HAWAI'I MEDICAL JOURNAL

August 2006 Volume 65, No. 8 ISSN: 0017-8594

Hawaii Medical Association

presents its

2006 ANNUAL MEETING

LEADING THE WAY...

BUILDING ON 150 YEARS OF SERVICE

Featuring CME and the Ola Pono Ike Medical Ball

October 20—22, 2006 Hawai'i Convention Center

REGISTRATION FORM

4 Ways to Register:

Online Fill out the form on HMA's website, www.hmaonline.net

Phone Call (808) 536-7702 Monday through Friday 9 A.M. to 4:30 P.M. with your credit card information.

Fax Fax completed form with credit card information to (808) 528-2376; toll-free (866) 528-2376.

Mail Send completed form with credit card information or check (payable to HMA) to: HMA Annual Meeting, 1360 S. Beretania St, #200, Honolulu, HI 96814.

REGISTRANT INFORMATION

Name_____

☐ MD ☐ DO Specialty_____

☐ Other_____

Mailing Address_____

City/State/Zip_____

Phone_____ Fax_____

Email_____

ANNUAL MEETING REGISTRATION FEE (Only the HMA member fee includes one Ola Pono Ike ticket)

☐ HMA Member - $225 ☐ Non-Member - $225

☐ Active Military - $75 ☐ Allied Health - $150

☐ Medical Student/Resident - $75 OR

☐ I want to volunteer for the Meeting in exchange for a student/resident registration fee scholarship

REFUND: To receive a refund of the registration fee, cancellations must be made in writing. Ola Pono Ike tickets are non-refundable. Registration fee refunds will be processed less 20% service fee if made by October 5, 2006. No refunds will be made after that date.

I will attend the following CME lunches (included with Annual Meeting registration):

☐ Saturday - The ABCs of Chronic Kidney Disease: Management Pearls for the PCP

☐ Sunday - Integrative & Complementary Medicine: Use of CAM with Cancer Patients

Addiction Medicine Pre-Conference Registration (FREE)

☐ I will attend the Annual Meeting AND Pre-Conference

☐ Pre-Conference ONLY ☐ I am not able to attend

OLA PONO IKE MEDICAL BALL (HMA members receive one free ticket with Annual Meeting registration)

HMA member registrants:

☐ I will attend ☐ I am unable to attend

Additional Tickets:

☐ Individual Seat $150 x_____ ☐ Table of Ten $1,500 x_____

Guest Name_____

If purchasing more than one ticket, please use an additional sheet of paper to list guest names.

☐ I am unable to attend, please accept my donation $_____

METHOD OF PAYMENT

☐ Check or money order payable to HMA

☐ VISA ☐ MasterCard ☐ American Express

Cardholder Name_____

Card Number_____

Exp. Date_____ Zip Code of Billing Statement_____

Total Payment $_____

Signature_____

For more information, call (808) 536-7702

HAWAI'I MEDICAL JOURNAL
(USPS 237-640)

Published monthly by the
Hawai'i Medical Association
Incorporated in 1856 under the Monarchy
1360 South Beretania, Suite 200
Honolulu, Hawai'i 96814-1520
Phone (808) 536-7702; Fax (808) 528-2376

 The *Hawai'i Medical Journal* (USPS 237640) is published monthly by the Hawai'i Medical Association (ISSN 0017-8594), 1360 South Beretania Street, Suite 200, Honolulu, Hawai'i 96814-1520.

Postmaster: Send address changes to the *Hawai'i Medical Journal*, 1360 South Beretania Street, Suite 200, Honolulu, Hawai'i 96814. Periodical postage paid at Honolulu, Hawai'i.

Nonmember subscriptions are $25.

Contents

Cover art by Dietrich Varez, Volcano, Hawai'i. All rights reserved by the artist.

"In Memoriam"

A design made for three air-ambulance workers who were killed when their aircraft crashed on the Big Island.

Over 50 Years of...

...Dedication to Hawaii's Physicians!

The Board of Directors at Physicians Exchange of Honolulu invite you to experience the only service designed by and for Physicians in Hawaii.

President: Franklin Young M.D.

Vice President: Garret Yoshimi

Treasurer: Stephen Bugman

Secretary: Stephen Kemble M.D.

Directors:

Richard Ando Jr. M.D.

Linda Chiu M.D.

Paul DeMare M.D.

Robert Marvit M.D.

Ann Barbara Yee M.D.

Manager: Rose Hamura

- **Professional 24 Hour Live Answering Service**
- **Relaying of Text Messages to Pagers and Cell Phones**
- **All Calls Confirmed, Documented and Stored for 7 Years**
- **HIPAA Compliant**
- **Affordable Rates**
- **Paperless Messaging**
- **Receptionist Services**
- **Subsidiary of Honolulu County Medical Society**
- **Discount for Hawaii Medical Association members**

Discover the difference of a professional answering service. Call today for more information.

Physicians Exchange of Honolulu, Inc.
1360 S. Beretania Street, #301
Honolulu, HI 96814

524-2575

Franklin Young MD
President

Garret Yoshimi
Vice-President

Stephen Kemble MD
Secretary

Stephen Bugman, Treasurer (not pictured)

Richard Ando Jr. MD
Director

Linda Chiu MD
Director

Paul DeMare MD
Director

Robert Marvit MD
Director

Ann Barbara Yee MD
Director

Rose Hamura
Manager

Patterns of Childhood Cancer in Hawai'i Between 1975 and 2000

Stella Wenceslao BS, Carolyn C. Gotay PhD, Leo Wang-Kit Cheung PhD, and Kami White MPH

Stella Wenceslao BS

Carolyn C. Gotay PhD

Leo Wang-Kit Cheung PhD

Kami White MPH

Correspondence to:
Carolyn C. Gotay PhD
Cancer Research
Center of Hawai'i,
University of Hawai'i
1960 East-West Road
Biomed C-105
Honolulu, HI 96822

Abstract

This study investigated the 25-year incidence of childhood cancer in Hawai'i, including sex, age, and ethnic differences and time trends. Leukemia was the most common diagnosis. Japanese in Hawai'i have lower pediatric cancer rates than for the United States. Previous trends toward increasing ethnic disparities in incidence rates were not found. Growing numbers of survivors imply the need for increased follow-up care.

Introduction

Over the past 20 years, cancer was the leading disease-related cause of death for American children under 20 years old, and the fourth overall cause of death in this age group.[1] According to *Hawai'i Cancer Facts & Figures 2003 – 2004*, cancer was also a leading cause of mortality in Hawai'i children.[2] While fewer than 1% of all cancers occurred in children less than 15 years of age, cancer was the second leading cause of death among 5 to14 year-olds from 1995 to 2000.

Hawai'i provides a unique opportunity to examine possible ethnic differences in cancer incidence, given the diverse ancestry of state residents. Five major ethnic groups make up 87% of Hawai'i's population of 1.2 million: Caucasian (24%), Native Hawaiian/Part Hawaiian (20%), Japanese (19%), Filipino (17%) and Chinese (7%). Examining state cancer rates is facilitated by the availability of the Hawai'i Tumor Registry, a population-based cancer registry that tracks cancer cases for the entire state. Created in 1960, the Registry has been a participant in the National Cancer Institute (NCI)'s Surveillance, Epidemiology, and End Results (SEER) Program since its inception in 1973. SEER includes registries across the United States that serve as a basis for national cancer statistics.

The purpose of this study is to describe the incidence of childhood cancers in Hawai'i from 1975-2000 according to ethnicity, age, sex, and type of cancer. This manuscript builds on an earlier report by Goodman, Yoshizawa, and Kolonel,[3] which examined childhood cancers in different ethnic groups in Hawai'i from 1960 to 1984. That paper concluded that incidence rates for childhood cancer in Hawai'i were similar to those found in all national SEER areas. However, rates in Hawai'i appeared to be increasing over time in Caucasian boys and Hawaiian girls. These findings need to be tempered by the small sample size, which may yield unstable statistical results.

This study investigates whether the trends suggested in the Goodman, et al.[3] paper persisted over the next two decades. Our analysis uses a larger sample that includes the most recent data available. Findings of this analysis will be compared with those of Goodman, et al.[3] and data from the most recent SEER Pediatric Monograph[1] that reports data for the United States.

Materials and Methods

Data were collected from the Hawai'i Tumor Registry. The primary criterion for participant selection was cancer diagnosis up to 19 years of age. Although some studies define childhood as before the 15th birthday,[3] the majority of pediatric cancer reports include individuals up to age 19. Data were abstracted for ethnicity, sex, age at diagnosis, year of diagnosis, type of cancer, and vital status (alive or deceased).

Childhood cancers were classified according to the following 12 major categories using the International Classification of Childhood Cancers (ICCC): leukemias, lymphomas and reticuloendothelial neoplasms, central nervous system and miscellaneous intracranial and intraspinal neoplasms, sympathetic nervous system (sns) tumors, retinoblastoma, renal tumors, hepatic tumors, malignant bone tumors, soft tissue sarcomas, germ-cell, trophoblastic and other gonadal neoplasms, carcinomas and other malignant epithelial neoplasms, and other and unspecified malignant neoplasms.

Age-specific and age-adjusted incidence rates per million for all childhood cancers from 1975 – 2000 were calculated. Population estimates were obtained from the Bureau of the Census for the year 2000. For the years 1975-1999, population estimates developed by the Hawai'i Tumor Registry was used rather than census counts in order to more appropriately account for the Native Hawaiian population. Details have been described elsewhere.[2] Age-adjusted incidence rates were calculated using the direct method and the World Population Standard. Join-point analyses were conducted to

Table 1.— Age-specific and age-adjusted (world population standard) incidence rates per million, Hawai'i 1975 - 2000

Childhood Cancer Types		Cases	Age at Diagnosis (years) 0-4	5-9	10-14	15-19	Age Adjusted
Leukemia	Males	194	84.0	41.0	26.3	27.5	47.5
	Females	169	83.0	40.4	23.8	18.0	44.4
– Acute Lymphocytic	Males	133	65.2	31.5	9.7	15.6	33.1
	Females	119	65.1	32.3	13.5	5.0	31.8
– Acute Non-Lymphocytic	Males	47	13.4	7.6	12.6	10.1	11.0
	Females	41	16.0	5.0	8.3	11.0	10.4
– Other	Males	14	5.4	1.9	3.9	1.8	3.4
	Females	9	1.9	3.0	2.1	2.0	2.2
Carcinomas and Other Malignant Epithelial Neoplasms	Males	42	–	1.9	11.7	25.7	8.9
	Females	67	3.8	2.0	11.4	50.0	15.5
CNS and Misc. Intracranial and Intraspinal Neoplasms	Males	113	35.7	28.6	28.2	12.8	27.1
	Females	88	25.5	27.2	26.9	8.0	22.3
Lymphomas and Reticuloendothelial Neoplasms	Males	77	5.4	13.3	24.3	29.3	17.0
	Females	39	0.9	6.1	10.4	22.0	9.1
Germ Cell and Trophoblastic and Other Gonadal Neoplasms	Males	53	10.7	1.9	5.8	30.3	11.8
	Females	54	3.8	3.0	12.4	35.0	12.6
Soft Tissue Sarcomas	Males	51	8.0	6.7	11.7	21.1	11.5
	Females	48	11.3	5.0	11.4	20.0	11.7
Malignant Bone Tumors	Males	48	0.9	6.7	13.6	23.8	10.4
	Females	31	0.9	7.1	7.2	16.0	7.3
Sympathetic Nervous System Tumors	Males	44	32.2	4.8	1.9	0.9	11.5
	Females	30	25.5	3.0	–	–	8.4
Retinoblastoma	Males	11	8.9	1.0	–	–	2.9
	Females	21	19.8	–	–	–	5.9
Renal Tumors	Males	24	17.0	2.9	1.0	0.9	6.2
	Females	12	9.4	1.0	–	1.0	3.3
Hepatic Tumors	Males	10	7.2	–	1.9	–	2.6
	Females	5	3.8	–	–	1.0	1.4
Other and Unspecific Malignant Neoplasms	Males	0	–	–	–	–	–
	Females	6	0.9	–	2.1	3.0	1.4
All Types	Males	667	210.0	108.6	126.4	172.3	157.4
	Females	570	188.7	94.8	105.5	174.0	143.2

investigate time trends.[5] Calculation of standardized incidence ratios for cancer allowed comparison of ethnic groups in Hawai'i to U.S. Caucasians.

Results

From 1975 to 2000, 1237 cases of cancers were diagnosed in children between birth and age 19 in the state of Hawai'i. Table 1 represents age-specific and age-adjusted incidence rates per million for each childhood cancer based on sex and age at diagnosis; it should be noted that rates based on small numbers may be unstable.

Age differences. Overall, leukemia was the most common diagnosis, with 363 cases, accounting for 29% of all cancers. Acute lymphocytic leukemia was the most common type of leukemia. The frequency of different cancer diagnoses varied according to age at diagnosis. Leukemia, CNS and miscellaneous intracranial and intraspinal neoplasms, and sympathetic nervous system (SNS) tumors were more common in the 0 – 4 age group, with rates decreasing in the older age groups. Conversely, rates peaked in the 15-19 age group for carcinomas, lymphomas, and germ cell and trophoblastic and other gonadal neoplasms. These trends were similar for boys and girls.

Sex differences. For all cancers combined, boys had a slightly higher incidence rate (157.4) compared to girls (143.2). This overall excess of cancer in boys was reflected in a number of specific cancers where boys had higher rates than girls: Leukemia (47.5, 44.4), lymphoma (17.0, 9.1), CNS (27.1, 22.3), and SNS tumors (11.5, 8.4). In contrast, girls had nearly twice the age-adjusted incidence rates per million for carcinomas compared to boys (15.5, 8.9). Interestingly, female carcinoma incidence rates nearly doubled between the 10 to 14 and the 15 to 19 age groups.

Ethnic differences. Ethnic differences were examined for all cancers combined, leukemia, and acute lymphocytic leukemia, as seen in the ethnic-specific, age-adjusted incidence rates for Caucasian, Japanese, Filipino, Hawaiian, and Chinese males and females shown in Table 2. The category of "other" represents ethnic groups not listed above. Rates for Chinese may be unstable due to low number of cases, especially for leukemia and acute lymphocytic leukemia.

It can be seen that in all ethnic groups except Caucasians, boys have higher incidence rates for all cancers combined than girls; in Caucasians, rates are similar, but slightly higher in girls. Overall incidence in Japanese – both boys and girls – is notably lower than in the non-Japanese ethnic groups, with the exception of the "other" group. Rates for leukemia are similar across the groups, although Filipino, Chinese, and "other" boys appear to have somewhat higher rates than the remaining groups. For acute lymphocytic leukemia specifically, Caucasian girls and Chinese boys have somewhat higher rates.

Changes over time. Figure 1 shows sex-specific, age-adjusted incidence rates per million for all childhood cancers combined for the five time periods of 1975-79, 1980-84, 1985-89, 1990-94, 1995-2000. Join-point analysis of annual incidence rates for childhood cancers showed a slight increase in all childhood cancers in both males and females during 1975–2000. The estimated annual percent changes (95% confidence limits) for males and females were 0.93% (0.5, 1.8) and 0.90% (-0.2, 2.0), respectively. A slight increase in cancer appeared for both boys and girls. Incidence rates for leukemia, the most common cancer in males and females, remained consistent over time, as seen in Figure 2. Rates for remaining cancer types are not shown due to the small number of cases.

Analysis of time changes for age-adjusted incidence rates by ethnicity and sex for all cancer types are shown in Figures 3A and 3B. To increase the number of cases among ethnic groups, analysis was conducted using three time periods (1975-82, 1983-91, 1992-2000). Rates for Chinese and "Other" were not included due to small numbers. Rates for Japanese boys increased, while rates for Hawaiian boys remained stable over the three times periods. Caucasian and Filipino boys had a similar incidence pattern: an elevation in rate during the 1983 to 1991 period, with lower rates before and after. Similarly, Caucasian, Filipino and Hawaiian girls had higher rates during the middle time period, while Japanese girls had stable (and lower) rates over time.

Comparison of Hawai'i data with United States rates. Table 3 shows the standardized incidence ratios for childhood cancers (all cancers, all leukemias, and all cancers except leukemias) by sex and ethnicity, compared to rates for U.S. Caucasians. Ratios above 100 indicate increased cancer rates, and those under 100, decreased cancer rates. Japanese had a significantly lower risk of having cancer for sites other than leukemia. Filipino girls and "other" boys also had a significantly lower risk in the category "all sites excluding leukemia." There were no statistically significant differences in leukemia for any ethnic groups compared to U.S. Caucasians.

Discussion

This study reports the largest numbers to date for pediatric cancers in Hawai'i. Nonetheless, the rarity of childhood cancer means that for certain cancer types, low numbers of cases may lead to unstable incidence rates. As a result, retinoblastoma, renal tumors, hepatic tumors, and other and unspecific malignant neoplasms were not interpreted due to low number of counts, although the data are included in Table 1. Cancer cases in Chinese children were also very low, and hence we could not reliably interpret the results. In addition, the "other" ethnicity category included individuals from many different ethnic backgrounds and this category cannot be explicated. Low numbers similarly affect our ability to detect statistically significant differences.

In many respects, our results were consistent with results of Goodman, et al.[3] (based on Hawai'i data from 1960 to 1984) and with the current SEER pediatric monograph (based on United States data for the 1975 to 1995 period).[1] Overall incidence in this study was 157.4 per million for males and 143.2 for females, compared to rates of 140.5 and 112.2 reported by Goodman, et al.[3] and approximately 160 and 140 in SEER.[1] (The SEER report did not provide numbers for overall incidence, and above estimates are based on visual interpretation of figures in the report.) Incidence for leukemia in this study was 47.5 per million for boys and 44.4 for girls, compared to rates of 49.9 and 44.8 reported by Goodman, et al.[3] and 42.7 and 36.0 by SEER.[1] Leukemia rates in Hawai'i continue to be somewhat higher than for the rest of the United States,

Table 2.— Ethnic-specific, age-adjusted (world population standard) incidence rates per million, Hawai'i 1975 - 2000

		All Cancer Types Combined		All Leukemia		Acute Lymphocytic Leukemia	
		Cases	Rates	Cases	Rates	Cases	Rates
Caucasian	Males	153	161.5	39	43.3	28	32.3
	Females	146	167.2	38	46.1	32	39.3
Japanese	Males	101	142.3	29	43.7	22	33.6
	Females	71	108.4	27	44.4	18	30.8
Filipino	Males	112	167.1	34	53.1	18	28.6
	Females	82	132.9	28	48.3	18	31.9
Hawaiian	Males	198	168.4	52	44.1	37	31.7
	Females	181	159.4	51	45.5	35	31.3
Chinese	Males	34	162.0	13	67.5	10	52.6
	Females	27	131.4	8	43.1	6	33.0
Others	Males	69	134.7	27	53.9	18	36.1
	Females	63	130.1	17	35.4	10	20.9

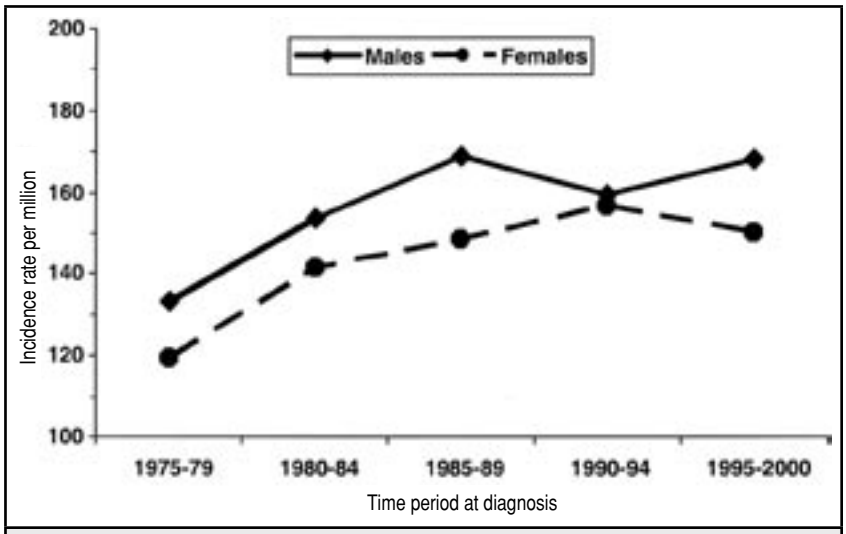

Figure 1.— Sex-specific, age-adjusted (world population standard) incidences rates for all cancer types combined among persons ≤19 years of age in Hawai'i, 1975-2000

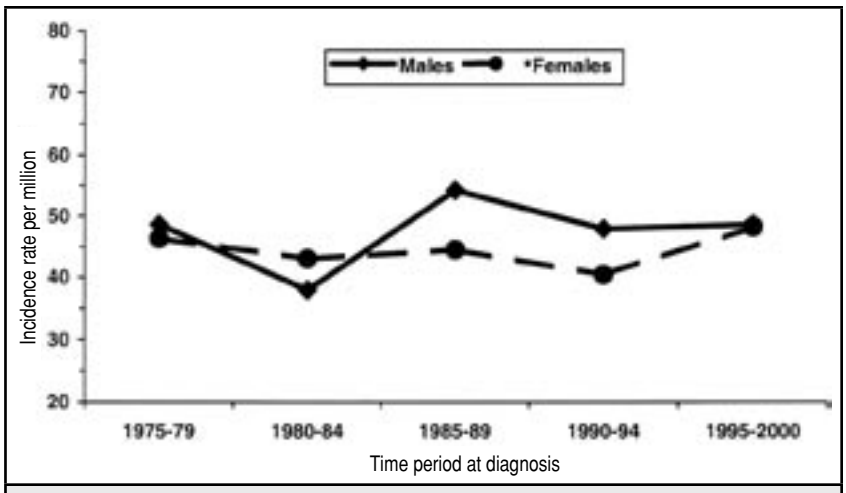

Figure 2.— Sex-specific, age-adjusted (world population standard) incidences rates for leukemia among persons ≤19 years of age in Hawai'i, 1975-2000

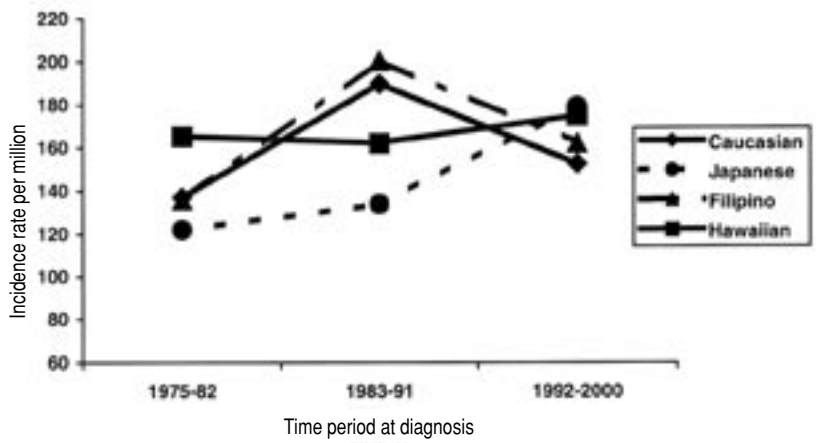

Figure 3A.— Male. Ethnic-specific, age-adjusted (world population standard) incidences rates for all cancers types combined for persons ≤ 19 years of age in Hawai'i, 1975-2000.

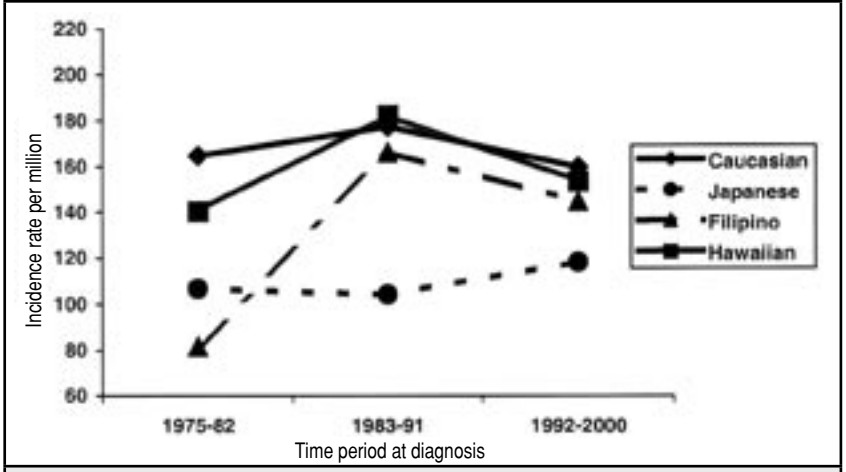

Figure 3B.— Female. Ethnic-specific, age-adjusted (world population standard) incidences rates for all cancers types combined for persons ≤ 19 years of age in Hawai'i, 1975-2000.

Table 3.— Standardized Incidence Ratios (SIR) for Childhood Cancers by Sex, Ethnicity, Hawai'i 1975 - 2000

		All Sites		Leukemia		All Sites Excluding Leukemia	
		Cases	SIR	Cases	SIR	Cases	SIR
Caucasian	Males	153	91	39	94	114	90
	Females	146	108	38	121	108	104
Japanese	Males	101	82[1]	29	95	72	77[1]
	Females	71	67[1]	27	116	44	53[1]
Filipino	Males	112	98	34	115	78	92
	Females	82	86	28	127	54	74[1]
Hawaiian	Males	198	99	52	97	146	99
	Females	181	104	51	121	130	98
Chinese	Males	34	93	13	142	21	77
	Females	27	85	8	112	19	77
Others	Males	69	78[1]	27	118	42	65[1]
	Females	63	84	17	94	46	80

Compared to United States Caucasians.
[1] p-value ≤0.05

as Goodman, et al. noted.[3] Leukemia is the most common childhood cancer, accounting for 29% of current cases in Hawai'i, 30% in Goodman, et al. (in a slightly younger sample), and 25% in the United States as a whole.[1] Like the comparison datasets, we found that the highest age-specific incidence of cancers occurred in the 0 – 4 and 15 – 19 groups, each with different cancer types. Leukemia, CNS, and SNS tumors comprised the majority of diagnoses in the younger age group, while carcinomas, lymphomas, and germ cell tumors mostly occurred in the older group. While leukemia was the most common childhood cancer, neuroblastoma, a type of SNS tumor, was the most common cancer of infancy, a finding also supported by SEER.

Age-adjusted incidence rates for carcinomas were similar to average annual specific incidence rates from SEER, including the apparent doubling of incidence rates in females compared to males in the 15 – 19 age group. Thyroid carcinoma, the most common histology, with 50% (n=55) of carcinomas in our sample thyroid cancers (data not shown), well in excess of the 36% reported by SEER. 71% (n=39) of these thyroid cancers occurred in children aged 15-19, and 79% (n=31) of those were diagnosed in girls, implying that thyroid cancer risk may be influenced by hormonal factors and elevate in puberty, particularly in girls.

There were several areas where our results differed from the other reports. The SEER Monograph[1] does not present data for different Asian and Pacific Islander groups, so we do not have a national comparison. However, in Goodman's study, the results indicated increasing pediatric cancer in Caucasian boys and Hawaiian girls, and that ethnic differences appeared to be widening. In another study by Goodman and colleagues,[5] increasing leukemia rates were noted as a source of concern, particularly in Caucasian and Japanese girls and Hawaiian males. While we did not perform analyses that were exactly comparable, Figures 3A and 3B reflect some of the same ethnic-specific elevations in incidence rates for the middle time period (1983 to 1991). However, this trend was largely reversed in the most recent time period. This is reassuring and indicates how cancer rates can vary markedly in small samples. The current study noted increasing rates of cancer in Japanese males, in contrast to consistently lower rates in Japanese females. This finding did not emerge in the earlier analysis and bears watching. Still, Japanese in Hawai'i, both boys and girls, experience significantly lower levels of childhood cancers compared to children on the U.S. Mainland, particularly with cancers other than leukemia. Further exploration of potentially protective factors in Japanese is a provocative area for future study.

This study, in conjunction with Goodman, et al.[3] showed that the incidence of childhood cancer in Hawai'i has been largely stable over a period of more than 40 years. At the same time, the population of Hawai'i has

increased, and the success of treating pediatric cancer has improved markedly. Currently, more than 80% of pediatric leukemia patients, and many of the childhood cancers (e.g., Hodgkin's lymphoma, Wilm's tumor, retinoblastoma) have survival rates exceeding 90%. By implication, there are increasing numbers of childhood cancer survivors in Hawai'i, as there are in the United States as a whole, which in 1997 had an estimated 95,000 survivors of pediatric cancers.[6]

As these children become adults, they will shift from obtaining care from pediatricians and pediatric oncologists to seeking new primary care practitioners (PCP). Given that many long term side effects of cancer therapy (both chemotherapy and radiation) may not emerge for ten or twenty years, PCPs need to be vigilant about identifying potential side effects, including effects on physical growth, intellectual development, pubertal development and fertility, and psychological well-being (e.g., depression, self-esteem deficits).[6] Other organ-specific effects are gonadal toxicity, cardiac arrythmias, pulmonary dysfunction, genitourinary tract damage, thyroid gland dysfunction, gastrointestinal/hepatic problems, and second malignancies.[6] Increased attention by health care providers is needed for this special group of cancer survivors.

Acknowledgments

Portions of this work were supported by a Meiji Fellowship from the Cancer Research Center of Hawai'i, University of Hawai'i, to Stella Wenceslao under the supervision of Carolyn Gotay PhD. We appreciate the assistance of Michael Green CTR and Marc Goodman PhD.

Authors' Affiliations

- John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI 96813 (S.W.)
- Cancer Research Center of Hawai'i, University of Hawai'i, Honolulu, HI 96822 (C.C.G., L.W.K.C., K.W.)

References

1. Ries LAG, Smith MA, Gurney JG, Linet M, Tamra T, Young JL, Bunin GR (eds). Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975 – 1995. Bethesda, MD: National Cancer Institute, SEER Program, NIH Pub. No. 99-4649. 1999.
2. American Cancer Society (2003). Hawai'i Cancer Facts & Figures 2003 – 2004. Honolulu, HI: American Cancer Society, Hawai'i Pacific, Inc.
3. Goodman MT, Yoshizawa, CN, Kolonel, LN. Ethnic patterns of childhood cancer in Hawai'i between 1960 and 1984. Cancer 1989, 64: 1758-63
4. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation test for joinpoint regression with applications to cancer rates. Stat Med 2000; 19: 335-51.
5. Goodman MT, Yoshizawa CN, Kolonel, LN. Incidence trends and ethnic patterns for childhood leukemia in Hawai'i: 1960 – 1984. Br J Cancer 1989, 60: 93-97
6. Hewitt M, Weiner S, Simone J. Childhood Cancer Survivorship. Improving Care and Quality of Life. Washington DC: National Academies Press, 2003.

Variations in Clinical Practice Among the Hawaiian Islands

James W. Davis PhD, Deborah Taira ScD, and Richard S. Chung MD

Abstract

State health surveys and hospital discharge data suggest aspects of health care may vary by island in the state of Hawai'i. This study further examines the issue comparing O'ahu, Maui, Hawai'i, and Kaua'i on 15 indicators of recommended clinical care using data from a large insurer in Hawai'i. The Hawaiian Islands differed to a statistically significant extent on 14 of the 15 indicators. O'ahu had the highest percentage of recommended care for six indicators, Maui for four, Kaua'i for three, and Hawai'i for two. In analyses adjusted for age, gender, morbidity, and health plan – and comparing the outer islands individually to O'ahu – O'ahu had more favorable care in 16 of 18 statistically significant comparisons. More focused geographic studies may be warranted to clarify where and why the variations in health care occur.

Introduction

Hawai'i as an island state faces unusual challenges in delivering equitable health care to its citizens. Urban centers and rural areas are spread across islands with diverse populations and geographies. State health surveys suggest that some aspects of health care may vary by island.[1] For example, people reporting they had ever had their blood cholesterol checked varied from 68.7% for Maui to 72.2% for Kaua'i to 74.9% for Hawai'i to 76.4% for Honolulu. Women aged 18 and older who reported having a mammogram within the past two years varied from 52.9% for Honolulu to 57.4% for Maui to 60.6% for Hawai'i to 60.9% for Kaua'i. People aged 50 and older who reported they had ever had a sigmoidoscopy varied from 41.9% for Maui to 43.9% for both Kaua'i and Hawai'i to 49.1% for Honolulu. Health utilization as assessed by hospital discharge rates also varies among the Hawaiian Islands.[2] Of note are variations in preventable hospitalizations such as bacteria pneumonia, congestive heart failure, asthma, cellulitis, and chronic obstructive pulmonary disease.

A further source to examine health care variations among the Hawaiian Islands is insurance data. A large insurer in Hawai'i monitors primary screening, disease management, and appropriate medication use among its members. The activity is based on clinical indicators that are evidence-based, and adapted from national guidelines or from peer-reviewed literature. The insurer's program offered a unique opportunity to assess variations in recommended clinical care. Results of clinical indicators based on insurance data have not been previously published for Hawai'i, and a single insurer covers about half of the state's population. This article compares 15 clinical indicators among residents of O'ahu, Maui, Hawai'i, and Kaua'i.

Methods

Study population and clinical indicators

The study employed a retrospective cohort design using data available from the insurer's physician award program. Members were included in the analysis for a clinical indicator if they were enrolled with the insurer between April 1, 2002 and March 31, 2003, met the eligibility criteria for the indicator, and resided on O'ahu, Maui, Hawai'i, or Kaua'i. Cohorts were defined based upon clinical guidelines for recommended care. Members of the cohorts who met the eligibility criteria of the guidelines for the evaluation period were classified either as having received or not having received the recommended care during the period. As an example women recommended by the guidelines as requiring a mammogram during the year were classified as either having received or not received a mammogram.

The indicators for the award program were derived from the Health Plan Employer Data and Information Set (National Committee on Quality Assurance), from priority areas identified by the Institute of Medicine, or based upon peer-reviewed literature.[3-5] Data used to define eligible populations and to identify members who received recommended care included claims billed for physician, pharmacy, inpatient, and outpatient services; and member demographic and enrollment information. Disease diagnoses were based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9). Other information used included procedure codes, admission and discharge dates, and pharmacy data including brand and generic names, therapeutic class, National Drug Codes, prescription fill dates, and days supply. For some analyses the physicians that members had seen were characterized into whether

Authors' Affiliations
- Hawai'i Medical Service Association (an Independent Licensee of the Blue Cross and Blue Shield Association) Honolulu, HI 96814 (J.W.D., R.S.C.)
- John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI 96813 (D.T.)

Correspondence to:
James W. Davis PhD
Department of Care Management.
HMSA
818 Keeaumoku St.
P.O. Box 860
Honolulu, Hawaii 96808-0860
Phone: 808-948-5495
Fax: 808-948-5680
Email: james_davis@hmsa.com

the physicians were board certified, into physician specialties (primary care, cardiology, endocrinology, obstetrics and gynecology (ob/gyn), and other), and by practice volume (physicians seeing the most patients [upper third] and those seeing fewer patients).

Fifteen clinical indicators were selected that included sufficient members from O'ahu, Maui, Hawai'i, and Kaua'i to fit regression models. Table 1 gives descriptions of the indicators and the abbreviations used in this article.

Statistical analyses

Comparisons of islands without adjustment for member or physician characteristics were performed using chi-square tests. Comparisons with adjustments were performed using logistic regression. The dependent variables in the regression models were indicators of receiving the recommended care (yes or no). A sequence of regression models were fit using general estimating equations, clustering members within the physicians they had seen the most (or the longest in cases of ties). To achieve comparability across the clinical indicators each model in the sequence used the same explanatory variables for all 15 indicators. Results from the regression models are expressed as odds ratios with 95% confidence intervals.

Results

The Hawaiian Islands differed to a statistically significant extent on 14 of the 15 clinical indicators (Table 2). The exception was adherence with anti-hypertensive drugs; all islands had comparable rates of 72% to 73%. In comparison to O'ahu, Maui had significantly different rates for 11 clinical indicators. Three differences were of 5% or greater favored O'ahu (differences in mammography and colorectal screening rates, and in the use of lipid lowering drugs for the treatment of coronary artery disease [CAD]). Follow-up after diagnosis of actinic keratosis favored Maui by 11.8%. Hawai'i differed to a statistically significant extent from O'ahu on 10 indicators. One difference of greater than 5% favored Hawai'i: a higher percentage of beta blocker use among patients with CAD. Four differences of 5% or greater favored O'ahu (follow-up after diagnosis of actinic keratosis, the use of lipid lowering drugs in CAD, and screening for chlamydia and colorectal cancer). Kaua'i differed significantly from O'ahu on all 15 indicators. Three differences of 5% or greater favored Kauai: retinal exams for members with diabetes, and the use of beta blocker and lipid lowering drugs in CAD. Seven clinical indicators differed significantly comparing Hawai'i to O'ahu (Figure 2); all had odds ratios below one. Odds ratios favored O'ahu for follow-up examinations for actinic keratosis, retinal exams and hemoglobin tests for people with diabetes, ace inhibitor use, and lipid lowering drugs among people with coronary artery disease, and cervical cancer and colorectal screening.

Table 1.— Clinical indicator abbreviations and descriptions

ABBREVIATION	DESCRIPTION
Ace inhibitor cad	Prescription for ACE inhibitor in coronary artery disease
Beta blocker cad	Prescription for Beta blocker in coronary artery disease
Lower lipids cad	Prescription for lipid lowering drug in coronary artery disease
Chlamydia	Chlamydia screening for women
Colorectal	Colorectal cancer screening within 3 years
Hemoglobin diabetes	Glycosylated hemoglobin for diabetics
Hypertension	Adherence 80% of days with anti-hypertensive drugs
Keratosis	Follow-up visit 1 month to 1 year after diagnosis of actinic keratosis
Lower Lipids	Adherence 80% of days with lipid-lowering drugs
Lipid panel diabetes	Lipid panel for diabetics
Mammography	Mammography screening
Nephropathy diabetes	Screening for diabetic nephropathy
Pap test	Cervical cancer screening
Retinal exam diabetes	Diabetic retinal exams
Statin	Liver function tests for statin

Unless stated otherwise, the interval for screening, testing, or medication use is during the reporting year.

Table 2.— Percentage of members receiving recommended care (and denominator population) by clinical indicator and by island comparing outer islands to O'ahu

INDICATOR	ALL ISLANDS	O'AHU	MAUI	HAWAI'I	KAUA'I
Ace inhibitor cad	46.9% (14,743)	48.1% (10,337)	44.3% (1,179) *	41.0% (2,336) *	51.9% (891) *
Beta blocker cad	37.5% (8,563)	35.0% (6,086)	37.8% (651)	47.6% (1,312) *	40.7% (514) *
Lower lipids cad	57.9% (14,732)	59.0% (10,331)	53.8% (1,179) *	52.1% (2,334) *	65.5% (888) *
Chlamydia	39.3% (12,314)	41.0% (8,358)	43.9% (1,232) *	32.0% (1,950) *	32.4% (774) *
Colorectal	56.8% (34,784)	60.3% (25,465)	48.5% (2,800) *	46.7% (4,686) *	47.6% (1,833) *
Hemoglobin diabetes	66.5% (36,667)	67.4% (27,037)	70.0% (2,551) *	65.6% (4,725) *	54.4% (2,354) *
Hypertension	73.0% (70,542)	73.2% (51,589)	72.5% (5,073)	72.7% (8,999)	71.7% (4,881) *
Keratosis Follow-up	59.5% (11,404)	61.1% (7,620)	72.9% (1,013) *	52.0% (2,163) *	44.1% (608) *
Lower lipids	61.3% (43,586)	61.6% (33,245)	59.3% (2,901) *	61.4% (4,830)	58.9% (2,610) *
Lipid Panel Diabetes	80.7% (36,667)	81.0% (27,037)	84.8% (2,551) *	80.3% (4,725) *	74.7% (2,354) *
Mammography	60.3% (52,995)	61.0% (38,548)	54.6% (4,156) *	61.3% (7,156)	56.8 (3,135) *
Nephropathy	66.3% (36,667)	67.3% (27,037)	66.1% (2,551)	65.5% (4,725)	56.9% (2,354) *
Pap test	60.1% (137,938)	61.2% (98,401)	56.2% (12,477)*	61.0% (18,992)	50.1% (8,068) *
Retinal exam diabetes	46.9% (36,667)	47.3% (27,037)	43.6% (2,551) *	41.7% (4,725) *	55.3% (2,354) *
Statin	70.2% (17,264)	70.9% (14,099)	70.3% (828)	67.5% (1,634) *	61.6% (703) *

Chi-square tests were all statistically significant comparing percentages for the four islands except for use of anti-hypertensive medications

* Statistically different ($p < 0.05$) compared to O'ahu

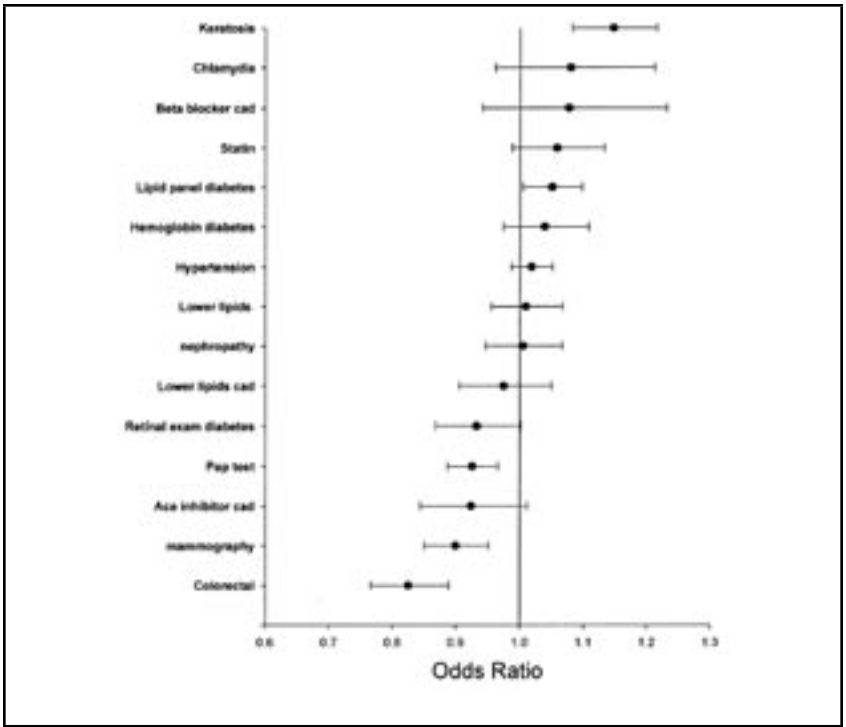

Figure 1.— Odds ratios for receiving recommended care comparing Maui to O'ahu by clinical indicator. All analyses were adjusted for member age, gender, morbidity, and type of insurance.

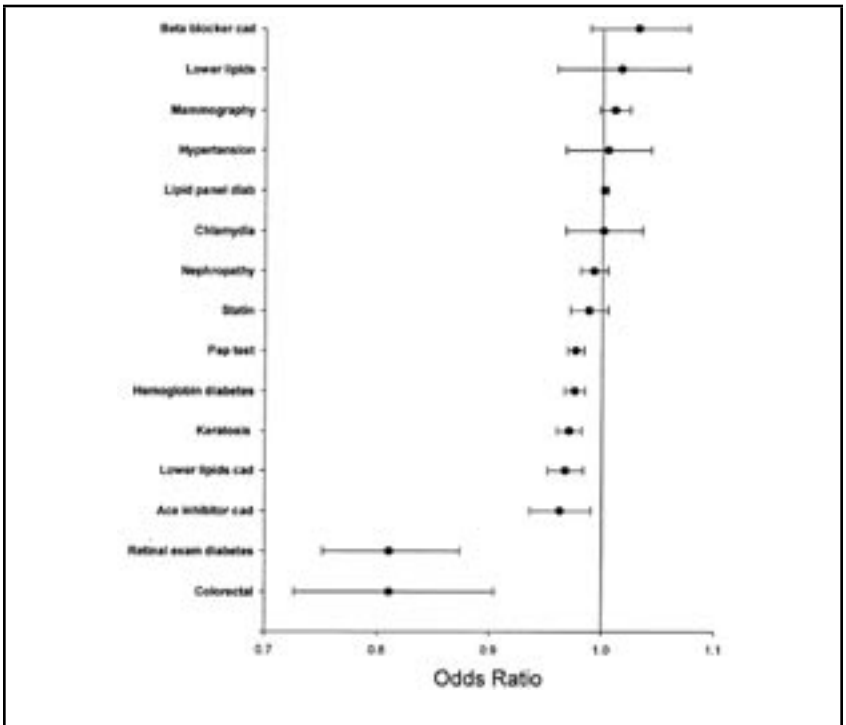

Figure 2.— Odds ratios for receiving recommended care comparing Hawaii to Oahu by clinical indicator. All analyses were adjusted for member age, gender, morbidity, and type of insurance.

To better understand the health care differences among the Hawaiian Islands we next fit regression models adjusted for demographic characteristics. These models ask if health care care differs by island among people of the same age, gender, morbidity, and health plan. Results are presented comparing the outer islands individually to O'ahu. For Maui only 5 of the 15 indicators remained statistically significant in the adjusted models (Figure 1). People from Maui were less likely to obtain screening for breast, cervical, and colorectal cancer; and more likely to test for lipids among people with diabetes and to obtain follow-up care after the diagnosis of actinic keratosis. Seven clinical indicators differed significantly comparing Hawai'i to O'ahu (Figure 2); all had odds ratios below one, odds ratios favoring O'ahu (follow-up examinations for actinic keratosis, retinal exams and hemoglobin tests for people with diabetes, ace inhibitor use and lipid lowering drugs among people with coronary artery disease, and cervical cancer and colorectal screening). In comparisons of Kaua'i to O'ahu, people from Kaua'i who had diabetes were significantly more likely to obtain retinal exams. People from Kaua'i, however, were less likely to receive recommended care for six other indicators (follow-up after actinic keratosis, cervical cancer and colorectal screening, and testing for lipids, nephropathy, and hemoglobin among patients with diabetes [Figure 3]).

In a final sequence models were fit including demographic and physician characteristics (Table 3). The odds ratios from these final models resembled to a substantial extent those from models adjusted only for member characteristics. Because of small changes in odds ratios, however, three of the significant differences comparing Hawai'i to O'ahu became non-significant (cervical cancer screening, follow-up after actinic keratosis, and hemoglobin test among people with diabetes).

Discussion

The 15 indicators of recommended clinical care varied substantially by Hawaiian island. The indicators represent health care practices supported by evidence based criteria; under ideal circumstances, most patients should receive the recommended care. Nonetheless, 14 of the 15 indicators varied to a statistically significant extent comparing O'ahu, Maui, Hawai'i, and Kaua'i. The island with the highest percentage of recommended care, however, varied by the clinical indicator. O'ahu had the highest percentage for indicators of health screening, disease management, and appropriate medication use. Maui had the highest percentage of recommended care for three indicators of diabetes management, especially important practices in Hawai'i given the state's high diabetes rates. Hawai'i had the highest percentage of beta blocker use among patients with CAD and the highest mammography screening rates. Kaua'i had the

highest percentage for three of the indicators of disease management: retinal exams for members with diabetes and two indicators of appropriate medication use for patients with CAD. The results suggest variable patterns of health care across the Hawaiian Islands.

In analyses adjusted for age, gender, morbidity, and health plan half of the significant differences comparing outer islands to O'ahu became non-significant. This result suggests that in part the observed differences among islands were due to demographic characteristics. Most of the statistically significant differences were less than 10% comparing islands, and only a few exceeded 30%; thus the differences were small to moderate in magnitude. Of the 18 statistically significant associations after statistical adjustment 16 favored O'ahu, including associations for seven of the eight indicators of recommended care for diabetes or cardiovascular disease. The strong trend toward recommended health care on O'ahu suggests that regional factors within the state may contribute to health care differences.

Possible explanations for the observed results may derive from issues often considered as challenges in rural health care, although the Hawaiian Islands with urban centers as well as rural areas are distinct from Mainland rural settings. The concept of being rural is most commonly defined with respect to population density or distances from services, but sociodemographic factors, environmental conditions, community resources, availability of general practitioners and specialists, and demands on physicians for emergency and extended clinical skills all contribute to differences between rural and urban areas.[6-8] A number of factors can limit rural health care delivery. Problems related to transportation are one; longer distances to travel or barriers in getting to health facilities can restrict care delivery.[9] Physician-related factors are a second, including a shortage of specialists, a lower physician to patient ratio in general, and fewer people who have a regular physician.[10-12] Access issues are a third factor that can limit rural health care.[13-16] Access can include a limited choice of services as well as a smaller workforce of providers. Many of these considerations in rural health care may pertain within Hawai'i.

Our results support the state behavioral risk survey in finding differences in health care among the Hawaiian Islands.[1] Both studies found that the highest rates of colorectal screening occurred on O'ahu. However, the state survey and our results are not easily compared; the populations, methods, and outcome criteria differ substantially. The behavioral risk survey results are more representative of the state. The surveyed population is selected based upon random sampling methodology; those surveyed include the uninsured as well as the insured. Our results, however, show differences among Hawaiian Islands persist even among the insured. Financial considerations may nonetheless

Table 3.— Odds ratios (95% confidence intervals) for obtaining recommended care by clinical indicator and island in regression models adjusted for patient and physician characteristics.

INDICATOR	MAUI	HAWAI'I	KAUA'I
Ace inhibitor cad	0.92 (0.85, 1.0)	0.92 (0.85, 0.99) *	1.06 (0.97, 1.15)
Beta blocker cad	1.06 (0.94, 1.19)	1.42 (1.31, 1.56) *	1.06 (0.91, 1.25)
Lower lipids cad	0.97 (0.90, 1.04)	0.94 (0.89, 1.00) *	1.06 (0.99, 1.13)
Chlamydia	1.02 (0.97, 1.08)	0.97 (0.88, 1.06)	0.88 (0.77, 1.00)
Colorectal	0.92 (0.87, 0.98) *	0.83 (0.79, 0.88) *	0.80 (0.72, 0.94) *
Hemoglobin diabetes	1.05 (0.98, 1.12)	0.95 (0.88, 1.03)	0.85 (0.77, 0.94) *
Hypertension	1.03 (1.00, 1.06	1.00 (0.98, 1.03)	0.99 (0.96, 1.03)
Keratosis Follow-up	1.09 (1.03, 1.16) *	0.94 (0.89, 1.00)	0.76 (0.68, 0.5) *
Lower lipids	1.02 (0.97, 1.08)	1.02 (0.98, 1.05)	0.99 (0.94, 1.05)
Lipid panel diabetes	1.04 (1.00, 1.08)	0.98 (0.94, 1.02)	0.93 (0.88, 0.98) *
Mammography	0.94 (0.91, 0.98) *	1.02 (0.99, 1.05)	0.95 (0.91, 0.99) *
Nephropathy	1.02 (0.96, 1.09)	0.96 (0.92, 1.01)	0.91 (0.84, 0.97) *
Pap test	0.93 (0.89, 0.97) *	0.97 (0.94, 1.00)	0.91 (0.87, 0.95) *
Retinal exam diabetes	0.97 (0.91, 1.04)	0.91 (0.87, 0.96) *	1.13 (1.05, 1.21) *
Statin	1.07 (1.00, 1.14)	0.95 (0.89, 1.02)	0.96 (0.88, 1.05)

Models were adjusted for age, gender, morbidity, health plan, physician specialty (primary care, cardiology, endocrinology, obstetrics and gynecology, or other), physician board certification, number of physicians seen, and physician volume (upper third for number of patients treated for the indicator, or otherwise).

* Statistically different ($p < 0.05$) compared to O'ahu

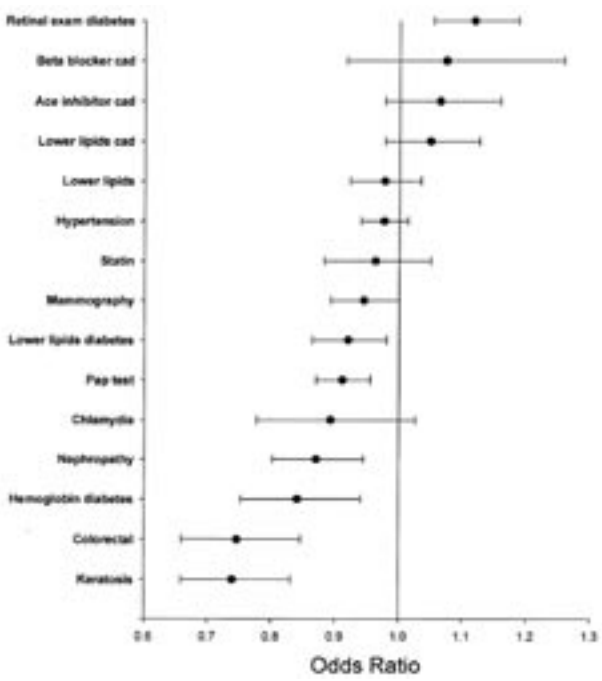

Figure 3.— Odds ratios for receiving recommended care comparing Kaua'i to O'ahu by clinical indicator. All analyses were adjusted for member age, gender, morbidity, and type of insurance.

drive some health care choices, as many insured services require co-payments. The state survey summarizes findings by ethnicity. Ethnicity was not examined in our study because such personal data are not routinely collected by the health insurer. Insurance data, on the other hand, have an advantage in measuring services received in contrast to health surveys, which rely on self-report. Further, insurance data can measure aspects of clinical care that are difficult to quantify accurately through health surveys.

A number of additional issues may also affect the interpretation of our results. The clinical indicators were defined using administrative data. Coding issues are invariably a concern with administrative data. Local physicians and external experts, however, contributed to developing the clinical algorithms that have been developed over a number of years. Another consideration is the variable sample sizes across islands and indicators, which could make statistical significance more likely for some comparisons than for others. Differences in percentages (or odds ratios and confidence intervals) better measure contrasts in health care than statistical significance. Given the many comparisons, some associations may have occurred by chance. Individual comparisons should be interpreted cautiously. Patterns more than single comparisons may provide the more accurate picture.

The study results in conclusion identify differences in recommended care among Hawaiian Islands in health screening, disease management, and appropriate medication use. Higher percentages by island sometimes favored O'ahu and sometimes Maui, Hawai'i, or Kaua'i. In analyses adjusted for member or member and physician characteristics, however, most significant comparisons favored O'ahu. These results suggest possible regional determinants of health care. More focused geographic studies, studies examining areas within islands, may be warranted to more fully understand the differences. The outer islands are more rural than O'ahu, and as discussed, problems associated with rural care may contribute to the observed differences. Rural disparities are a national concern. Integrating rural and urban health systems may be essential to optimizing health care needs.[17] The Agency for Health care Research and Quality targets rural disparities as an agency priority.[18] The agency emphasizes the importance of collecting high quality data to identify problem areas and monitor programs. Although insurance data have notable limitations, they do offer a practical approach to identify and potentially to track regional health care disparities.

References

1. Behavioral Risk Factor Surveillance System [Hawai'i State Department of Health web site]. http://www.Hawaii.gov/health/statistics/brfss/brfss2004/subareas04.html. Accessed September 28, 2005.
2. Health Hawai'iInformation Corporation. Health trends in Hawai'i: health resource utilization. http://www.healthtrends.org/health_resource_util/index.html. Accessed September 29, 2005.
3. Kohn LT, Corrigan JM, Donaldson MS, eds. To Err Is Human: Building a Safer Health System. Committee on Quality of Health Care in America. 2000. Institute of Medicine of the National Academies: National Academies Press. Washington, D.C. www.nap.edu
4. Institute of Medicine. (2001). Crossing the Quality Chasm: A New Health System for the 21st Century. Committee on Quality of Health Care in America: Institute of Medicine. Institute of Medicine of the National Academies: National Academies Press. Washington, D.C. www.nap.edu
5. Tanahashi N. (2003) Problems in development and use of guidelines for clinical practice. Rinsho Shinkeigaku 43, 843-846.
6. Wakeman J. Defining remote health. Australian J of Rural health. 2004;12:210-217.
7. Maglacas AM. Health for all: nursing's role. Nurs Outlook 1988;36:66-71.
8. Doty RE. Alternative theoretical perspectives: Essential knowledge for the advanced practice nurse in the promotion of rural family health. Clinical Nurse Specialist 1996;10:217-219.
9. Arcury TA, Preisser JS, Gesler WM, Powers JM. Access to transportation and health care utilization in a rural region. J Rural Health 2005;21:31-38.
10. Mathews M, Edwards AC. Having a regular doctor: rural semi-urban and urban difference in Newfoundland. Can J Rural Med 2004; 9:166-72.
11. Buck ST, Trauba V, Christensen RG. Minn Med 2004;87:40-43.
12. Norris, TE, House P, Schaad D, Mas J, Kelday JM. Student providers aspiring to rural and underserved experiences at the University of Washington: Promoting team practice among the health care professions. Association of American Med Colleges 2003; 78:1211-1216.
13. Bourke L, Sheridan C, Russell U, Jones G, DeWitt D, Liaw ST. Developing a conceptual understanding of rural health practice. Aust J Rural Health 2004; 12:181-186.
14. O'Dwyer LS, Burton DL. Potential meets reality: GIS and public health research in Australia. Australian and New Zealand Journal of Public Health 1998; 22:819-823.
15. Bourke L, Sheridan C, Russell U, Jones G, DeWitt D, Siaw-Teng L. Developing a conceptual understanding of rural health practice. Austrailian J Rural Health.
16. Mishra SI, Luce PH, Hubbell FA. Breast cancer screening among American Samoan women. Prev Med 2001; 9-17.
17. Sumaya CV. Rural health: A personal perspective. Am J Public Health 2004;94:1660.
18. AHRQ Focus on Research: Rural health care. http://www.ahrq.gov/news/focus/focrural.htm#Priorities, Accessed September 29, 2005.

Adolescent Calorie/Fat Menu Ordering at Fast Food Restaurants Compared to Other Restaurants

Julienne A. Yamamoto, Joelle B. Yamamoto, Brennan E. Yamamoto, and Loren G. Yamamoto MD, MPH, MBA

Julienne A. Yamamoto

Joelle B. Yamamoto

Brennan E. Yamamoto

Loren G. Yamamoto MD, MPH, MBA

Correspondence to:
Loren G. Yamamoto MD
Department of Pediatrics,
John A. Burns School of Medicine, University of Hawaii,
Kapiolani Medical Center For Women And Children
1319 Punahou Street, 7th Floor
Honolulu, HI 96826
Phone: (808)983-8387
Fax: (808)945-1570
E-mail: Loreny@hawaii.edu

Abstract

Objective: Childhood and adolescent obesity is an increasing public health problem. Fast food consumption has been linked to obesity. The purpose of this study is to determine adolescent calorie and fat consumption patterns at different types of restaurants.

Method: Study subjects (104 adolescents) were asked to order a dinner meal from 10 restaurant menus with an estimate of how much they would actually consume. A paired T-test was used to compare the calories and fat values for each restaurant vs. McDonald's.

Results: Mean calories/fat (g) ordered at each restaurant were: California Pizza Kitchen (CPK): 1284/70, Chili's (Ch): 1333/62, Denny's (Den): 1226/61, McDonald's (MD): 1016/45, Outback Steakhouse (OS): 1656/93, Panda Express (PE): 873/29, Red Lobster (RL): 1016/49, Stuart Anderson's (SA): 1058/52, Taco Bell (TB): 800/34, Wendy's (Wen): 879/32. Calorie/fat content of the ordered items were significantly higher at CPK, Ch, Den, and OS compared to McDonald's. RL and SA were not significantly different from MD. Calorie/fat content of the ordered items were significantly lower at PE, TB and Wen compared with McDonald's.

Conclusion: More calories/fat were ordered at many sit down restaurants compared to McDonald's. The lowest calories/fat were ordered at other fast food restaurants (Taco Bell, Wendy's and Panda Express).

Introduction

Childhood and adolescent obesity is an increasing public health problem. Fast food consumption has been linked to obesity. The purpose of this study is to investigate adolescent calorie and fat consumption patterns at different types of restaurants.

Methods

Ten national restaurant chains were selected based on the variety of food types and serving styles: McDonald's, Taco Bell, Wendy's, Panda Express, Denny's, Red Lobster, Chili's, Outback Steakhouse, California Pizza Kitchen (CPK), and Stuart Anderson's. Menus were obtained from the restaurants directly. For restaurants without available menus (McDonald's, Taco Bell, Wendy's, Panda Express), a representative menu was created using photography of their in restaurant menu display, images from their web site, or a combination of the two. Calorie and fat content of menu items were obtained from sources published by the first five restaurants.[1-5] Red Lobster,[6,7] Outback Steakhouse[7] and Chili's[7] calorie/fat content information was obtained from published books. Additional Chili's calorie/fat content information was available from a Web site[8] and from a toll-free number.[9] CPK calorie/fat contents were estimated by reviewing two CPK recipe books,[10,11] which contain the ingredient lists for most of their menu items, that were used to estimate the calorie content of these items. For CPK menu items which were not in their recipe books, a comparable menu item was used to approximate its calorie/fat content. Stuart Anderson's calorie/fat content values as well as miscellaneous menu items from other menus that were not included in the above sources, were determined by using calorie and fat reference books.[12-16] Other nutrition information assumptions are listed in appendix A.

Burger restaurants such as Burger King, Carls Jr, In-N-Out Burger, Jack in the Box, Sonic Burger, etc., were not included in the group of restaurants surveyed since these restaurants are not likely to be significantly different from the two burger restaurants included; McDonald's and Wendy's. The 10 restaurant chains chosen were based on variety in the types of menus offered. We chose not to include Subway because this restaurant is specifically advertised as a low fat restaurant.

Adolescents 11 to 18 years of age were eligible for participation. Written parental informed consent and written study subject informed assent were obtained for all study subjects under 18 years of age. Per federal regulations, written consent/assent was not required for 18 year old study subjects. This study was approved by the health system institutional review board. None of the authors have any financial, business, or family links to any entity or aspect of the restaurant or fast food industry.

Study subjects were enrolled by convenience at tennis tournaments and at school (with written permission of the respective school principals).

Study subjects were asked to self report their height,

Table 1.— Mean calories and fat (in grams) ordered at each restaurant. p values reflect the probability that the mean calorie/fat (per kg body weight) difference compared to McDonald's is the same (paired T-test).

	Calories	Cals/kg	p	Fat	Fat/kg	p
California Pizza Kitchen	1284	26.4	<0.001	70	1.4	<0.001
Chili's	1333	26.4	<0.001	62	1.2	0.002
Denny's	1226	25.2	<0.001	61	1.3	<0.001
McDonald's	1016	20.5	—	45	0.9	—
Outback Steakhouse	1656	33.2	<0.001	93	1.9	<0.001
Panda Express	873	17.5	0.001	29	0.6	<0.001
Red Lobster	1016	20.5	NS	49	1.0	NS
Stuart Anderson's	1058	21.2	NS	52	1.0	0.038
Taco Bell	800	16.0	<0.001	34	0.7	<0.001
Wendy's	879	17.5	<0.001	32	0.6	<0.001

Table 2.— Calories and fat (in grams) (per kg body weight) ordered at each restaurant comparing males and females. p values reflect the probability that males and females ordered the same calorie/fat per kg values (T-test).

	Mean Calories (per kg)			Mean Fat (grams) (per kg)		
	Males	Females	p	Males	Females	p
Number of subjects	53	51		53	51	
California Pizza Kitchen	28.9	23.7	NS (0.091)	1.6	1.2	NS
Chili's	30.5	22.2	0.006	1.5	1.0	0.008
Denny's	26.8	23.5	NS	1.4	1.1	NS
McDonald's	22.6	18.2	0.014	1.0	0.8	<0.001
Outback Steakhouse	40.4	25.6	<0.001	2.3	1.4	<0.001
Panda Express	18.7	16.2	NS (0.083)	0.6	0.5	NS
Red Lobster	21.2	19.7	NS	1.0	1.0	NS
Stuart Anderson's	23.1	19.2	NS	1.2	0.9	NS (0.068)
Taco Bell	17.7	14.3	0.003	0.7	0.6	0.028
Wendy's	20.9	14.0	<0.001	0.8	0.5	<0.001

Table 3.— Calories and fat (in grams) (per kg body weight) ordered at each restaurant comparing overweight and just right/underweight subjects. p values reflect the probability that overweight and just right/underweight subjects ordered the same calorie/fat per kg values (T-test).

	Mean Calories (per kg)			Mean Fat (grams) (per kg)		
	Over-weight	Just right/un-derweight	p	Over-weight	Just right/un-derweight	p
Number of subjects	25	79		25	79	
California Pizza Kitchen	20.5	28.2	0.030	1.2	1.5	NS
Chili's	21.9	27.8	NS (.0973)	1.0	1.3	NS
Denny's	18.3	27.4	0.004	1.0	1.3	0.029
McDonald's	15.3	22.1	0.001	0.7	1.0	0.001
Outback Steakhouse	28.2	34.7	NS	1.6	1.9	NS
Panda Express	14.7	18.4	0.026	0.6	0.6	NS
Red Lobster	16.3	21.8	0.033	0.8	1.1	0.040
Stuart Anderson's	16.7	22.6	0.041	0.9	1.1	NS
Taco Bell	14.4	16.6	NS	0.6	0.7	NS (0.087)
Wendy's	14.0	18.7	0.013	0.5	0.7	NS (0.068)

weight, and a self-assessment of their body as being "too skinny", "slightly underweight", "just right", "slightly overweight", or "too fat". Study subjects were shown a restaurant menu and they were asked to order a dinner meal with an estimate of how much of it they would actually consume. This was repeated for the 10 restaurants (sequence randomized).

The calories/fat ordered at each restaurant was compared to McDonald's, since McDonald's is often thought of as the most popular fast food restaurant. The paired T-test methodology was used to determine if a significant difference between a restaurant and McDonald's exists. A conventional T-test was used to compare the group differences (gender, target group, obese vs. non-obese).

Results

For the 104 adolescents interviewed (musicians and tennis players, age 11 to 18 years), mean calories and fat ordered at each restaurant are summarized in Tables 1 through 5. All p values listed are double-sided (two-tailed) probabilities. Musician study subjects are defined as those who were interviewed as part of a school band/orchestra. Tennis player study subjects are defined as those who were interviewed as participants in high school varsity or an open junior tennis tournament (the "open" tournaments are the highest level of junior competition, as opposed to novice and intermediate tournaments).

Body mass index (BMI = weight in kg / height in meters squared) was calculated using the height and weight values given by the study subjects (no weights or heights were actually measured). The overall mean BMI was 19.8 (SD 3.2) kg per square meter. Mean BMI for the 53 boys was 20.4 (SD 3.8). Mean BMI for the 51 girls was 19.2 (SD 2.3). Only 5 of study subjects had a BMI greater than or equal to 25 (all males). Z score BMI normalization was not determined. BMI correlated well with the study subjects' self report of their body habitus: too skinny (mean BMI 16.2±1.1), somewhat underweight (mean BMI 18.5±2.1), just right (mean BMI 19.3±2.0), slightly overweight (mean BMI 22.5±4.2), too fat (mean BMI 22.6±3.0).

Table 1 describes the mean calories and fat (in grams) ordered at each restaurant. McDonald's was used as a base comparison restaurant. Calories and fat ordered by study subjects at each restaurant were compared to the calories/fat ordered at McDonald's. Calories ordered were higher at California Pizza Kitchen, Chili's, Denny's, and Outback Steakhouse compared with McDonald's. Calories ordered were lower at Panda Express, Taco Bell, and Wendy's compared with McDonald's. The differences in calories ordered at Red Lobster and Stuart Anderson's compared with McDonald's were not statistically significant. Fat grams ordered were higher at California Pizza Kitchen, Chili's, Denny's, Outback Steakhouse and Stuart Anderson's

compared with McDonald's. Fat grams ordered were lower at Panda Express, Taco Bell and Wendy's compared with McDonald's. The difference in fat grams ordered at Red Lobster compared with McDonald's was not statistically significant.

When boys and girls were tabulated separately, similar relationships were found in most comparisons.

Table 2 compares calorie and fat consumption (corrected for body weight) between boys and girls at each restaurant. Boys ordered significantly more calories and fat per kg of body weight than girls at Chili's, McDonald's, Outback Steakhouse, Taco Bell and Wendy's. Calories and fat per kg were not significantly different between boys and girls at California Pizza Kitchen, Denny's, Panda Express, Red Lobster, and Stuart Anderson's. However, some of the two-tailed probabilities listed are <0.10, which means that it would be considered significant (P<0.05) if a single sided probability were used. Since the expectation is that boys would order more than girls (and not vice versa), it might be appropriate to use a single sided probability. One interpretation of this table is that although females are better able to control their calorie/fat intake than males at Chili's, McDonald's, Outback Steakhouse, Taco Bell and Wendy's, girls consumed similar amounts of calories/fat at the other restaurants, suggesting that this latter group of restaurants might be more tempting or their calorie/fat contents are more difficult to estimate (assuming that their menu choice might be influenced by calories and fat).

Table 3 compares calorie and fat consumption (corrected for body weight) between "overweight" study subjects (defined by their self report of being slightly overweight or too fat) and "just right/underweight" study subjects (defined by their self report of being just right or underweight) at each restaurant. Overweight study subjects ordered significantly fewer calories per kg of body weight than non-overweight study subjects at California Pizza Kitchen, Denny's, McDonald's, Panda Express, Red Lobster, Stuart Anderson's, and Wendy's. Overweight study subjects ordered significantly less fat per kg of body weight than non-overweight study subjects at Denny's, McDonald's, and Red Lobster. The other comparisons were not significantly different. This comparison might be misleading since the denominator (weight) of the obese subjects is greater than the non-obese subjects, which would automatically downwardly skew their calories and fat per kg.

Table 4 compares calorie and fat consumption (corrected for body weight) between musicians and tennis players at each restaurant. Most of these comparisons do not show statistically significant differences.

Table 5 describes the ordering of drinks and fries relative to the total calories ordered. Fries were separately tallied for McDonald's and Wendy's only. Although fries were sometimes ordered at other restaurants such as Chili's, Denny's, Outback Steakhouse, Red Lobster, and Stuart Anderson's, other starch options were more dominant at these restaurants. Compared to McDonald's, calories from drinks were lower at California Pizza Kitchen, Denny's, Outback Steakhouse, Panda Express, Red Lobster, Stuart Anderson's, and Wendy's.

Table 4.— Calories and fat (per kg body weight) ordered at each restaurant comparing musicians and tennis subjects. p values reflect the probability that overweight and just right/underweight subjects ordered the same calorie/fat per kg values (T-test).

	Mean Calories (per kg)			Mean Fat (grams) (per kg)		
	Musicians	Tennis	p	Musicians	Tennis	p
Number of subjects	27	77		27	77	NS
California Pizza Kitchen	30.0	25.1	NS	1.7	1.3	NS
Chili's	24.3	27.2	NS	1.0	1.3	NS
Denny's	29.3	23.7	NS (0.074)	1.5	1.1	0.017
McDonald's	18.8	21.0	NS	0.8	0.9	NS
Outback Steakhouse	35.2	32.4	NS	2.1	1.8	NS
Panda Express	17.9	17.3	NS	0.6	0.5	NS
Red Lobster	23.1	19.6	NS	1.0	1.0	NS
Stuart Anderson's	23.0	20.6	NS	1.2	1.0	NS
Taco Bell	17.1	15.7	NS	0.8	0.6	NS (0.093)
Wendy's	17.4	17.6	NS	0.7	0.6	NS

Table 5.— Calories from drinks and fries at restaurants relative to total calories. p values represent the probability that the calories from drinks ordered at this restaurant is similar to the calories from drinks ordered at McDonald's (paired T-test).

	Total calories	Calories from drinks	p	Calories from fries
California Pizza Kitchen	1284	124	0.006	
Chili's	1333	136	NS	
Denny's	1226	128	0.05	
McDonald's	1016	158	—	280
Outback Steakhouse	1656	100	<0.001	
Panda Express	873	110	<0.001	
Red Lobster	1017	96	<0.001	
Stuart Anderson's	1058	91	<0.001	
Taco Bell	800	162	NS	
Wendy's	879	125	0.004	231 (P=0.027)

Because the calories from beverages were highest at McDonald's and Taco Bell, this implies that if drinks were served equally at all the restaurants, the calorie differences would be even greater when compared to McDonald's and Taco Bell. In other words, calorie differences between McDonald's vs. California Pizza Kitchen, Chili's, Denny's, and Outback Steakhouse, would be even greater if calories from drinks were equalized. There was a greater tendency to order a soft drink at the fast food restaurants, while ordering water more often at the sit-down restaurant. This could be due to the availability of water at sit-down restaurants (i.e., a customer generally does not have to ask for it) and the higher cost of soft drinks at sit down restaurants compared to the fast food restaurants. Most fast food restaurants have combination meals that include a soft drink. The standard combination meal at Taco Bell includes a 32-ounce drink (244 estimated calories), compared with the standard combination meal at most other fast food restaurants which includes a 21-ounce drink (189 estimated calories). Most sit down restaurants do not include a soft drink as part of the meal. Some fast-food restaurants have free refills and this could greatly add to the calories consumed.

Although refills were not specifically considered, the survey did include the size of the drink ordered and what portion of it would be actually consumed. For a person who would typically refill the drink, he/she did have the option of specifying two drinks.

Calories from fries were higher at McDonald's compared with Wendy's. The most commonly ordered size of fries (size medium) contains 450 calories at McDonald's and 390 calories at Wendy's. Fries contain substantial calories. The 450-calorie medium fries at McDonald's represents 44% of the total calories of the average meal ordered at McDonald's.

Discussion

Our study includes McDonald's, Taco Bell and Wendy's, which most would agree represent fast food restaurants. Sit down restaurants such as California Pizza Kitchen, Chili's, Denny's, Outback Steakhouse, Red Lobster, and Stuart Anderson's would generally not be considered to be fast food restaurants. Panda Express might be considered to be a fast food restaurant by some, but since it is served on a plate, more resembling a meal to be consumed at a table, rather than one which can be consumed in a car or on the go, this is an intermediate type of restaurant which was included in our study for this reason.

Two recently published studies have linked the consumption of fast food to excessive dietary consumption.[17,18] The methodology of these two studies compared fast food with non-fast food. But what was not studied is the consumption of food at restaurants which would not normally be called "fast food". Our study shows that higher calorie/fat ordering takes place at most of the non-fast food restaurants compared to the fast food restaurants. There is an alternative conclusion from these studies.[17,18] Rather than concluding that fast food is linked to excessive dietary consumption, it is more likely that eating out (fast food or sit down restaurant) is linked to excessive dietary consumption. Since the two cited studies did not adequately include a sit-down restaurant study option,[17,18] it cannot be accurately concluded that excessive dietary consumption is linked to fast food restaurants alone. Our study suggests that compared with McDonald's, more calories and fat are ordered at most of the sit down restaurants. Based on this finding, it would be more accurate to conclude that eating out (at any restaurant) is linked to excessive dietary consumption. Since fast food is less expensive, eating out more commonly takes place at fast food restaurants, but it would be unfair to link excessive dietary consumption to fast food alone, merely because fast food is more convenient and less expensive.

In one of the studies,[18] adolescents were given food from a fast food restaurant and they were instructed to eat as much as they wanted to. Yet the study investigators did not repeat the same procedure using food that would normally be found at a sit down restaurant (e.g., steaks, lobsters, ribs, baked potatoes, etc.). Without studying consumption at sit down restaurants, it would not be valid to conclude that fast food alone is linked to excessive dietary consumption.

Guthrie, et al, published a study in 2002, examining food consumed at home, at fast food restaurants, at other restaurants and at other non-home prepared foods (e.g., schools).[19] They concluded that "away" food (i.e., food that collectively was not prepared at home, which includes fast food, other restaurants, etc.) consumption was increasing and that consuming "away" food resulted in the consumption of more calories, fat, sodium, and cholesterol.[19] Since this study considered the role of non-fast food restaurants, it more accurately concluded that all restaurants (fast food and sit down restaurants) are implicated in excessive dietary consumption. Nielsen et al, published data demonstrating increasing trends toward eating out (less eating at home).[20]

The merits of holding the fast food industry legally responsible for obesity have been discussed elsewhere.[21,22] While a cheeseburger can be considered to be unhealthy in many aspects similar to tobacco, the same type of cheeseburger is also available at a sit down restaurant. Similarly, prime rib and other sit down restaurant entrees have similar adverse health properties. Thus, if fast food restaurants are to be held responsible, it should be all restaurants in general since the same allegations apply to all restaurants. While it is cheaper to purchase food at a fast food restaurant, it is a matter of choice. Individuals choose to go to a fast food restaurant vs. a sit-down restaurant for various reasons, but the dominant reasons are greater convenience and lower cost. This amplifies the effect of fast food restaurants because they impact a greater portion of the population more often. An analogy to smoking would be to hold the most popular cigarettes responsible, while absolving cigars and chewing tobacco of responsibility.

The more accurate conclusion is that it is healthier to eat at home, rather than to eat out.[19] It is possible that eating at home results in less calorie/fat consumption simply because there is less food in the house and more limited choices. Eating at restaurants presents more choices, which include healthy options together with high calorie unhealthy options.[6,7] Adolescents are relatively uneducated in making low calorie, low fat decisions. A growing child and growing teen diet might have the goal of optimizing growth which would stress a high protein and calorie diet. The post-pubertal adolescent who is no longer growing must shift to more of a maintenance diet higher in high fiber vegetables and lower in calories, fat, cholesterol, and sodium. Converting an adolescent's eating behavior from a growth oriented diet (large portions) to a modest maintenance diet to prevent obesity is a difficult task.[23]

It cannot be stated with certainty that fast food restaurants are worse than sit down restaurants.[19] Our study shows that significantly more calories and fat were ordered at most of the sit down restaurants compared to McDonald's. Additionally, the lowest calorie/fat consumption values were obtained from Panda Express, Taco Bell, and Wendy's. The significance of this is that media and/or public health nutritional interventions targeted at fast food restaurants would be missing part of the problem; and it might simply displace the problem from fast food restaurants to other restaurants. Interventions should be more comprehensive to include fast food restaurants, sit down restaurants, and other "eating out" establishments.

Healthier low calorie, low fat options are available at most restaurants. Although these might be more expensive, the option to purchase healthier items is usually there.[24] It can be difficult to identify the healthier option, since most restaurants do not point these out in an obvious fashion. Choices of menu items are influenced by previous experiences at a restaurant, the display of menu items, prices, combination meals and the appeal of the menu item. Most adolescents have more experience with fast food restaurants than with sit-down restaurants. Many study subjects took noticeably longer to make a selection from a sit-down restaurant menu, probably because these menus are longer and they are less familiar with the menu. This is

probably similar to what happens in reality, in that a typical menu choice at a fast food restaurant occurs relatively quickly compared to more leisurely menu selections at sit down restaurants. It is unclear how this affects the results of this study.

Study Limitations and Strengths

This study would most ideally be performed by having study subjects actually consume the meal that they order. This is impractical and inaccurate. Taking a group of teens to a restaurant would not reflect reality since their food bill would be paid for by someone other than them or their parents. Essentially offering them an unlimited ordering potential would not realistically estimate what they would normally order if they went to this restaurant on their own or with their family. The method used in this study recorded food choices as they were made, which should be more accurate (but not totally valid since study subjects didn't actually consume the food) than dietary recall which is a standard method that is used in nutrition studies.

Ideally, the study interview should take place just before dinner. This was not done because of scheduling difficulties. However, this should not affect the results of the study since for a given study subject, the menu choices for all 10 restaurants were done at the same time. Thus, the "hunger level" of the study subject did not vary between restaurants. Although the "hunger level" of the study subjects differ at different times of the day, the paired T-test comparison removes the variance between subjects (and between hunger levels) and only tests the differences between the two restaurants being compared (the subject and hunger level are constant).

The statistical comparison results are from multiple paired T-tests. A random block design (similar to analysis of variance, but with linked non-independent observations, as was the case here) could have been done, but a significant result would only be able to conclude that at least one of the restaurants was different from the others. The multiple paired comparisons were more useful in that specific restaurants could be determined to be associated with more or less calories compared to McDonald's. Because of the multiple comparisons, a Bonferroni correction is in order. Since there were nine comparisons for calories and nine comparisons for fat, an appropriate correction would be to set the significance level at 0.05 divided by 9, which equals 0.00555. This type of correction is generally felt to be conservative (i.e., the significance level is lower than it should be). Additionally, the significance level could be lowered further by a factor of two or four if considering the separate calorie and fat calculations and the separate tables. However, calories and fat are closely linked making this correction less than mandatory. The corrections should largely apply to the results in Table 1 since the other tables are relatively minor and are less related to the primary purpose of the study. Many of the statistically significant p values in Table 1 are <0.001, which is still below the corrected significance level of 0.00555. p values above the 0.00555 level could be considered non-significant after the Bonferroni correction.

This study cohort of adolescent musicians and tennis players consists largely of non-obese subjects. The study results might be different if different study subjects were interviewed. For example, a group characterized by larger appetites and body builds (e.g., football players or wrestlers) would likely yield different results from a group characterized by smaller appetites and body builds (e.g., ballet dancers). Musicians and tennis players were selected because we had access to these groups and the two groups could be roughly characterized by their association within these groups. Studying subjects without a group association would make it more difficult to characterize the group. Tennis is a recreational sport skewed toward upper socioeconomic groups. All the musicians studied were from public school music programs with a broad variety of socioeconomic levels, but probably skewed toward middle socioeconomic groups. This limits the generalizability of the study conclusions. However, any small study group, even a heterogeneous one, would have generalizability reservations as well. A group that is uncharacterized cannot be analyzed for confounding variables. At least with the current study group, the two dominant groups (musicians and tennis players) are known so that the conclusions can more accurately be limited to these segments.

Conclusions

More calories and fat were ordered at many sit down restaurants compared to McDonald's. The lowest calories and fat were ordered at other fast food restaurants (Taco Bell, Wendy's and Panda Express).

Authors' Affiliations

- Moanalua High School (J.A.Y.)
- Moanalua Middle School (J.B.Y., B.E.Y.)
- Department of Pediatrics, University of Hawai'i, John A. Burns School of Medicine and Kapiolani Medical Center for Women and Children (L.G.Y.)

References

1. A Full Serving of Nutrition Facts. McDonald's & You. Nutrition information brochure distributed at McDonald's dated April 2003.
2. Taco Bell Nutrition Information. www.tacobell.com Accessed October 1, 2003.
3. http://www.wendys.com/food/US_Nutrition_2003.pdf Accessed October 1, 2003.
4. Panda Express Entrees Nutritional Information. Issued by Panda Restaurant Group, Inc., January 2003.
5. http://www.dennys.com/menu/nutrition.asp Accessed October 1, 2003
6. Natow AB, Heslin J. Eating Out Food Counter. 1998, New York: Pocket Books. ISBN 0-671-89471-4
7. Borushek A. The Doctor's Pocket Calorie Fat & Carbohydrate Counter, 2004 edition. Family Health Publications: Costa Mesa, CA, 2004. ISBN 1-930448-07-4
8. www.dwlz.com Accessed December 1, 2003
9. (800) 983-4637
10. Flax L, Rosenfield R. The California Pizza Kitchen Cookbook. Hungry Minds, Inc., New York, 1996. ISBN 0-02-860988-3
11. Flax L, Rosenfield R. California Pizza Kitchen Pasta, Salads, Soups, and Sides. William Morrow and Company, Inc., New York, 1999. ISBN 0-688-16466-8
12. Natow AB, Heslin J. The Most Complete Food Counter. Pocket Books, New York, 1999. ISBN 0-671-02561-9
13. Netzer CT. The Complete Book of Food Counts, 6th edition. Dell Publishing, New York, 2003. ISBN 0-440-22564-7
14. The Nutribase Complete Book of Food Counts. Avery, New York, 2001. ISBN 1-58333-107-7
15. Blondz E. The Nutrition Doctor's A-to-Z Food Counter. Signet Books, New York, 1999. ISBN 0-451-19587-6
16. The NutriBase Buide to Fast-Food Nutrition. Avery, New York, 2001. ISBN 1-58333-108-5
17. Bowman SA, Gortmaker SL, Ebbeling CB, Pereira MA, Ludwig DS. Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. Pediatrics. 2004;113(1 Pt 1):112-118.
18. Ebbeling CB, Sinclair KB, Pereira MA, Garcia-Lago E, Feldman HA, Ludwig DS. Effects of fast food on total energy intake in obese and nonobese adolescents. Obes Res. 2004 Jan;12(1):171.
19. Guthrie JF, Lin BH, Frazao E. Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: changes and consequences. J Nutr Educ Behav. 2002;34(3):140-150.
20. Nielsen SJ, Siega-Riz AM, Popkin BM. Trends in food locations and sources among adolescents and young adults. Prev Med. 2002 Aug;35(2):107-113.
21. Falit B. Fast food fighters fall flat: plaintiffs fail to establish that McDonalds should be liable for obesity-related illnesses. J Law Med Ethics. 2003;31(4):725-729.
22. Mello MM, Rimm EB, Studdert DM. The McLawsuit: the fast-food industry and legal accountability for obesity. Health Aff (Millwood). 2003;22(6):207-216.
23. Yamamoto LG. Teen Dieting. In: Tidbits on Raising Children. 2000, Bloomington, IN: 1st Books, pp. 127-130.
24. Yamamoto JA, Yamamoto JB, Yamamoto BE, Yamamoto LG. Adolescent Fast Food and Restaurant Ordering Behavior with and without Calorie and Fat Content Menu Information. J Adolesc Health 2005;37(5):397-402.

Appendix A on next page

Appendix A: Calorie/Fat assumptions

If drink size specifications are not listed in the nutrition information, McDonald's sizes are assumed.

Child=12oz Small=16oz Medium=21oz
Large=32oz SuperSize=42oz

If drink sizes are unspecified, medium is assumed (21oz).

Shakes are considered "drinks". However, frosty dairy dessert and McFlurry are not considered drinks.

Calorie content for drinks are modestly variable (per oz). The same type of drink of the same size has different published calorie values at different restaurants probably because a different fraction of ice is assumed. It also appears that regardless of the type of drink (cola, orange juice, fruit punch, lemonade, lemon-lime beverage, etc., the calorie content is roughly the same). Thus, to reduce the contribution of variation in the assumption of calories contained in drinks, this study assumes that all drinks are 9 calories per ounce with the exception of water, diet beverages, unsweetened iced tea, and other low or no calorie beverages, which were assigned an estimated calorie value of zero calories per ounce.

Smoothies are hard to calculate so they are estimated to be double the calorie content (18 calories per oz) with no fat.

Portion sizes can vary substantially. When sizes were not specified, best judgment was used to estimate the size that would normally be served.

Steak calorie/fat content varies substantially depending on many factors: the amount of untrimmed fat, the degree of marbling, the grade of the steak (prime, choice, good, etc.), the method of cooking (broiled, etc.). Different nutrition books specified the calorie content of beef to be anywhere from 34 to 116 calories per ounce. To reduce the variation in the assumptions used for steaks, all the nutrition books used were reviewed for representative ranges of steak calorie/fat contents for each type of steak: prime rib, sirloin, New York (top loin, short loin), porterhouse, rib eye, filet mignon (tenderloin), T-bone. The high value and the low value were discarded and a representative mean was used for each type of steak for restaurants which did not specify the actual calorie/fat content of their steaks. A similar process was carried out for rack of lamb.

HAWAI'I MEDICAL JOURNAL

The Role of Public Health in Medical Education

Jay Maddock PhD
Associate Professor & Chair
Department of Public Health Sciences
John A. Burns School of Medicine
University of Hawai'i

Public Health and Medicine

Public health and medicine have a long relationship that has often been fraught with difficulty and concern over roles, responsibilities, and power.[1] The field of public health is rather new in the United States with few organized efforts preceding the 20th century.[2] Throughout the 18th and 19th centuries, public health developed mostly as a sanitary science that focused on control of infectious disease issues related to a rapidly growing population.[2] A large number of casualties from the Civil War and the building of the Panama Canal raised the impetus to address public health to the national level.

In 1912, the Public Health Service was granted the ability to investigate infectious disease and the sanitation of streams and lakes.[2] As public health became more strongly rooted in biological sciences, physicians took a leading role in the field, often at the expense of non-medical public health professionals.[2] Public Health's relationship with the medical field also changed from widespread support to mistrust and ambivalence[1] as public health evolved from focusing on sanitation and bacteriology to public health education and community health. A key tension between the two disciplines has been direct service to patients. Early public health efforts included attempts at acute care, well baby visits, and reporting of communicable diseases that overlapped with medical roles and caused considerable anger in the medical community.[1] A need arose to define public health and to create a system to train public health professionals that was separate from medicine.

The New Public Health

As public health matured, there has been a strong movement away from direct services to a system-based approach. The Ottawa Charter for Health Promotion and the Ten Essential Services of Public Health outlined this new direction. The Charter defined health promotion as the process of enabling people to increase control over and to improve their health.[3] The Charter recognized that health is not just the responsibility of the health sector but includes governmental as well as non-governmental sectors.

The prerequisites for health were defined as peace, shelter, education, food, income, a stable eco-system, sustainable resources, and social justice and equity. Health promotion therefore includes healthy public health policy, supportive environments, strengthening community action, developing individual's skills, and reorienting health services to health promotion.[3] The Ten Essential Services of Public Health were released in 1994 to focus and redirect efforts of local and state public health agencies to address the needs of the public most effectively. The consensus statement: (1) explains what public health is; (2) clarifies the essential role of public health in the overall health system; and (3) provides accountability by linking public health performance to health outcomes.[4] The statement on essential services provides a vision for public health in America – "Healthy People in Healthy Communities" – and states the mission of public health: "Promote physical and mental health and prevent disease, injury, and disability".[5] The statement describes what public health seeks to accomplish in providing essential services to the public, and how it carries out these basic public responsibilities.[4] This document serves as a blue print for how states should address public health problems. The ten essential services are: (1) monitor health status to identify community health problems; (2) inform, educate, and empower people about health issues; (3) mobilize community partnerships to identify and solve health problems; (4) develop plans and policies that support individual and community health efforts; (5) revise and enforce laws; (6) ensure a competent workforce; (7) evaluate effectiveness, accessibility, and quality of personal and population-based health services; (8) research for new insights and solutions to health problems; (9) diagnose and investigate health problems and health hazards in the community; and (10) link people to needed personal health services and ensure the provision of health care when otherwise unavailable.[4]

Public Health Education and Training

Public health education in the United States is diverse and includes both formal and informal methods. The doctorate of philosophy (PhD), public health doctorate (DrPH), preventive medicine residencies and the Master of Science (MS) are all methods in which individuals receive formal training in public health. However, the most common degree is the Master's in Public Health (MPH). This degree is designed specifically to train future practitioners in public health.

Although the MPH allows for specialization in many different areas, all degree candidates receive training in epidemiology, biostatistics, social and behavioral sciences, health services administration and policy, and environmental health. Specializations in public health address a wide variety of subfields including maternal and child health, gerontology, public health genetics, infectious and chronic disease epidemiology, social epidemiology, occupational health, international health, and many more. Typical MPH programs consist of two years of full-time study along with a field-based practical experience. In recent years, executive and distance-based MPH programs have been increasing in popularity. Schools and programs in public health are accredited by the Council on Education in Pub-

lic Health (CEPH). There are currently 33 accredited Schools of Public Health and 66 accredited programs in public health in the United States.

The core focus of public health training is on the population and not on the individual. Students study the social determinants of health including socioeconomic status, the influence of race and ethnicity, the social and physical environment, and the effects of population factors on health. The goal of all training programs is to provide students with the skills and abilities to address the new public health as outlined in the Ottawa Charter for Health Promotion and the Ten Essential Services of Public Health.

Public Health training at the University of Hawai'i :

The John A. Burns School of Medicine (JABSOM) currently offers both the MPH and MS degrees in epidemiology and social and behavioral health sciences through the Department of Public Health Sciences. Both of these programs are nationally accredited by the Council on Education in Public Health. In addition, JABSOM offers a PhD in Biomedical Sciences (Epidemiology). This program is designed for students with an interest in becoming epidemiological researchers.

JABSOM has recently received funding from the Centers for Disease Control and Prevention to create a strategic plan to rebuild the School of Public Health. The Department of Public Health Sciences has been working since October to develop a plan. The planning process includes facilitated meetings with the program faculty, community input and key informant interviews with the Association for Schools of Public Health and deans who have been successful in developing schools elsewhere. Efforts are currently under way to complete this plan by the end of 2006. When a School of Public Health is established, several additional degrees will be available. These would include at a minimum: Master's in Public Health in health administration, environmental health, and biostatistics along with two additional doctoral level programs. In addition, the university would be eligible to receive funding that is only available to schools of public health.

There is an ever-growing realization that public health and medicine are distinct fields, both necessary to provide a continuum of care from prevention to cure. Many medical schools are increasing their coverage of core public health skills and orientation to include epidemiology, biostatistics, and the social and behavioral sciences. JABSOM is currently examining ways to increase public health training into its medical school curriculum. With emerging public health threats that include avian influenza, SARS, the rise in obesity and other health disparities, continued collaboration between public health and medicine will be necessary to protect the public's health in a rapidly changing world.

References

1. Brandt AM, Gardner M. Antagonism and accommodation: interpreting the relationship between public health and medicine in the United Stats during the 20th century. Am J Public Health 2000; 90:707-715.
2. Scutchfield FD, Keck CW. Principals of Public Health Practice. Boston: Delmar Publishers, 1997.
3. World Health Organization. Ottawa Charter for Health Promotion. International Conference on Health Promotion, Ottawa, Ontario, Canada, 1986.
4. Centers for Disease Control and Prevention. The essential public health services. Accessed on-line at http://www.cdc.gov/od/ocphp/nphpsp/EssentialPHServices.htm on June 16, 2006.
5. Blueprint for a Healthy Community (1994). Washington, DC: National Association of County Health Officials.

HAWAI'I MEDICAL JOURNAL

Selenium, Selenoproteins, and Cancer

Jeffrey Squires MS and Marla J. Berry PhD,
Department of Cell and Molecular Biology,
John A. Burns School of Medicine, University of Hawai'i

Selenium is an essential nutrient primarily known for its cellular redox functions. Numerous epidemiologic, clinical, and experimental studies have indicated that selenium may have potent chemopreventative properties. The most notable of these are the selenium supplementation studies carried out by the Nutritional Prevention of Cancer Study Group. The initial findings of this study, reported in the *Journal of the American Medical Association* in 1996, indicated decreases in the incidence of prostate, lung, and colorectal cancer in the supplemented group.[1] Follow up studies confirmed the decreased incidence of prostate cancer in the supplemented population, particularly in individuals with baseline plasma selenium level concentrations in the lowest two tertiles. The molecular basis of selenium's potential anti-cancer activity is generally thought to be a result of its known effects on oxidative stress, cell proliferation, apoptosis, immunity, DNA repair, hormone signaling, angiogenesis, and cellular adhesion. Selenium is thought to act on cancer cells by directly altering cell metabolism in the form of selenite, selenomethionine, and methylseleninic acid, or via indirect means through incorporation into selenoproteins, a unique class of proteins that contain the amino acid selenocysteine. Indeed, polymorphisms in the genes for the selenoproteins, glutathione peroxidase 1 (Gpx1) and selenoprotein 15 (sep15) have been linked to some cancers, and changes in expression of Gpx1, Gpx2, selenoprotein P (SelP) and thioredoxin reductase 1 (Trx1) have been implicated in tumorigenesis. These alterations have been reviewed recently,[2] and are summarized in Table 1.

Table 1.— Selenoprotein genes implicated in human cancers

Selenoprotein gene	Cancer types	Alterations
Gpx1	Breast, prostate, lung, head and neck	Allelic variations, Loss of heterozygosity
Gpx2	Colorectal adenoma	Increased expression, Allelic variations, Loss of heterozygosity
SelP	Colorectal adenoma	Decreased expression, Allelic variations, Loss of heterozygosity
Sep15	Breast, head and neck	Allelic variations, Loss of heterozygosity
Trx1	Numerous	Increased expression

Selenium and Prostate Carcinogenesis

The Nutritional Prevention of Cancer (NPC) trials reported a 0.51 percent (0.29-0.87) reduction in prostate cancer incidence in individuals supplemented with dietary selenium.[3] Selenium's chemoprevention in the prostate has further been supported by epidemiological case studies that have shown an inverse correlation between advanced prostate cancer incidence and selenium levels in serum and toenails.[4] Preliminary data from the ongoing Selenium and Vitamin E Cancer Prevention Trial (SELECT) also indicates a lower incidence of prostate cancer in men with elevated plasma selenium levels.[5]

The relationship between selenium and prostate cancer risk has set an impetus to elucidate the mechanism of the micronutrient's chemoprevention. LNCaP cells (an androgen-sensitive human prostate cancer cell line) treated with methylseleninic acid (MSA) and analyzed by cDNA microarray analysis revealed downregulation of androgen receptor expression and changes in expression of cell cycle-regulating genes and androgen-regulated genes. MSA treatment inhibited cell proliferation of the LNCaPs and decreased the levels of prostate specific antigen secreted into the cell culture medium.[6] These results suggest that MSA protects prostate cells from carcinogenesis by altering gene expression and thereby activating cellular cancer defenses while inhibiting cell proliferation. Studies using cell lines isolated from C3(1)/SV40 T antigen (Tag) transgenic prostate cancer bearing mice have also revealed transcriptional alterations in prostate cancer.[7] The C3(1)/Tag transgenic model employs a segment of the rat steroid binding promoter gene C3(1) to regulate the expression of SV40-T antigen. Male transgenic mice develop prostatic hyperplasia, and form preneoplastic lesions that develop into invasive carcinomas.[8] Gene expression was profiled in cell lines isolated from prostatic intraepithelial neoplasia, invasive carcinoma, and lung metastases at different stages of tumorigenesis in the C3(1)/T antigen mice. cDNA microarray analysis and RT-PCR revealed changes in the expression of genes involved in promoting cell growth, angiogenesis, cellular adhesion, and invasion. Intriguingly, the investigators detected a significant decline in the expression of SelP,[7] a selenoprotein involved in selenium transport and the reduction of lipid hydroperoxides.[9] To analyze the role of selenoproteins in prostate chemoprevention, C3(1)/Tag mice were crossed with i^6A transgenic mice that lack fully-functional selenocysteyl-$tRNA^{[Ser]Sec}$.[10] i^6A mutants lack the modified base, isopentenyladenosine, in the selenocysteyl-$tRNA^{[Ser]Sec}$ anticodon loop, and exhibit reduced efficiency of selenoprotein translation.[11] The resulting i^6A/Tag mice displayed an accelerated development of prostatic lesions as compared to the wild type/Tag control mice, implicating the reduced efficiency of selenoprotein translation in prostate cancer. A marked decrease in Gpx1 protein and enzymatic activity was detected in the i^6A/Tag animals as compared to the wild type/Tag mice, confirming the selenoprotein deficient phenotype in the bigenic animals.[10]

Selenium and Colon Cancer

Epidemiologic data suggest an inverse relationship between selenium and colorectal cancer risk.[12] Colorectal cancer patients have been found to have substantially lower serum selenium levels and higher manganese and iron levels than controls.[13] The selenoproteins SelP, Trx1, Gpx2 and Gpx3 are expressed in the mucosa of the colon and have been implicated in colorectal carcinogenesis.[14] Human biopsies of colorectal adenomas were analyzed and compared to neighboring non-adenomatous tissue. The cancerous tissue had a marked reduction in SelP mRNA and protein, whereas Gpx2 levels tended to increase, indicating a possible compensatory mechanism to maintain the antioxidant potential during colorectal carcinogenesis. Indeed, Trx1 and Gpx3 levels did not change in the adenomas.[14] Further investigation revealed polymorphisms within the SelP and Gpx2 genes in colorectal cancer tissue, which are absent in colon cancer cell lines.[15] Studies using the i^6A transgenic mice and azoxymethane to induce colon cancer showed increased aberrant crypt formation in the transgenic mice. Intriguingly, selenium supplementation with selenite suppressed the development of aberrant crypts in both wild-type and the i^6A transgenic mice. These results suggest that both selenoprotein levels and supplementation with selenite may reduce colon cancer development.[16]

Selenium and Breast Cancer

As in the prostate and colon, selenium has been implicated in chemoprevention in the breast.[13] Studies using TM6 mouse mammary epithelial tumor cells treated with methylselenocysteine (MSC) revealed an inhibition of cell division. Data indicates that MSC arrests TM6 cells in S phase by increasing the interaction between cdk2 and cyclin E. It is postulated that the cellular arrest brought about by MSC may promote apoptosis.[17] Further studies have shown MSC to inhibit cellular growth of TM6 cells by inhibiting phospatidylinositol 3-kinase (P13-K) activity. Signaling molecules downstream of P13-K were also affected; p38 MAPK downregulation and inhibition of the Raf-MEK-ERK signaling pathway were established.[18] MSA studies on human breast cancer MCF-7 cells have indicated that selenium inhibits estradiol-dependent cell growth and decreases the expression of estrogen receptor α (ER α).[19] Investigators also provided evidence that MSA decreases binding of ER α to the estrogen response element and decreases the affinity of estradiol to ER α.[20]

Conclusions

Based on the initial findings of the Nutritional Prevention of Cancer Study Group, the National Cancer Institute of the National Institutes of Health funded the SELECT study to recruit more than 32,000 men into the largest prostate cancer study ever conducted. Meanwhile, research on the molecular mechanisms by which selenium may prevent carcinogensis is progressing at an unprecedented pace, providing exciting new insights into the potential roles of individual selenoproteins in various cancers. **(For more information on the Cancer Research Center of Hawai'i, visit its web site at www.crch.org.)**

References

1. Clark LC, Combs GF, Jr., Turnbull BW, Slate EH, Chalker DK, Chow J, Davis LS, Glover RA, Graham GF, Gross EG, Krongrad A, Lesher JL, Jr., Park HK, Sanders BB, Jr., Smith CL, and Taylor JR, Effects of selenium supplementation for cancer prevention in patients with carcinoma of the skin. A randomized controlled trial. Nutritional Prevention of Cancer Study Group. Jama, 1996. 276(24): p. 1957-63.
2. Diwadkar-Navsariwala V and Diamond AM, The link between selenium and chemoprevention: a case for selenoproteins. J Nutr, 2004. 134(11): p. 2899-902.
3. Duffield-Lillico AJ, Dalkin BL, Reid ME, Turnbull BW, Slate EH, Jacobs ET, Marshall JR, and Clark LC, Selenium supplementation, baseline plasma selenium status and incidence of prostate cancer: an analysis of the complete treatment period of the Nutritional Prevention of Cancer Trial. BJU Int, 2003. 91(7): p. 608-12.
4. Yoshizawa K, Willett WC, Morris SJ, Stampfer MJ, Spiegelman D, Rimm EB, and Giovannucci E, Study of prediagnostic selenium level in toenails and the risk of advanced prostate cancer. J Natl Cancer Inst, 1998. 90(16): p. 1219-24.
5. Taylor PR, Parnes HL, and Lippman SM, Science peels the onion of selenium effects on prostate carcinogenesis. J Natl Cancer Inst, 2004. 96(9): p. 645-7.
6. Zhao H, Whitfield ML, Xu T, Botstein D, and Brooks JD, Diverse effects of methylseleninic acid on the transcriptional program of human prostate cancer cells. Mol Biol Cell, 2004. 15(2): p. 506-19.
7. Calvo A, Xiao N, Kang J, Best CJ, Leiva I, Emmert-Buck MR, Jorcyk C, and Green JE, Alterations in gene expression profiles during prostate cancer progression: functional correlations to tumorigenicity and down-regulation of selenoprotein-P in mouse and human tumors. Cancer Res, 2002. 62(18): p. 5325-35.
8. Maroulakou IG, Anver M, Garrett L, and Green JE, Prostate and mammary adenocarcinoma in transgenic mice carrying a rat C3(1) simian virus 40 large tumor antigen fusion gene. Proc Natl Acad Sci U S A, 1994. 91(23): p. 11236-40.
9. Burk RF and Hill KE, Selenoprotein P: an extracellular protein with unique physical characteristics and a role in selenium homeostasis. Annu Rev Nutr, 2005. 25: p. 215-35.
10. Diwadkar-Navsariwala V, Prins GS, Swanson SM, Birch LA, Ray VH, Hedayat S, Lantvit DL, and Diamond AM, Selenoprotein deficiency accelerates prostate carcinogenesis in a transgenic model. Proc Natl Acad Sci U S A, 2006. 103(21): p. 8179-84.
11. Moustafa ME, Carlson BA, El-Saadani MA, Kryukov GV, Sun QA, Harney JW, Hill KE, Combs GF, Feigenbaum L, Mansur DB, Burk RF, Berry MJ, Diamond AM, Lee BJ, Gladyshev VN, and Hatfield DL, Selective inhibition of selenocysteine tRNA maturation and selenoprotein synthesis in transgenic mice expressing isopentenyladenosine-deficient selenocysteine tRNA. Mol Cell Biol, 2001. 21(11): p. 3840-52.
12. Duffield-Lillico AJ, Shureiqi I, and Lippman SM, Can selenium prevent colorectal cancer? A signpost from epidemiology. J Natl Cancer Inst, 2004. 96(22): p. 1645-7.
13. Patrick L, Selenium biochemistry and cancer: a review of the literature. Altern Med Rev, 2004. 9(3): p. 239-58.
14. Mork H, al-Taie OH, Bahr K, Zierer A, Beck C, Scheurlen M, Jakob F, and Kohrle J, Inverse mRNA expression of the selenocysteine-containing proteins Gl-GPx and SeP in colorectal adenomas compared with adjacent normal mucosa. Nutr Cancer, 2000. 37(1): p. 108-16.
15. Al-Taie OH, Uceyler N, Eubner U, Jakob F, Mork H, Scheurlen M, Brigelius-Flohe R, Schottker K, Abel J, Thalheimer A, Katzenberger T, Illert B, Melcher R, and Kohrle J, Expression profiling and genetic alterations of the selenoproteins Gl-GPx and SePP in colorectal carcinogenesis. Nutr Cancer, 2004. 48(1): p. 6-14.
16. Irons R, Carlson BA, Hatfield DL, and Davis CD, Both selenoproteins and low molecular weight selenocompounds reduce colon cancer risk in mice with genetically impaired selenoprotein expression. J Nutr, 2006. 136(5): p. 1311-7.
17. Sinha R and Medina D, Inhibition of cdk2 kinase activity by methylselenocysteine in synchronized mouse mammary epithelial tumor cells. Carcinogenesis, 1997. 18(8): p. 1541-7.
18. Unni E, Koul D, Yung WK, and Sinha R, Se-methylselenocysteine inhibits phosphatidylinositol 3-kinase activity of mouse mammary epithelial tumor cells in vitro. Breast Cancer Res, 2005. 7(5): p. R699-707.
19. Shah YM, Kaul A, Dong Y, Ip C, and Rowan BG, Attenuation of estrogen receptor alpha (ERalpha) signaling by selenium in breast cancer cells via downregulation of ERalpha gene expression. Breast Cancer Res Treat, 2005. 92(3): p. 239-50.
20. Lee SO, Nadiminty N, Wu XX, Lou W, Dong Y, Ip C, Onate SA, and Gao AC, Selenium disrupts estrogen signaling by altering estrogen receptor expression and ligand binding in human breast cancer cells. Cancer Res, 2005. 65(8): p. 3487-92.

HAWAI'I MEDICAL JOURNAL

Issues in Medical Malpractice II

S.Y. Tan MD, JD
Professor of Medicine,
and Adjunct Professor of Law,
University of Hawai'i

QUESTION: Little Janet, a 3-year-old toddler, accidentally ingested some aspirin pills while mom was away seeing the family doctor for the 'flu'. When she returned, she found little Janet sweaty, irritable and breathing rapidly. She immediately brought the 3-year-old to the doctor, who diagnosed Janet's condition as the 'flu', similar to her mother's. The doctor prescribed baby aspirin. Twelve hours later, the child died of salicylate poisoning. At trial, the plaintiff's expert testified that the sweating and hyperventilation should have been a tip-off to the doctor that this may have been a case of salicylate poisoning rather than the 'flu'.

A. The family physician is not negligent because he had no way of knowing that there was an accidental ingestion of aspirin.

B. But for the mother's carelessness in leaving the child unattended, the poisoning would not have taken place. Thus, the mother is contributorily negligent.

C. Poisoning is a leading cause of pediatric deaths, and all family physicians are expected to consider this diagnostic possibility.

D. The plaintiff must prove causation to win the lawsuit.

E. The doctor is liable as evidenced by the fact that he prescribed aspirin, which is contraindicated in young children because it can cause Reye's syndrome.

ANSWER: ***C, D are correct.*** This question deals with the issue of failure to diagnose, a common reason for a malpractice suit. The case centers on standard of care, i.e., whether the doctor breached his or her duty of due care. Pediatricians and family doctors who treat infants should know that the accidental ingestion of medications is a leading cause of morbidity in this patient population. The doctor in this case should have inquired into this possibility, even though the presenting signs and symptoms may also be compatible with a viral infection. Since the mother was unaware of the infant's overdose, the history given would be unhelpful or even misleading, unless the doctor raises the issue. The case will also turn on whether the physical findings themselves are enough to raise the suspicion of salicylate poisoning.

The plaintiff's expert testified that an aspirin overdose should have been suspected, suggesting that the doctor was practicing below the standard of care. The defense will have to bring in an expert or more likely several experts to testify otherwise, and the jury will evaluate the credibility and logic of the dueling experts in reaching their decision regarding fault.

It is true that without the mother's own negligence in leaving the child unattended, harm may not have come to the child. Strictly speaking, this is not contributory negligence, which applies to the victim's own negligence, and the victim here is the child. However, a separate third party claim can be entered by the defendant against the mother, and she may also face prosecution for child neglect.

Aspirin is contraindicated in young patients because of the risk of Reye's syndrome, a potentially fatal complication. This obviously places the doctor in a poor light, as it speaks to his overall low quality of care. However, the injury here is death from salicylate poisoning, not Reye's syndrome. Thus the plaintiff must still prove by expert testimony that the doctor's failure to timely diagnose salicylate poisoning was a proximate cause of death. Whether the doctor's prescription of aspirin was an additional causative factor depends on whether little Janet was given any of the prescribed aspirin. The facts are silent on this point and she may have been too ill to take any! Choice E is therefore incorrect.

Standard of Care

In negligence law, the duty owed is that of due care, or what a reasonably prudent person would do under the circumstances. However, it has long been recognized that the average layperson is incapable of judging what the acceptable level of medical care ought to be. The legal standard is therefore that level of care expected of the reasonably competent doctor, rather than the reasonably prudent person. It does not have to be a unanimous community standard, so long as it represents a minority view that is held by a respectable group of doctors.

In the past, courts would ask where the tortious act took place, invoking the so-called 'locality rule'. This was based on the belief that different standards of care were applicable in different areas of the country, e.g., urban versus rural. However, this rule has been largely abandoned in favor of a uniform standard, because medical training and board certifications all adhere to a national standard. Telemedicine has further propagated this uniformity.

Expert testimony is required to establish the customary standard of the profession. Both the complaining patient and the defendant doctor are required to produce experts to legally establish what constitutes standard care as opposed to substandard care. Experts, by virtue of their skill, knowledge, experience or education – supported by authoritative texts and treatises as necessary – then articulate the standard as it applies to the particular case. In reaching their

verdict, jurors listen to all the evidence and decide which expert, and therefore which of the parties, is the more credible.

Some courts have chosen to accept package inserts (information provided in the PDR or by medical device manufacturers) as setting the standard for drug or device use, and will hold a physician liable if it can be shown that the doctor's prescription was contrary to the manufacturer's instructions. Other jurisdictions including Hawai'i do not go as far, and merely accept the PDR as evidence to be considered.[1]

A plaintiff who attempts to sue a practitioner without assistance of an expert is likely to have the case thrown out at an early stage. The law generally prohibits a layperson from setting the standard of care in professional negligence disputes; the plaintiff cannot simply refer to a book or article to support his or her case. In many ways therefore, this is the biggest stumbling block for the plaintiff, as it is not always an easy or inexpensive matter to secure the services of an expert witness who is willing to testify against a doctor.

However, there is one important exception. The doctrine of common knowledge, more technically called *res ipsa loquitur* or 'the thing speaks for itself', holds that where *"the plaintiff's evidence of injury creates a probability so strong that a lay juror can form a reasonable belief,"* a plaintiff may be entitled to a waiver of the requirement of expert testimony.[2] This doctrine is invoked rarely, usually in obvious examples of medical injuries such as amputation of the wrong limb, lung puncture following routine shoulder injection, or removal of the wrong vertebral disc.

In legal proceedings addressing standard of care, the doctor is judged according to his or her specialty. The surgeon will be judged by the community standard of the ordinarily skilled surgeon, and the general practitioner (GP) by that of his or her fellow GPs. But there is a separate duty to refer to a specialist if the case is outside one's field of expertise. If the customary standard is to refer to a specialist, the generalist who undertakes to treat the patient will be held to the specialist's higher standard. For example, in Simpson v. Davis,[3] a general dentist performed root canal work and was therefore held to the standard of an endodontist.

This article is meant to be educational and does not constitute medical, ethical, or legal advice. It is excerpted from the author's book, *"Medical Malpractice: Understanding the Law, Managing the Risk"* published in 2006 by World Scientific Publishing Co. You may contact the author, S.Y. Tan MD, JD, at email: siang@hawaii.edu or call (808) 526-9784 for more information.

References

1. Craft v Peebles, 893 P.2d 138 (Haw. 1995).
2. Gordon v. Glass, 785 A.2d 1220 (Conn. App. 2001).
3. Simpson v. Davis, 549 P.2d 950 (Kan. 1976).

HAMPAC Needs Your Help

Join the fight to protect your patients and your practice.

HAWAII DESERVES BETTER

Medical Tort Reform Bill SB3279, HD3, SD1 died because Plaintiff Attorney and House Judiciary Chair Rep. Sylvia Luke refused to release the bill from her committee.

Point the finger at the legislature when a highly-trained trauma physician or obstetrician is not there for you and your loved ones in your greatest hour of need.

Is this an election issue? You better believe it.

Hawaii Medical Association thanks the courageous legislators who voted for Tort Reform, putting the health and welfare of Hawaii's citizens above politics:

Dennis Arakaki
Rida T.R. Cabanilla
Corinne W.L. Ching
Lynn Finnegan
Josh Green, MD
Heléne H. Hale
Chris Halford
Bev Harbin

Barbara C. Marumoto
Colleen Rose Meyer
Mark S. Moses
Kymberly Pine
Anne V. Stevens
Bud Stonebraker
Cynthia Thielen

For more information, go to: www.hmaonline.net

Paid for by the Hawaii Medical Association, a statewide membership organization for physicians and the Hawaii affiliate of the American Medical Association

As seen in The Honolulu Advertiser

HAMPAC (Hawaii Medical Political Action Committee) is a voluntary, non profit, non partisan organization of physicians and spouses.

HAMPAC financially supports pro-medicine candidates seeking public office.

Your contribution helps ensure that medicine's voice is heard at the Legislature.

Make a difference – join HAMPAC today!

To enroll, call Hawaii Medical Association at (808) 536-7702, toll-free (888) 536-2792, or go online: www.hmaonline.net/legislative.htm

UPCOMING CME EVENTS

Date	Specialty	Sponsor	Location	Meeting Topic	Contact
August 2006					
8/6-8/12	IM, FM	Keck School of Medicine of USC	Hyatt Regency Maui Resort, Maui	48th Annual Refresher Course in Medicine	Tel: (800) 872-1119
8/11-8/12	GS	Hawaii Chapter American College of Surgeons	JW Marriott Ihilani Resort and Spa	2006 Summer Meeting: Pay For Performance and Tort Reform/Nationally and Locally	Tel: (808) 586-7446 Web: http://hawaiifacs.org
8/12-8/13	OBG	Department of Obstetrics & Gynecology, John A. Burns School of Medicine	Kaka'ako Medical Education Building -- Auditorium 2nd Floor, JABSOM	Obstetrics and Gynecology Coding Conference	Tel: (808) 203-6528
8/16-8/19	EM	University of California, Davis	Ritz-Carlton Hotel, Kapalua, Maui	Hot Topics 2006: Emergency Medicine	Tel: (916) 734-5390 Web: www.ucdmc.ucdavis.edu/cme
8/17-8/18	Multi	St. Francis Medical Center -- Liliha	Sheraton Waikiki, Honolulu	Medical Malpractice: Understanding the Law, Managing the Risk	Tel: (808) 547-6050
8/22-8/26	UM, EM	University of New Mexico, Department of Emergency Medicine	Jack's Diving Locker, Kailua-Kona	Marine and Diving Medicine	Tel: (505) 280-5181 Web: www.mountainandmarine-medicine.com/Kona2006.html
8/24-8/26	GE	M.D. Anderson Cancer Center	Hawai'i Convention Center, Honolulu	International Gastroenterological Carcinogensis Conference	Tel: (713) 792-2223
8/24-8/25	Multi	Kaiser Permanente	Hawai'i Prince Hotel, Honolulu	5th Annual Pain Management Symposium: The Art & Science of Pain Management	Tel: (808) 432-7932
September 2006					
9/8-9/9	ON, GO, SO	Cancer Research Center of Hawaii	Four Seasons Resort, Hualalai, Kailua-Kona	9th Annual West Hawaii Cancer Symposium	Tel: (808) 987-3707
9/21-9/22	Multi	Kaiser Permanente	Radisson Prince Kuhio	Palliative Care: An Interdisciplin-ary Approach	Tel: (808) 432-7932
October 2006					
10/2-10/4	Multi	Stanford Hospital & Clinics	Mauna Lani Bay Resort, Kohala Coast	Perspectives on Pain and Palliative Care	Tel: (650) 724-7166 Web: www.cme.stanfordhospital.com
10/12-10/16	R, N	Western Neuroradiological Society	Fairmont Orchid, Kohala Coast	38th Annual Meeting	Tel: (630)574-0220 x226 Web: www.wnrs.org
10/20-10-22	Multi	Hawai'i Medical Association	Hawai'i Convention Center, Honolulu	2006 Annual Meeting: Leading the Way… Building on 150 Years of Service	Tel: (808) 536-7702 Web: www.hmaonline.net
10/22-10/27	U	Western Section of the American Association of Urology	Hyatt Regency Resort, Maui	82nd Annual Meeting	Tel: (714) 550-9155 Web: www.wsau.org
10/22 - 10/27	AN	International Trauma Anesthesia & Critical Care Society	Wailea Marriot Resort & Spa	Trauma: The Team Approach to the Clinical Challenge	Tel: (800) 222-6927
10/29-11/2		University of California, Davis	Grand Wailea, Maui	UCD Review and Update of Pain & Palliative Care Medicine	Tel: (916) 734-5390 Web: www.ucdmc.ucdavis.edu/cme
November 2006					
11/6-11/9	Multi	Kaiser Permanente	Wailea Marriott Resort	Evidence-Based Medicine Conference: The Essentials	Tel: (808) 432-7932
11/8-11/11	OBG	American College of Obstetricians and Gynecologists	Hapuna Beach Prince Hotel, Kohala Coast	Obstetrical and Gynecological Pearls	Tel: (800) 638-8444 x2540 Web: www.acog.org

Interested in having your upcoming CME Conference listed? Please contact Nathalie George at (808) 536-7702 x103 for information.

Classified Notices

To place a classified notice:

HMA members.– As a benefit of membership, HMA members may place a complimentary one-time classified ad in HMJ as space is available.

Nonmembers.– Rates are $1.50 a word with a minimum of 20 words or $30. Not commissionable.

For more information call (808) 536-7702.

BC/BE INTERNISTS

Hawai'i Permanente Medical Group/Kaiser Permanente

Hawai'i's most established multi-specialty group of 400+ physicians recruiting for BC/BE internists for busy outpatient clinic and call, practice based in new Maui Lani clinic (affiliated with Maui Memorial Medical Center). We are also looking for several hospitalists to be based at the main medical center in Honolulu.

Positions immediately available. Applicant must have a commitment to quality care, patient advocacy, and involvement in patient and professional education. Competitive salary, excellent benefits, relocation assistance and more. Send CV to: Physician Recruitment, HPMG Administration, 501 Alakawa Street, Suite 255, Honolulu, HI 96817-5764. email: **Thao.Hartford@kp.org**, FAX **(808) 432-4620**. EOE.

PHYSICIAN NEEDED

PART-TIME PHYSICIAN NEEDED: The Honolulu Military Entrance Processing Station is recruiting a Physician for an on-call position. Duties will involve conducting medical qualification examinations on applicants for the Armed Forces. Looking for M.D. or D.O., any specialty. Individuals applying will be subject to a credentials review and must possess a valid, current, unrestricted license. If you are looking for a unique opportunity to be part of our team, send your C.V. to: **John Kusterman, M.D., at honcmo@mepcom.army.mil or call at (808) 471-8725, ext 220.**

OFFICE SPACE

OFFICE TO SHARE: KUAKINI MEDICAL PLAZA. 3 exam rooms, 2 consultation rooms. Terms Negotiable. **524-5225.**

SEEKING INTERNIST

HOSPITALIST: Kapi'olani Medical Center at Pali Momi's contracted hospitalist group is seeking a full-time board eligible/certified internist to join a 4-member hospitalist group. Competitive salary. KMCPM is a 116-bed facility located next to Pearlridge Shopping Center. It has private rooms, an MRI and CT scanner, dx. cardiac cath. and a wide array of specialists. Contact Deborah Gaynor at (808) 983-6931, or fax CV to: **(808) 983-6939 or email: debbieg@kapiolani.org. www.kapiolani.org**

HAWAI'I MEDICAL JOURNAL

❖ EAT A LOT OF VEGETABLES AND YOU START LEANING TOWARD SUNLIGHT.

From the journal *Investigative Ophthalmology and Visual Science* comes a study conducted in France on carotenoids plasma lutein and zeaxanthin, commonly found in vegetables, to determine possible benefits regarding age-related maculopathy (ARM) and cataract. Using retinal photography and slit lamp examination, 899 subjects were studied, and after multivariate adjustment, the highest quintile of plasma zeaxanthin was significantly associated with decreased risk of ARM and cataract. The highest food source for zeaxanthin is the Chinese Wolfberry (lycium barbarum) which is commonly found in health food markets and has long been used in traditional Chinese medicine. With ARM minimized and cataracts avoided, it remains for a cure to be found for glaucoma, and many eye surgeons can take early retirement.

❖ THE BIRTH CERTIFICATE READS, "FATHER 48QAH."

Over a period of seven years a handsome young man sold between 150 and 200 specimens to a sperm bank. He was labeled 48QAH, where the QAH stood for "quite a hunk." It was known that he was a doctor, and he described himself as six-foot-four, 190 lbs, brown hair, green eyes, and an interest in caring for critically ill children. The sperm bank provides a donor catalog with a description of physical characteristics or whatever, to help potential parents make a selection of genetic material. It developed that 48QAH was rather popular, and the young man's sperm was frequently purchased at $250 for two vials. He received $50 for each contribution. Conceivably, he could have sired more than 100 children. One of the mothers wanted to find her child's biological father, but the California Cryobank maintains strict anonymity to insulate donors from any possible paternal obligation. The mother went to the Internet to create an online data base which collates contact information, names of sperm bank used and donor number. The Web site now has more than 7,000 members and to date more than 1600 people have located biological family members. It was determined that 48QAH is a pediatrician living in Michigan. This is a brave new world that takes some getting used to. Some method will need to be available to ensure that half siblings do not marry.

❖ WURLITZER AND XEROX WILL COMBINE TO MAKE REPRODUCTIVE ORGANS.

The standard medical state of mind for a couple unable to have a child is that the female has a problem. Much too often she is peremptorily subjected to multiple invasive tests to determine why she is "barren" when in fact the difficulty may be with her mate. Most physicians now recognize this, and to cover both bases, so to speak, the typical lab method to determine male potency is to count sperm and observe motility. Now, Genosis has devised a single use over-the-counter test that can be used for both male and female potency. Using established methods of fertility labs, the couple can test themselves in the privacy of their own home. Fertell® is designed to test the sperm's ability to swim through a barrier created to function like a cervix. Moreover, use of this OTC fertility test allows the gentleman to avoid the inconvenience and embarrassment of collecting a specimen in a lab closet with a Playboy centerfold.

❖ FRUIT JUICE ONLY ANGERS MY NEED FOR CHOCOLATE.

Researchers at University of North Carolina have identified the active component of grapefruit, which interacts with certain medications to produce a higher-than-expected blood level. Some of the drugs affected are calcium-channel blockers and other heart drugs, cholesterol-lowering statins, anti-depressants and certain anti-seizure medications. In some cases the impact can be equivalent to double or triple the prescribed dose. The study in the Journal of Clinical Nutrition showed that a chemical group called furanocoumarins are present in grapefruit and serve to inactivate certain enzymes. Other citruses do not cause the same disturbance. Question is, how does grapefruit juice react with vodka?

❖ SMOKING CURES OBESITY - EVENTUALLY.

Outrageous, ignominious, despicable! R. J. Reynolds tobacco company is not satisfied to merely poison America with the addictive leaf. Recently it has distributed alcohol-flavored cigarettes. Camel Exotic Blends is targeting young smokers with cigarettes labeled Blackjack Gin, Snake Eyes Scotch and Screwdriver Slots. R. J. Reynolds claims it is appealing to young adults, but it is easy to see the company is really targeting teenagers who could be captivated by the booze appeal. Reynolds introduced a campaign in December 2005 called Drinks on Us to help celebrate birthdays with coasters and liquor recipes. No one can suggest that tobacco companies have changed their behavior despite lawsuits, penalties and damage awards. In fact, legislation to allow the Food and Drug Administration (FDA) to regulate the sale, manufacture and marketing of all tobacco products was introduced in 2004 and defeated in Congress. A similar bill was reintroduced and is pending at this time. Don't hold your breath. Big tobacco is an amoral, frighteningly powerful industry buying politicians by the basketful, and shamelessly trading on human frailties.

❖ IF HER LIPS ARE ON FIRE AND SHE TREMBLES IN YOUR ARMS, BE CAREFUL, SHE PROBABLY HAS MALARIA.

In Kansas, the attorney general gave his interpretation of the state law on sexual abuse. He stated that doctors, nurses, teachers and counselors had to report sex, both consensual and non-consensual, between minors younger than 16. Moreover, teenagers seeking medical attention for a sexually transmitted disease, pregnancy or birth control could also trigger mandatory reporting. Failure to comply could result in a misdemeanor criminal charge against a physician or other health professional. Needless to say, multiple medical and social groups filed a friend-of-the-court brief, arguing that the AG's opinion would create a conflict between acting in the best interests of their patients and obeying the state's requirement. Wisely, the U.S. District Court for Kansas ruled that doctors only have to report underage sexual activity if they suspect actual injury or abuse has occurred. The attorney general is expected to appeal.

❖ DOGS HAVE A HAPPY LIFE. YOU NEVER SEE A DOG WITH A WRISTWATCH.

The average dog owner shelled out $1,571 last year for his/her best friend, Phideaux, to buy stuffed squirrels, flavored gnawing bones, and assorted treats. The American Pet Products Manufacturers Association conducted a survey and found that about half of the expense was in surgical care and vet visits, while food, vitamins and grooming were about one-third. Cats are cheaper, running an annual average of $919, since catnip mice and scratching posts don't run up large expenses. What is not included in the survey is how much the animals cost in repair of torn carpets, mutilated chairs, damaged car interiors, torn wearing apparel, and other indirect expenses. Still, it is great to have a warm body that is always glad to greet you.

❖ THERE IS NOTHING SO DIFFICULT AS DOING NOTHING.

Putnam Investments, a money management firm, conducted a study on American retirees. One-third have gone back to work or are seeking work, and most of them couldn't wait to do it. The respondents are largely college educated, and have an average annual family income of $87,000. About two-thirds of those who have returned to work wanted to get back in the workforce, and with the average household having assets of $548,000, many of them did not need to work. 70% of retirees say they wished they had begun saving sooner and 60% still carry a mortgage. The point is that retirement age in the United States has moved far beyond age 65, and for many retirement is just a planned pause before resuming a career.

ADDENDA

❖*Men's Fitness* magazine listed the healthiest cities in America. Honolulu was second behind number one Baltimore. Chicago and Las Vegas were at the bottom. Criteria were diet, exercise, air quality and pollution. The data must have been collected before the Honolulu colossal sewage outbreak.

❖In Milwaukee, Wisc., Anthony Zielinski, a member of the county Board of Supervisors, proposed a law that would allow the government to sell vital organs of indigents when they die. "If they can't help society while they are alive, maybe they can be of use when they die." He later withdrew the proposal.

❖According to the postal service, an estimated 6 billion solicitations were sent from credit card companies last year, 27 for each adult citizen.

❖Today's airline traveler is defined as "the uncomfortable served the inedible by the indifferent."

❖My parakeet died. We were playing badminton.

ALOHA AND KEEP THE FAITH — rts■

Contents of this column do not necessarily reflect the opinion or position of the Hawai'i Ophthalmological Society and the Hawai'i Medical Association. Editorial comment is strictly that of the writer.

You are cordially invited to HMA's...

Ola Pono Ike

(Health is Knowledge)

Medical Ball & Silent Auction

Saturday, October 21, 2006 Hawai'i Convention Center Ballroom

Celebrating HMA's 150th Anniversary

Keynote Speaker: Lou Whittaker, Famous Mountaineer
Emcee: Paula Akana

Featuring the installation of HMA's new president, Linda Rasmussen, MD and HMA's annual awards ceremony

Please join us in honoring:

Thomas S. Kosasa, MD
Physician of the Year

John S. Smith, MD
President's Award

J.P. Schmidt, Esq.
State Administrator of the Year

Dennis A. Arakaki & Lynn Finnegan
Legislators of the Year

Hawaii Public Radio
Live Media Reporters of the Year

Helen Altonn
Print Media Reporter of the Year

A portion of the proceeds benefit Hawaii Medical Foundation

Ola Pono Ike Tickets are available for $150, Tables of 10 for $1500.
HMA members who register for the Annual Meeting receive one complimentary ticket.
To R.S.V.P. or for more information, go online to www.hmaonline.net or contact HMA at:
(808) 536-7702, toll-free (888) 536-2792. Kindly R.S.V.P. by October 9, 2006.