9 per 100,000).<sup>2</sup> This represents an increase over 1990 findings which identified 73.8 dentists per 100,000 population in Hawai'i.<sup>3</sup> Today, based upon an examination of the local telephone company business phone directory (1999), the most accurate means available to us in determining the distribution of dentists in active practice, it appears that the current estimate is 86.9 dentists per 100,000 or 1 dentist to 1,213 residents Statewide.

Since first demonstrated in 1958 through a standardized DMFT survey of school children, children in Hawai'i have been shown consistently to exhibit among the highest caries prevalence rates in the nation. Kau et al identified *mean caries prevalence rates in secondary or permanent teeth* (DMFT) rates, which exceeded those reported in several regions of the U.S. mainland as well as significant variance among ethnic groups.<sup>2</sup> [DMFT is the caries prevalence rate which reflects the mean number of secondary teeth which are decayed, filled or missing due to caries.] Of the six ethnic groups reported, Japanese children exhibited the highest DMFT, followed by part-Hawaiians, Filipinos, (pure) Hawaiians, Chinese and Caucasians. A 1968 survey demonstrated that dental caries was most prevalent among children of Japanese ancestry, followed by Hawaiians, Filipinos and Caucasians.<sup>2</sup> An investigation in 1972 demonstrated that Native Hawaiian eighth graders had higher DMFT scores than Japanese, who had higher scores than Caucasians.<sup>2</sup> In this study, it was reported that DMFT scores for Native Hawaiians were found to be significantly higher than those of Japanese ( $p < 0.001$ ) and Caucasians and that the variance between Japanese and Caucasian children was not statistically significant. In 1987, Louie et al described dmfs, dft and BBTD rates among Hawai'i Head Start enrollees which exceeded those found in California and were less than those found among cohorts in other areas of the Pacific basin.<sup>2</sup>

Hawai'i has been essentially excluded from past efforts of the National Institute of Dental & Craniofacial Research National Dental Caries Prevalence Surveys. The 1979-1980 national caries prevalence survey did not include Hawaii or Alaska in its sample.<sup>2</sup> The 1986-1987 sample excluded Alaska, but included Hawai'i for the first time. Hawai'i was part of a regional sample including California, Oregon and Washington State; however, the Hawai'i State cohort was limited to a very small random sample and the survey did not generate locally valuable information.<sup>2</sup>

Given the groundwork laid by previous researchers with smaller, more narrowly focused Hawai'i samples, this project was undertaken in order to develop a more comprehensive and regionally and ethnically specific oral health profile of Hawaii's children. Reported here are statistical findings from samples in 1989 and 1999 of public school children Statewide.

## Methods

In 1988, planning was initiated for the development of a low cost and user-friendly oral health data collection and analysis system. Caries prevalence survey observational criteria established for Hawaii's dft and DMFT surveys are consistent with National Institute of Dental Research standards. [*Dft refers to a caries prevalence rate, which reflects the mean number of primary teeth, which are decayed or filled due to caries.*] Forms and calibration manuals were developed and licensed dental hygienists employed by the Dental Health Division of Hawai'i State Department of Health were trained and calibrated. Calibration was repeated at various intervals between 1988 and 1999. Examinations and recordings were carried out chair side on elementary school campuses. Armamentaria included World War II vintage portable dental chairs, halogen lamps, explorers and mouth mirrors. Records were batched for entry into computerized database system by Division staff calibrated for the task of data entry.

For the purpose of this comparative analysis, the 1989 and 1999 data sets included only data collected at the same schools. The 1988-1989 and 1998-1999 school year samples included 28,086 and 24,752 children, respectively. The large sample sizes assured that a reliable analysis could be done both on the sample aggregate and numerous sub-populations.

Social research and planning in Hawai'i are somewhat dependent upon the ability to separate valid data sets by region (and island) and ethnic group.

For this project, ethnic groups were defined within the context of commonly accepted definitions applied in Hawai'i. Not reflected among the data presented here is the category "Other", which included children not fitting the ethnic groups presented. "Native Hawaiian" includes all children of Native Hawaiian ancestry, that is, children with Hawaiian roots which pre-date European contact, regardless of blood quantum. 'Other Pacific Islanders' are children of Pacific Island ancestry, other than Native Hawaiian. This group is made up largely of Samoan, Tongan and Micronesian children. "Asian Mixed" were

multi-ethnic children of Asian lineage. "East-West Mixed" are multi-ethnic children of Asian and Caucasian or African-American. "Southeast Asians" include Vietnamese, Cambodian, Laotian and Indonesian children, as well as others from that geographic region. "Asians and Pacific Islanders", as defined in this project, includes 'east Asians' (Chinese, Japanese, Koreans, Filipinos and Southeast Asians) and Pacific Islanders (Native Hawaiians and 'Other Pacific Islanders'). While the number of Asians other than those identified above is unknown, their numbers would not have an influence on our statistical findings due to their very low population in Hawai'i. "Non-Asian or Pacific Islanders" include Caucasians, African-American and Hispanics.

## Results

Analysis of the set reveals some remarkable disparities in oral health when Hawai'i is compared with the U.S. mainland and different Hawai'i regional and ethnic groups are contrasted. This was true for both 1989 and 1999. Oral health indicators reported include caries prevalence rates (dft and DMFT), proportion of children with rampant early childhood caries, proportion of children with unmet treatment needs and proportion of children utilizing dental sealants.

## Caries Prevalence

Though statistically insignificant, between 1989 and 1999, the age-weighted caries prevalence rate affecting the primary dentition of children 5 through 9 years of age, appeared to have increased (Table 1). On the other hand, the decrease in caries prevalence rate among secondary teeth among 8 year olds was statistically significant. As typically found in caries prevalence surveys, boys exhibited higher rates of caries in the primary dentition and girls exhibited higher rates in the secondary dentition.

While all islands exhibited dft rates far exceeding the national mean in 1987, significant variance was found among islands. Among the six major populated islands, statistically significant reductions in dft were found between 1989 and 1999 on Kaua'i and Moloka'i. Though statistically insignificant, the Islands of Hawai'i and O'ahu showed increases in mean dft. For DMFT, all islands with the exception of Lana'i exhibited significant reductions in DMFT rates, while Lana'i exhibited a statistically insignificant increase.

Most striking were our findings of significant variance among ethnic cohorts. As a group, Asian & Pacific Islander (API) children exhibited disproportionately poor oral health indicators by contrast with children of European, African or Latin origins (non-APIs). Interestingly, non-APIs showed a statistically significant increase in dft over the ten-year period. While API children demonstrated a statistically significant decrease in dft, APIs still exhibited close to the twice the caries rate found in non-APIs. Most ethnic cohorts examined showed decreases (varying in significance) in mean dft. African-Americans, Caucasians, Hispanics and 'Pacific Islanders other than Native Hawaiians' exhibited increases in mean dft. For mean DMFT, all exhibited decreases.

The relative ethnic variance exhibited falls within what might be considered "common knowledge" among public health professionals in Hawai'i, with Caucasian and Japanese children being among the most 'dentally healthy' and Pacific Islanders, Southeast Asians and Filipinos being among the least 'dentally healthy'. However, the data does challenge any assumption that 'rural' communities are less 'dentally healthy' than 'urban' communities. While some oral health indicators presented reflect more favorable numbers for O'ahu (arguably the State's most urban island center), in most instances, variance with the other islands is not statistically significant. In 1999, the mean dft rate in Honolulu (the urban center of O'ahu) was 4.197 (s.d. 3.879). This rate was statistically equivalent with those found on Maui, Moloka'i and Kaua'i ( $p>0.05$ ) and below the rates found on the Island of Hawai'i ( $p<0.05$ ). For DMFT, the rate in Honolulu was 0.687 (1.222), which was statistically higher than the rates on the Islands of Maui, Kaua'i, Moloka'i and

Hawai'i ( $p<0.05$ ). Clearly, urban and rural communities can face the same challenges in attempting to control and prevent oral disease.

### Rampant early childhood caries

As a proxy for 'early childhood caries', 5 year old children were examined for the presence of a pattern of rampant primary dentition caries commonly attributed to poor feeding habits, poor oral hygiene, inappropriate use of baby bottles and nursing-on-demand. Progressive smooth surface caries affecting the primary maxillary (upper) incisors is a result of caries activity which is initiated shortly after a child's first primary teeth erupt at approximately 6 months of age. Therefore, this pattern may serve as a proxy for caries activity among young children. A caries pattern consistent with "Baby Bottle Tooth Decay" is believed to be present in an estimated 5 percent of U.S. 5 year olds.<sup>2</sup>

**Table 1. Caries prevalence among young children in Hawai'i, 1989 vs. 1999**

	dft (s.d.) <sup>a</sup>				Variance	DMFT (s.d.) <sup>b</sup>				Variance
	Among 5-9 year olds					Among 8 year olds				
U.S. mainland (1987)	1.884 (0.048)					0.510 (0.029)				
	1989		1999			1989		1999		
Hawai'i Statewide	3.890	(3.722)	3.910	(3.671)	*	0.882	(1.359)	0.553	(1.090)	$p<0.001$
Girls	3.737	(3.679)	3.765	(3.593)	*	0.986	(1.410)	0.632	(1.171)	$p<0.001$
Boys	4.032	(3.756)	4.042	(3.736)	*	0.787	(1.304)	0.481	(1.005)	$p<0.001$
Non-APIs <sup>c</sup>	2.208	(2.958)	2.328	(3.028)	$p<0.05$	0.533	(1.140)	0.261	(0.730)	$p<0.001$
Asians & Pacific Islanders <sup>d</sup>	4.405	(3.778)	4.297	(3.712)	$p<0.005$	0.981	(1.400)	0.617	(1.144)	$p<0.001$
Island of Hawai'i	3.339	(3.456)	3.428	(3.327)	$p<0.001$	0.645	(1.194)	0.517	(1.042)	$p<0.05$
O'ahu	3.863	(3.695)	3.898	(3.678)	*	0.889	(1.363)	0.552	(1.094)	$p<0.001$
Maui	4.436	(4.082)	4.259	(3.819)	*	0.997	(1.441)	0.576	(1.092)	$p<0.001$
Kaua'i	4.556	(3.963)	4.123	(3.939)	$p<0.02$	1.091	(1.450)	0.500	(1.041)	$p<0.001$
Moloka'i	4.794	(3.620)	4.035	(3.530)	$p<0.002$	1.274	(1.467)	0.370	(0.861)	$p<0.001$
Lana'i	5.609	(4.813)	5.034	(3.657)	*	1.348	(1.824)	1.429	(1.461)	*
African Americans	1.826	(2.664)	2.057	(2.812)	*	0.500	(1.144)	0.283	(0.712)	*
Caucasians	2.194	(2.950)	2.253	(2.990)	*	0.542	(1.101)	0.232	(0.690)	$p<0.001$
Hispanics	2.765	(3.301)	3.210	(3.396)	$p<0.05$	0.495	(1.451)	0.442	(0.972)	*
Japanese	3.318	(3.637)	2.738	(3.352)	$p<0.001$	0.620	(1.105)	0.334	(0.898)	$p<0.001$
East-West Mixed <sup>e</sup>	3.533	(3.558)	3.258	(3.510)	$p<0.01$	0.788	(1.298)	0.413	(0.936)	$p<0.001$
Chinese	3.774	(3.764)	3.541	(3.777)	*	0.819	(1.413)	0.493	(1.040)	$p<0.05$
Koreans	4.083	(3.567)	4.224	(3.621)	*	0.705	(1.216)	0.702	(1.195)	*
Asian Mixed <sup>f</sup>	4.218	(3.787)	3.937	(3.704)	*	0.927	(1.314)	0.415	(0.871)	$p<0.001$
Other Pacific Islanders <sup>g</sup>	4.253	(3.473)	4.544	(3.438)	$p<0.02$	1.184	(1.459)	0.866	(1.270)	$p<0.002$
Native Hawaiians <sup>h</sup>	4.306	(3.598)	4.189	(3.495)	$p<0.05$	0.981	(1.390)	0.570	(1.107)	$p<0.001$
Samoan	4.347	(3.572)	4.483	(3.389)	*	1.127	(1.433)	0.822	(1.230)	$p<0.01$
Tongan	4.711	(3.505)	4.622	(3.461)	*	1.364	(1.458)	0.985	(1.481)	*
Southeast Asians	5.726	(4.049)	5.046	(3.937)	$p<0.05$	1.536	(1.513)	0.680	(1.232)	$p<0.001$
Filipinos	5.747	(3.966)	5.414	(3.935)	$p<0.001$	1.226	(1.542)	0.811	(1.291)	$p<0.001$

<sup>a</sup> dft defined as mean numbers of decayed or filled primary teeth (deciduous dentition caries prevalence)

<sup>b</sup> DMFT defined as mean numbers of decay, missing due to decay or filled secondary teeth (permanent dentition caries prevalence)

<sup>c</sup> Non-APIs include Caucasians, African-Americans and Hispanics

<sup>d</sup> APIs in Hawai'i exclude Caucasians, African-Americans and Hispanics

<sup>e</sup> Asians + non-Asian (European, African American, etc.) mixed ancestry

<sup>f</sup> Asian + Asian mixed ancestry

<sup>g</sup> Pacific Islanders other than Native Hawaiians

<sup>h</sup> Persons of Native Hawaiian ancestry regardless of blood quantum

\* Variance statistically insignificant ( $p>0.05$ )

**Table 2. Oral health indicators among young children in Hawai'i, 1989 vs. 1999**

U.S. mainland	5 year olds with a "Baby Bottle Tooth Decay" <sup>a</sup>				6 through 8 year olds with Unmet Treatment Needs <sup>b</sup>				8 year olds with at least one Dental Sealant			
	~ 5 percent				~ 5 percent				~ 5 percent			
	1989		1999		1989		1999		1989		1999	
Hawai'i Statewide	16.9%	± 1.0	13.7%	± 0.9	38.8%	± 0.7	36.0%	± 0.7	15.1%	± 0.9	20.4%	± 1.0
Boys	17.0	± 1.5	13.9	± 1.3	38.8	± 1.0	36.9	± 1.0	14.6	± 1.3	20.0	± 1.4
Girls	16.9	± 1.5	13.5	± 1.3	38.9	± 1.0	34.9	± 1.0	15.6	± 1.3	20.9	± 1.5
Non-APIs <sup>c</sup>	6.9	± 1.4	5.9	± 1.4	26.0	± 1.3	23.2	± 1.4	17.2	± 2.1	25.2	± 2.6
Asians & Pacific Islanders <sup>d</sup>	20.5	± 1.3	15.9	± 1.1	42.7	± 0.8	38.9	± 0.8	14.5	± 1.0	19.4	± 1.1
Island of Hawai'i	16.2	± 3.0	8.4	± 2.4	36.8	± 2.1	30.0	± 1.9	19.3	± 2.9	19.0	± 2.9
O'ahu	16.0	± 1.2	14.2	± 1.2	38.1	± 0.8	37.9	± 0.9	14.7	± 1.0	14.2	± 1.2
Kaua'i	19.6	± 5.1	13.6	± 3.8	48.5	± 4.1	26.8	± 2.8	14.8	± 4.8	21.6	± 5.4
Moloka'i	32.7	± 9.1	16.3	± 7.1	45.8	± 5.1	39.1	± 5.5	13.8	± 6.0	35.1	± 9.6
Maui	22.7	± 4.6	13.5	± 2.6	42.2	± 2.9	36.0	± 2.0	12.5	± 3.7	12.5	± 2.3
Lana'i	23.3	± 15.1	23.3	± 12.6	63.6	± 10.7	33.0	± 8.6	4.3	± 8.3	5.9	± 7.9
African Americans	3.8	± 3.3	1.5	± 2.1	26.4	± 3.9	25.4	± 4.2	13.3	± 5.3	19.7	± 6.9
Caucasians	6.5	± 1.5	5.5	± 1.5	25.6	± 1.5	22.2	± 1.4	17.6	± 2.3	27.1	± 3.0
Japanese	9.9	± 2.8	7.6	± 2.8	22.1	± 2.1	16.1	± 2.2	20.8	± 3.6	19.1	± 4.2
Hispanics	13.5	± 5.8	13.4	± 6.1	29.1	± 4.7	27.9	± 4.8	18.3	± 7.3	17.7	± 7.0
East-West Mixed <sup>e</sup>	12.7	± 2.8	7.8	± 2.5	33.9	± 2.2	24.7	± 2.2	16.3	± 3.2	22.3	± 3.7
Chinese	14.9	± 6.5	9.7	± 4.7	31.1	± 5.1	34.5	± 4.5	12.4	± 6.3	18.4	± 6.5
Asian Mixed <sup>f</sup>	15.0	± 5.7	12.1	± 4.5	32.0	± 3.7	25.2	± 3.1	19.4	± 5.4	21.1	± 5.1
Native Hawaiians <sup>g</sup>	20.0	± 2.2	13.9	± 1.8	46.1	± 1.4	39.6	± 1.3	13.5	± 1.6	20.3	± 1.8
Koreans	22.0	± 11.5	21.0	± 13.0	44.4	± 7.1	36.3	± 7.2	21.3	± 10.3	19.3	± 10.2
Other Pacific Islanders <sup>h</sup>	23.1	± 5.0	21.1	± 4.4	61.0	± 3.2	62.4	± 2.7	7.6	± 3.1	16.7	± 3.5
Samoa	23.4	± 4.8	22.7	± 5.7	62.1	± 3.1	63.4	± 3.4	7.7	± 3.1	17.8	± 4.6
Tongan	30.8	± 11.2	18.7	± 9.6	68.8	± 6.4	65.2	± 6.2	5.4	± 5.5	8.8	± 6.9
Southeast Asians	36.4	± 16.4	23.7	± 13.5	47.9	± 7.5	48.0	± 6.5	7.1	± 6.7	30.7	± 10.4
Filipinos	32.7	± 3.3	24.6	± 2.6	50.0	± 1.8	45.4	± 1.6	13.4	± 2.2	16.8	± 2.1

95% C.I.

<sup>a</sup> "Baby Bottle Tooth Decay" a pattern of rampant tooth decay defined as 3 or more carious maxillary anterior primary teeth<sup>b</sup> Children with actively carious teeth in need of treatment<sup>c</sup> Non-APIs include Caucasians, African-Americans and Hispanics<sup>d</sup> APIs in Hawai'i exclude Caucasians, African-Americans and Hispanics<sup>e</sup> Asians + non-Asian (European, African American, etc.) mixed ancestry<sup>f</sup> Asian + Asian mixed ancestry<sup>g</sup> Pacific Islanders other than Native Hawaiians<sup>h</sup> Persons of Native Hawaiian ancestry regardless of blood quantum

As shown on Table 2, in Hawai'i, there was a reduction from 16.9 percent to 13.7 percent of all 5 year olds examined who presented with 3 or more carious maxillary incisors, a conservative definition of "Baby Bottle Tooth Decay". [Children have four maxillary incisors.] The decrease found among boys and girls was found to be statistically significant. Though the variance is not statistically significant at all sites, the percentage of children affected appears to have decreased on all islands except Lana'i.

In 1999, APIs as a group, at 15.9 percent (95% C.I. 14.8, 17.0), the proportion of affected children far exceeds the 5.9 percent (95% C.I. 4.5, 7.3) found among non-APIs. Rates of rampant early childhood caries were found to be highest among Koreans, Pacific Islanders other than Native Hawaiians, Southeast Asians and Filipinos. By

contrast with finding in 1989, Southeast Asian, Filipinos and Native Hawaiians exhibited the greatest improvement. Though the U.S. estimate is based upon a meta-analysis, these findings demonstrate that API toddlers and pre-school age children in Hawai'i are at significantly higher risk than non-API children, who have rates comparable with U.S. mainland children.

### Unmet treatment needs

An evaluation of unmet treatments needs or the proportion of children with one or more decayed primary or secondary teeth (children with active caries in need of restorative services) is a proxy measure of community need and relative dental care utilization. This indicator is consistent with the U.S. Healthy People 2010 Objective 21.2b to "Reduce the proportion of children with untreated dental

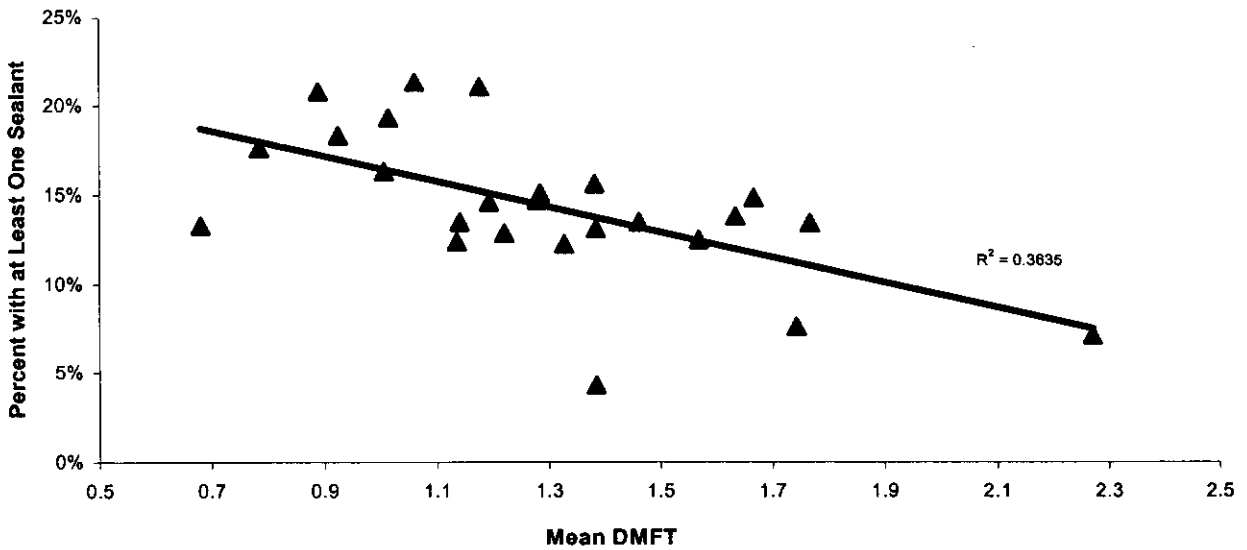
decay in primary and permanent teeth to not more than 21 percent'.<sup>1</sup> The U.S. national baseline is estimated at 29 percent. In 1999, at 36.0 percent of 6 through 8 year olds overall, the rate in Hawai'i of unmet treatment needs exceeded the national baseline (Table 2). The rate found among non-APIs in Hawai'i of 23.2 percent (95% C.I. 21.8, 24.6) is below the national baseline and well below the rate of 38.9 percent (38.1, 39.7) found among Hawai'i APIs.

By island, the rate ranges from 26.8 percent (95% C.I. 24.0, 29.6) on Kaua'i to 39.1 percent (33.6, 44.6) on Moloka'i. While most island and ethnic cohorts exhibited improvement between 1989 and 1999, this variance was statistically significant only on the islandsof Hawai'i, Kaua'i, Maui and Lana'i and among Caucasians, Japanese, Native Hawaiians and Filipinos and multi-ethnic children. In 1999, the highest rates of unmet treatment needs were found among 'Other Pacific Islanders', Southeast Asians, Filipinos and Native Hawaiians, at 62.4, 48.0, 45.4 and 39.6 percent, respectively.

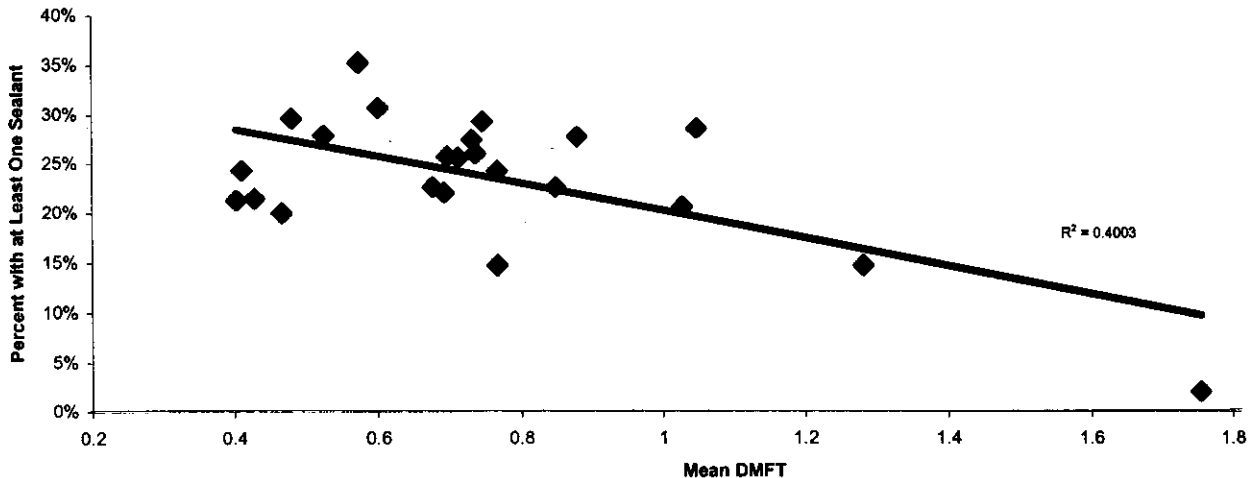
### Dental Sealants

The proportion of 8-year-old children with at least one dental sealant is a proxy indicator of utilization of preventive dental services among adolescents. The data presented is consistent with U.S. Healthy People 2010 Objective 21.8 to 'Increase the proportion of children who have received dental sealants on their molar teeth to not less than 50 percent'. In 1999 there was generally significant improvement in sealant utilization among most Hawai'i cohorts, most fell short of the national baseline of 23 percent, as shown in Table 2. The greatest improvement between 1989 and 1999 occurred on the Island of Moloka'i, from 13.8 percent (95% C.I. 7.8, 19.8) to 35.1 percent (25.5, 44.7), and among Southeast Asians, from 7.1 percent (0.4, 13.8) to 30.7 percent (20.3, 41.1). Caucasian children also exhibited a significant increase in sealant utilization, from 17.6 percent (15.3, 19.9) to 27.1 (24.1, 30.1). Collectively, greater improvement was found among non-APIs, from 17.2 percent (15.1, 19.3) to 25.2 (22.6, 27.8), than APIs, from 14.5 percent (13.5, 15.4) to 19.4 percent (18.3, 20.5).

**Figure 1 Linear Correlation Between Percentage of 8 Year Old Children with Sealants and Mean DMFT Among 9 Year Olds in Hawai'i, 1989**



**Figure 2 Linear Correlation Between Percentage of 8 Year Old Children with Sealants and Mean DMFT Among 9 Year Olds in Hawai'i, 1999**



Numerous comprehensive reviews have shown the effectiveness of pit and fissure sealants<sup>1</sup> Figures 1 and 2 show an apparent negative correlation between sealant utilization in Hawai'i and DMFT rates. While many factors are associated with the utilization of dental sealants and caries risk among populations, and it cannot be concluded that sealants alone have directly affected DMFT rates in Hawai'i, there is reason to assume that sealant placement in Hawai'i has, at least indirectly, reduced caries risk and prevalence among older children.

## Discussion

As can be seen from the findings of this report, no single oral health indicator may be used in assessing the health status of a community, or the relative health status of cohorts in the same community. A fairly accurate and comprehensive picture can be drawn of oral health status utilizing a variety of indicators of disease rate, preventive service utilization and unmet treatment needs.

Overall, our findings show that children in Hawai'i suffer from disproportionately higher rates of dental caries by contrast with their mainland counterparts and that Asian and Pacific Islander children in Hawai'i have poorer oral health than other children in the same communities of Caucasian, African-American or Hispanic ancestry. While more research is needed to assess the impact of socioeconomic status and cultural beliefs and practices on the oral health of young children, we know that, in Hawai'i, as with most health indicators, we have significant variance between regional and ethnic groups.

Hawai'i is fortunate to have a high concentration of practicing dentists, as data reflect high rates of treatment service needs. This high rate of disease and need for treatment services is not expected to wane unless policy makers are willing to implement a comprehensive dental disease prevention strategy, which includes the implementation of a community water fluoridation program. Until then it is expected that for the foreseeable future, improvements in oral health status will continue to be marginal, incremental and unpredictable in nature.

## Acknowledgements

The authors wish to acknowledge the loyal and dedicated staff of the Hawai'i State Department of Health's Dental Hygiene Branch, without whom this project would have been impossible.

## Reference

1. U.S. Census Bureau, 2000
2. The State of Hawai'i DATA BOOK 1997. State of Hawai'i Department of Business, Economic Development & Tourism, Research and Economic Analysis Division; P.O. Box 2359, Honolulu, Hawai'i 96804.
3. Factbook - United States Health Personnel. Health Resources and Services Administration, U.S. Department of Health and Human Services, Washington, D.C.: Government Printing Office, 1997.
4. Manpower Project, Report No. 2; American Association of Dental Schools, Washington, D.C., 1989.
5. Kau, M., Robinson, J., Bennett, C. Dental Caries Among Hawai'i's School Children. *Journal of the American Dental Association*; 1961; 63:653-665.
6. Chung, C., Runck, D., Niswander, J., Bilben, S., Kau, M. Genetic and Epidemiologic Studies of Oral Characteristics in Hawai'i's School Children: I. Caries and Periodontal Disease. *Journal of Dental Research*; 49(6):1374-1385, 1970.
7. Hankin, J., Chung, C., Kau, M. Genetic and Epidemiologic Studies of Oral Characteristics in Hawai'i's School Children: Dietary Patterns and Caries Prevalence. *Journal of Dental Research*; 52(5):1079-1086, 1973.
8. Louie, R., Brunelle, J., Maggiore, E., Beck, R. Caries Prevalence in Head Start Children, 1986-87. *Journal of Public Health Dentistry*; 50(5):299-305, 1990.
9. The Prevalence of Dental Caries in United States Children, The National Dental Caries Prevalence Survey: 1979-1980. National Caries Program, National Institute of Dental Research, *NIH Publication No. 82-2245*, December, 1981.
10. Oral Health of United States Children, The National Survey of Dental Caries in U.S. Children: 1986-1987 Epidemiology and Oral Disease Prevention Program, National Institute of Dental Research, *NIH Publication No. 89-2247*, September, 1989
11. Ripa, Louis Nursing Caries: A Comprehensive Review. *Pediatric Dentistry*; 10:268-282, 1988.
12. U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington, DC: U.S. Government Printing Office, November 2000.
13. Weintraub, JA. The effectiveness of pit and fissure sealants. *J Public Health Dent*, 1989; 49(5 Spec No.): 317-30.

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