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The Effect of the 2012 ASCCP Consensus Guideline for Abnormal Cervical Cytology on Resident Colposcopy Training

Cori-Ann M. Hirai MD; Bliss Kaneshiro MD, MPH; and Mark K. Hiraoka MD, MSCR

Abstract

The primary objective was to determine the theoretical number of colposcopies at a resident clinic if the 2012 American Society for Colposcopy and Cervical Pathology (ASCCP) guidelines were applied. The secondary objective was to determine the actual number of colposcopies before and after the ASCCP guidelines. This was a two-part descriptive study. The first part applied the 2012 ASCCP guidelines to all pre-guideline colposcopy cases at a single resident clinic. These theoretical results were then compared to the actual number of colposcopies. The second part compared the actual number of colposcopies during the one-year time period before and after the guidelines. Chi-Square tests and Fisher's Exact tests were used to examine the association of categorical variables. Seventy-three colposcopies were performed during the pre-guideline period. After applying the 2012 ASCCP guidelines, 52.1% would not have been indicated, resulting in 35 colposcopies. The largest reductions would have occurred in patients with low grade cytologic abnormalities. Applying the new guidelines, patients 24 years and younger would have been less likely than patients ages 25 to 64 to require colposcopy ($P < .001$). Fifty-eight indicated colposcopies were actually performed during the post-guideline period. While there was a decrease in the number of colposcopies performed post-guidelines, the decrease was not as dramatic as expected. From a training standpoint, as indications for colposcopy decrease, fewer training opportunities are available for residents. In particular, residents will have less experience evaluating low grade cytologic abnormalities in younger women.

Keywords

Resident colposcopy, ASCCP guidelines, colposcopy training

Abbreviations and Acronyms

ASCCP – The American Society for Colposcopy and Cervical Cytology

ABOG – The American Board of Obstetricians and Gynecologists

ACGME – The Accreditation Council for Graduate Medical Education

HPV – Human Papilloma Virus

ASCUS – Atypical Squamous Cells of Undetermined Significance

LSIL – Low Grade Squamous Intraepithelial Lesion

CIN – Cervical Intraepithelial Neoplasia

LEEP – Loop Electrosurgical Excision Procedure

CPT – Current Procedural Terminology

SPSS – Statistical Package for the Social Sciences

HSIL – High Grade Squamous Intraepithelial Lesion

ASC-H – Atypical Squamous Cell – cannot exclude High Grade Squamous Intraepithelial Lesion

Introduction

When compared worldwide, cervical cancer in the United States has a relatively low incidence. In 2017, the cervical cancer incidence in the United States was 7.4 per 100,000 according to the National Cancer Institute.¹ Locally in Hawai'i, the Centers for Disease Control and Prevention reported the incidence as 8.6 per 100,000 in 2014.² This low incidence rate is due in large part to effective cervical cancer screening. The goal of effective screening should be to reduce morbidity and mortality by iden-

tifying precursors that lead to invasive disease, while limiting unnecessary treatment and procedures. Pap smear collection has been a long-standing, effective screening test for cervical cancer. When cytologic abnormalities are identified by the screening pap smear, a colposcopy procedure serves to further investigate and diagnose any abnormalities. Colposcopy involves examining the cervix with a microscope and using saline, acetic acid, white light, and green light to further highlight concerning areas on the cervix. In many instances, this leads to visually directed biopsies of the cervix. This microscopic examination and biopsy of the cervical tissue is used to identify and diagnose cervical cancer or precursors to invasive disease.^{3,4} Colposcopy is a basic gynecologic skill that requires pattern-recognition. Aptitude, ease, and confidence improve as the number of procedures a trainee performs increases. The American Society for Colposcopy and Cervical Pathology (ASCCP) requires trainees in their mentorship program to perform 25 supervised examinations over a 12 to 24-month period with cytologic, colposcopic, and histologic correlation.³ However, the minimum number of procedures required for competency in colposcopy has not been established. The American Board of Obstetrics and Gynecology (ABOG) does not define the minimum number of colposcopies required for board certification. The Accreditation Council for Graduate Medical Education (ACGME) does not require residency training programs to report the number of colposcopies residents perform during their training, though they track statistics on other types of office-based procedures.

As the number of indications for colposcopy has decreased, concerns about resident proficiency in colposcopy have been raised. Cervical cancer screening guidelines have changed dramatically over the last 10 years with a trend towards decreasing the frequency of screening in more restricted age groups (age 21 to 65). The latest consensus guideline released in 2012 reduced the instances where colposcopy was recommended as the next step in evaluation in three specific ways: (1) Human Papilloma Virus (HPV) testing or repeat cytology was recommended with atypical squamous cells of undetermined significance (ASCUS) rather than immediate colposcopy; (2) Repeat cytology rather than colposcopy was recommended for ASCUS and low grade squamous intraepithelial lesions (LSIL) in young women, age 21 to 24 years; and (3) Co-testing with cytology and HPV testing was recommended for women with a history of cervical intraepithelial neoplasia (CIN) 2 or 3 who had an excisional procedure (ie, LEEP).⁴

With less women getting screened and fewer indications for colposcopy, fewer colposcopies will be performed resulting

in decreased procedures available for resident training. Data is limited on how the continually changing guidelines have affected colposcopy procedure numbers in Obstetrics and Gynecology residency training programs. A study from a Family Medicine program found an actual 45.1% cumulative decrease in colposcopy procedures after the 2001 and 2006 ASCCP guideline changes.⁵ The primary objective of this study was to describe the effect of the 2012 ASCCP consensus guidelines for abnormal cervical cytology on the number of colposcopies performed by residents at a single obstetrics and gynecology residency program.

Methods

A retrospective chart review was conducted at the Kapi'olani Medical Center Women's Resident Clinic from April 1, 2012 to March 31, 2014 after an exemption was received from the Institutional Review Board at the Hawai'i Pacific Health Research Institute. A dedicated colposcopy clinic, which receives both internal and community referrals, takes place on one half day a week at this site. Female patients between the ages of 21 and 65 years were included. Colposcopies were identified by Current Procedural Terminology (CPT) code (CPT 57452, 57454, 57455, 57456) and electronic medical records were reviewed. Data regarding patient age, indication for colposcopy including cytology result, and colposcopy result were extracted. Cases from April 1, 2012 to March 31, 2013 were evaluated using the 2012 ASCCP guidelines to determine whether colposcopy would still be indicated. This one-year time frame correlates to the one-year period prior to the release of the 2012 ASCCP guidelines. These results were then compared to the actual number of colposcopies performed between April 1, 2012 and March 31, 2013 as well as the actual number of colposcopies performed between April 1, 2013 and March 31, 2014, the one-year time frame after the release of the guidelines. Chi-Square Tests and Fisher's Exact Tests were used to determine the significance of association for categorical variables. All analyses were performed with Statistical Package for the Social Sciences (SPSS) version 16.0 (Chicago, Illinois).

Results

Seventy-three colposcopies were performed during the one-year study period, April 1, 2012 to March 31, 2013, prior to the release of the 2012 ASCCP guidelines. After applying the 2012 ASCCP guidelines, 35 of 73 colposcopies would still be performed and 38 would no longer be indicated, resulting in a 52.1% reduction in the number of colposcopies [Table 1]. Seven residents rotate through the colposcopy clinic per year, therefore the number of colposcopies per resident would have decreased from 10.4 to 5.0 had the 2012 ASCCP guidelines been in place. The largest reductions occurred in patients with ASCUS and ASCUS high risk HPV positive [44.4% (16/36) still indicated], LSIL [50.0%, (10/20) still indicated], and history of CIN 2/3 [0%, (0/8) still indicated] [Table 2]. Those with high-grade cytologic abnormalities such as high grade squamous intraepithelial lesions (HSIL) and atypical squamous

cells – cannot exclude high grade squamous intraepithelial lesions (ASC-H) (100%, 8/8 still indicated) were significantly more likely than those with low grade abnormalities to continue to require colposcopy when the 2012 ASCCP guidelines were applied ($P=.008$). Patients 24 years and younger (3.2%, 1/31) were less likely than patients age 25 to 29 (83.3%, 15/18) and 30 to 64 (79.2%, 19/24) to require colposcopy after the 2012 ASCCP guidelines were applied ($P<.001$).

A total of 58 indicated colposcopies were performed in the one-year time period, April 1, 2013 to March 31, 2014, following the release of the 2012 ASCCP guidelines [Table 1]. Thus, under the new guidelines, the number of patients who would have been indicated for a colposcopy increased from 35 to 58, or by 65.7%. Seven residents continued to rotate through this colposcopy clinic per year resulting in 8.3 colposcopies per resident.

Discussion

The new guidelines resulted in a decrease in the number of indications for colposcopy. Ultimately, patients benefited from a reduced number of invasive procedures. However, OB/GYN residents also had fewer opportunities for training in this important procedure. The 2012 ASCCP guidelines recommended longer screening intervals, later initiation of screening, increased use of HPV co-testing for evaluation of mild abnormalities, and an overall reduction in colposcopy in instances where the risk of cervical cancer is low.^{3,4} Upon initial review of our resident clinic, it was projected that the application of the 2012 ASCCP guidelines would result in a 52.1% reduction in the number of colposcopies performed, decreasing the mean number of colposcopies performed per resident per year, from 10.4 to 5.0. We projected a large proportion of the decline would be in women age 21 to 24 in whom low grade cytologic abnormalities were no longer an indication for colposcopy.

In the year following the guideline release, the actual number of indicated colposcopies performed was 58, which is higher than the expected 35 cases that were indicated under the new guidelines in the previous year. Based on this number, each resident performed 8.3 colposcopies per year. As predicted with the new guidelines, fewer women between the ages of 21 and 24 had a colposcopy. Interestingly, we observed an increase in the number of colposcopies performed for women between the ages of 30 to 65, which is why the overall number of colposcopies did not decrease as dramatically as predicted. Precise reasons for the increased number of colposcopies in this older population are unclear. We did not note an overall shift in the demographics of the population receiving general obstetrics and gynecologic care at this site. We hypothesize the decreased number of young patients requiring colposcopy left more clinic appointments open for outside referrals which tended to represent an older demographic population.

In clinical practice, adoption of a new guideline rarely happens instantaneously. As previously reported in the literature, there seemed to be a delay in the adoption of the 2006 guidelines.^{6,7} In the transition period following the release of the 2012 guidelines

Table 1. Total number of colposcopies performed in a resident clinic before and after the 2012 ASCCP Guidelines			
	Pre-2012 ACSSP Guidelines (April 1, 2012 to March 31, 2014)		Post-2012 ASCCP Guidelines (April 1, 2013 to March 31, 2014)
	Pre-2012 ASCCP Guidelines	Predicted Post-2012 ASCCP Guidelines	Actual Post-2012 ASCCP Guidelines
# of Colposcopies	73	35	58
# Colposcopies per Resident (based on average of 7 residents per year)	10.4	5	8.3

ASCCP – American Society for Colposcopy and Cervical Cytology

Table 2. Total number of colposcopies performed in a resident clinic by indication and age before and after the 2012 ASCCP Guidelines				
		Pre-2012 ACSSP Guidelines (April 1, 2012 to March 31, 2014)		Post-2012 ASCCP Guidelines (April 1, 2013 to March 31, 2014)
		Pre-2012 ASCCP Guidelines (n=73)	Predicted Post-2012 ASCCP Guidelines (n=35)	Actual Post-2012 ASCCP Guidelines
Indication for colposcopy	ASCUS and ASCUS, high risk HPV positive cytology on pap	36	16	17
	LSIL cytology on pap	20	10	13
	HSIL and ASC-H cytology on pap	8	8	11
	History of CIN 1	0	0	8
	History of CIN 2 or 3	8	0	4
	Other	1	1	5
Overall Mean Age (years)		28.5	32.8	31.6
Age Group	Age 21 – 24	31	1	4
	Age 25 – 29	18	15	25
	Age 30 – 64	24	19	29

ASCCP – American Society for Colposcopy and Cervical Cytology

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CIN – Cervical Intraepithelial Neoplasia

some unindicated colposcopies were performed at our clinic and these were excluded from our data set.

Both the predicted and actual colposcopy numbers demonstrated that the decrease in procedures was more evident in patients with low-grade cytologic abnormalities than high-grade abnormalities. Our study suggests residents will get less training in evaluating mild abnormalities while getting a similar experience in evaluating high-grade abnormalities. Because the goal of colposcopy is to diagnose cervical cancer and high-grade precancerous lesions (ie, CIN 3), resident training may not be as adversely affected as the overall numbers would imply. The number of colposcopies for high-grade lesions that a trainee needs to perform to be adequately trained has not been defined by national organizations. Brotzman and Apgar have suggested in the Family Medicine literature, at least 10 high grade lesions should be evaluated for competency.^{8,9}

This data was collected from a single resident clinic and does not include resident colposcopy experience gained outside of this particular clinic such as continuity clinics or gynecologic oncology clinics. Thus, exact procedure numbers that arise from this specialty colposcopy clinic do not reflect the entire colposcopic experience obtained by the residents in our program. Another limitation to this study was the use of CPT codes to identify our subjects. This method relies on accurate coding and can inadvertently miss subjects that did in fact have a colposcopy procedure. Though our results are reflective of current trends that we predict are affecting training programs in the U.S., the results may not be generalizable to all residency training programs. Both the increased cervical cancer screening interval and increased administration of the HPV vaccination are likely to reduce the number of abnormal cervical cytology results further.^{4,10}

Conclusion

The screening guidelines for cervical cancer continue to be reevaluated and updated with the overall goal of decreasing time and resources while improving diagnosis and survival rates. From a public health perspective, decreasing the number of unnecessary invasive procedures will undoubtedly be beneficial for patients and society as a whole. From a medical education standpoint, if there is no change to the current training methods, there is a risk that residents may not get adequate training to achieve competency. In addition to clinical exposure, a standardized curriculum including a multi-angle approach to teaching that incorporates readings, case conferences, image review, and simulation may also be necessary to provide comprehensive training. These tools have effectively been used in other programs.⁹ Other clinical opportunities including community health centers may need to be identified. Over time, if procedural numbers significantly decrease, this may necessitate referral to a physician who performs a concentrated volume of colposcopies, thus removing this procedure from the scope of some general Obstetrician Gynecologists. Residency programs

should evaluate their colposcopy training curriculum in light of the guideline changes. As clinical exposure decreases, colposcopy may need to be a required procedure tracked by the ACGME to ensure that graduates receive adequate clinical experience.

Conflict of Interest

None of the authors identify any conflict of interest.

Authors' Affiliation:

- Kapi'olani Medical Center for Women and Children, Honolulu, HI


Correspondence to:

Cori-Ann M Hirai MD; 1319 Punahou St., Suite 824, Honolulu, HI 96826;
Email: chirai@hawaii.edu

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Recommendations for Contraception: Examining the Role of Patients' Age and Race

Amanda Williams PhD; Kasey Kajiwaru MD; Reni Soon MD, MPH;
Jennifer Salcedo MD, MPH, MPP; Mary Tschann PhD; Jennifer Elia DrPH,
Kristin Pauker PhD; and Bliss Kaneshiro MD, MPH

Abstract

The literature suggests that women of different races are more or less likely to use certain contraceptive methods and patient race can influence which contraceptive recommendations a provider makes. To explore whether health care providers treat individuals of different races differently, we conducted a preliminary investigation on whether medical students recommended different contraceptive methods for hypothetical patients presenting with the same clinical features who only varied by race. Third- and fourth-year medical students (n=103) at the University of Hawai'i completed an online survey. Students read case studies about a 23-year-old and 36-year-old patient and then made contraceptive recommendations. All students reviewed the same scenarios, with the exception of the patient's name which was randomly assigned to represent one of five racial/ethnic groups (White, Chinese, Filipina, Native Hawaiian, and Micronesian). Recommendations were analyzed using χ^2 tests and bivariate logistic regressions. For the younger patient, students were most likely to recommend intrauterine devices (IUDs), followed by the contraceptive pill and Etonogestrel implant; recommendations did not differ by race/ethnicity ($P = .91$). For the older patient, students were most likely to recommend IUDs or sterilization, and Micronesian women were more likely to receive sterilization recommendations compared to White women (60% versus 27%, $P = .04$). In summary, contraceptive recommendations, specifically the frequency of recommending sterilization varied by race. Our findings add to the literature exploring the role of a patient's race/ethnicity on recommendations for contraception and highlights the need for more studies exploring the etiology of health care disparities.

Keywords

contraception, disparities, race/ethnicity, medical students, sterilization

Introduction

Despite national initiatives by organizations like the Department of Health and Human Services and the Centers for Disease Control and Prevention to provide equitable health care, race/ethnicity and socioeconomic status disparities in health outcomes persist.¹⁻³ These disparities reflect not only systematic differences in access to high-quality care, but also the attitudes and behavior demonstrated by healthcare providers toward patients from socially disadvantaged groups.⁴⁻⁷ For example, race and socioeconomic status can influence a woman's contraception use and providers' recommendations of contraceptive methods.⁸⁻¹⁰ Studies have demonstrated that healthcare providers may be more likely to recommend intrauterine devices (IUDs) to Blacks, Latinas and low socioeconomic status Whites as compared to high socioeconomic status White women.⁸

Low access to quality healthcare can lead to an increase in unintended pregnancy, particularly among women of color. Although approximately half of all pregnancies in the United States are unintended, Black women have a rate of unintended

pregnancy of 79 per 1,000 women age 15 to 44 and Hispanic women have a rate of 58 per 1,000, both are significantly higher than the rate among non-Hispanic White women (33 per 1,000).¹¹ While the endorsement of methods like IUDs, which are long-acting and highly-effective, could reflect an effort to reduce unintended pregnancy among communities that are disparately experiencing unintended pregnancies, it could also be perceived as a method of fertility control.^{8,10} Women using IUDs and implants must see a health care provider to remove them and regain fertility.

In addition to encouraging the use of highly effective but reversible contraceptive methods, health care providers also perform tubal sterilizations more commonly in minority women (Black and Hispanic), and women with low-income, public insurance, and less education.^{12,13} This higher tubal sterilization rate may be attributable to cultural preferences among patients, insurance status, and/or racial/ethnic discrimination from providers.¹²⁻¹⁵ Highlighting the potential role of provider biases in tubal sterilization, low income racial/ethnic minority women are more likely to be advised to limit their childbearing than middle-class White women, and racial minority women have reported that sterilization prevented them from conceiving more wanted children.¹⁶⁻¹⁸

The majority of research examining how patient demographics may influence contraceptive recommendations has been conducted in the continental United States (US), where Whites make up 77% of the population.¹⁹ Little is known of whether biased recommendations will emerge in contexts where Whites are not the numerical majority, an important consideration given the growing diversity occurring within the US. By 2044, more than half of all individuals living in the US are projected to belong to a racial/ethnic minority group.²⁰ Within the US, Hawai'i provides a unique setting to examine questions related to racial diversity and majority group status as it reflects the nation's anticipated population diversity. In 2015, 73% of individuals living in Hawai'i identified as a racial minority, with only 27% identifying as mono-racial White.¹⁹ Hawai'i also has the nation's largest population of Native Hawaiians and Pacific Islanders in the US, comprising 26% of the population, allowing researchers to examine whether known disparities in contraceptive recommendations for Black and Hispanic women extend to women from other disadvantaged racial/ethnic minority groups.²¹ We sought to explore whether potential race-related biases in providers' contraceptive recommendations are present early in

one's medical career, during medical school. We conducted a study of medical students' contraceptive recommendations using standardized case studies that varied only race of the patient to see if this variation affected their recommendations.

Methods

Case Studies

We presented 10 case studies with standardized descriptions of a female patient requesting a method of birth control (see Table 1). Patients in the case studies varied systematically by age (either 23- or 36-years-old), and race/ethnicity, specifically White, Chinese, Filipina, Native Hawaiian, and Micronesian. These are a few of the major racial/ethnic groups in Hawai'i and research has demonstrated differences in health-related outcomes between these groups.²² The race/ethnicity of the patients was portrayed through the use of prototypical names (Table 2). The names of the White, Chinese, and Hawaiian patients were pre-tested with a sample of 18 undergraduate students from the University of Hawai'i who demonstrated, on average, 90% agreement that these names represented women from the targeted racial groups. The Filipina and Micronesian names were identified as prototypical based on the researchers' experiences with these population groups in their clinical practice and consultation with leaders in the Filipino and Micronesian medical community.

Study Design

We emailed surveys to 195 third and fourth year medical students who had completed all required didactic education in obstetrics and gynecology from the John A. Burns School of Medicine at the University of Hawai'i between June 2014 and July 2015. Students were emailed a link to an online survey and sent a

reminder follow-up email two weeks later. Participants were first presented with case studies and asked to identify which contraceptive method they would recommend from a list of six options (female sterilization [laparoscopic tubal sterilization or hysteroscopic sterilization], intrauterine device [copper or Levonorgestrel IUD], Etonogestrel implant [Nexplanon], depot medroxyprogesterone acetate [DMPA 3-month injection], oral contraceptive pills, or condoms). Methods were always presented in this order and students were restricted to selecting only one option. For scoring purposes, contraception methods were reverse coded into ranked data such that responses ranged from least (1 – condoms) to most (6 – female sterilization) effective methods. Each participant answered questions about two case studies: one a 23-year-old woman and the other a 36-year-old woman. The race of the patients in the case studies was not explicitly disclosed, but the names were changed systematically to reflect White, Chinese, Filipina, Hawaiian, or Micronesian race. For each participant, the selected names for the 23-year old and 36-year old reflected the same race. The order of the case studies was counterbalanced between participants so that an equal number of students read the scenario about the 23-year old woman versus the 36-year old woman first. The authors created an item to gauge participants' level of experience with contraception in clinical settings (responses included None, Not Very Much, A Little, Some, Very Much, and Substantial). Finally, participants completed a demographic questionnaire which included their racial self-identification.

This study was approved by the Committee on Human Studies at the University of Hawai'i. All participants provided informed consent before completing the study. To minimize social desirability bias, several questions that did not directly relate to the study objective were included in the survey to blind participants to the primary study objective and the study intent was not revealed to participants until they completed the survey. Students received a \$5 gift card for their participation.

Statistical Analyses

Our primary outcome was to describe whether participants' contraceptive recommendations differed by patient race in the case studies. We used a convenience sample of all available third and fourth year medical students at our institution. We used a series of χ^2 tests, Spearman correlations, and pre-specified bivariate logistic regressions to analyze whether contraceptive recommendations differed by patient race, participants' clinical experience or participants' race. All analyses were performed with SPSS Version 22 (IBM Corp: Armonk, NY).

Results

One hundred and twenty-four students enrolled in the study and consented to participate, of which 103 unique individuals completed the case studies and provided contraceptive recommendations. Of these 103, four students did not provide their experience with contraception in a clinical setting and eight students did not provide their racial identification. The number of case studies for each race/ethnicity group was balanced

Table 1. Patient Case Studies	
Younger Patient	<i>Name</i> is a 23-year-old woman who comes in to your office requesting a method of birth control. She has no previous pregnancies. <i>Name</i> became sexually active at age 18. She does not have a history of sexually transmitted infections. Testing for gonorrhea and chlamydia three months ago was negative. <i>Name's</i> blood pressure today is normal. <i>Name</i> states that she does not want to become pregnant for at least a couple of years.
Older Patient	<i>Name</i> is a 36-year-old woman who comes in to your office requesting a method of birth control. She has two children. <i>Name</i> became sexually active at age 18 and is currently in a monogamous relationship. She does not have a history of sexually transmitted infections. <i>Name's</i> blood pressure today is normal. <i>Name</i> states that she does not want to become pregnant again.

Table 2. Names for each Racial/Ethnic Group	
Race/Ethnicity	Name
White	Claire Patterson, Heather Anderson
Chinese	Ying Cheung, Mei Wong
Filipina	Rhea Mae Aquino, Mariel Bautista
Hawaiian	Keikilani Kapahu, Kailani Mahelona
Micronesian	Jayleen Morelik, Merly Sigrah

($\chi^2(4) = .54, P = .97$); 22 participants read case studies about White patients, 21 about Chinese patients, 22 about Filipina patients, 18 about Hawaiian patients, and 20 about Micronesian patients. Post hoc analysis using G*Power software version 3.1.9.2 (Heinrich-Heine-Universität Düsseldorf: Kiel, Germany) for χ^2 goodness-of-fit tests indicated that 103 students provided 68% power to detect a medium effect when comparing recommendations between five racial/ethnic groups using a binary outcome of recommending sterilization.

Recommendations for Contraception

For the 23-year-old patient, a difference in the frequency of contraceptive recommendations was noted ($\chi^2(4) = 59.86, P < .001$, Figure 1). Students were most likely to recommend IUDs, followed by the contraceptive pill and Etonogestrel implant. Condoms and depot medroxyprogesterone acetate were less likely to be recommended. No recommendations were made for female sterilization in the younger patient case study. Contraceptive recommendations did not differ by race of the patient presented in the case studies for the younger scenario ($\chi^2(16) = .901, P = .91$).

A difference in the frequency of contraceptive recommendations for the 36-year-old patient was noted ($\chi^2(5) = 118.65, P < .001$, see Figure 2). Recommendations for the older women most frequently included IUD and female sterilization, followed by the contraceptive pill and Etonogestrel implant. As with the younger patient, recommendations for condoms and depot medroxyprogesterone acetate occurred less frequently. We did not note a difference in contraceptive recommendations when examining all 5 methods separately (ie, condoms, pills, DMPA, implants, IUDs, and sterilization) for the 36-year-old patient ($\chi^2(20) = 17.39, P = .63$).

Recommendations for Sterilization

To further examine our a priori assumption that the frequency of sterilization recommendations would differ across patient race, we coded contraceptive recommendations into non-sterilization (IUD, Etonogestrel implant, depot medroxyprogesterone acetate, contraceptive pills, and condoms) and sterilization (female sterilization) categories. Because the 23-year-old patient did not receive recommendations for sterilization, we focused on recommendations made for the 36-year-old patient. Previous research has demonstrated that women of color experience disparities in contraception recommendations in relation to White women⁸⁻¹⁰ so we conducted bivariate logistic regressions to examine sterilization recommendations by race of patient, using White women as the control group. Micronesian women (60%) received more frequent sterilization recommendations compared to White women (27%; $B = 1.39, SE = .66$, Wald $\chi^2(1) = 4.39, P = .04$). In addition, Chinese (38%), Filipina (41%), and Hawaiian (39%) women, were more likely to receive sterilization recommendations as compared to White women, although these comparisons failed to reach conventional levels of statistical significance ($P > .34$).

Student Characteristics and Contraceptive Recommendations

For the 23-year-old patient, contraceptive recommendations did not differ by the participant's race ($\chi^2(12) = 10.75, P = .55$; Table 3). However, recommendations were related to students' previous clinical experience with contraception (Spearman correlation $r = .22, P = .029$) such that students who reported having more experience with contraception in a clinical setting were more likely to recommend increasingly effective methods (eg, IUDs and implants).

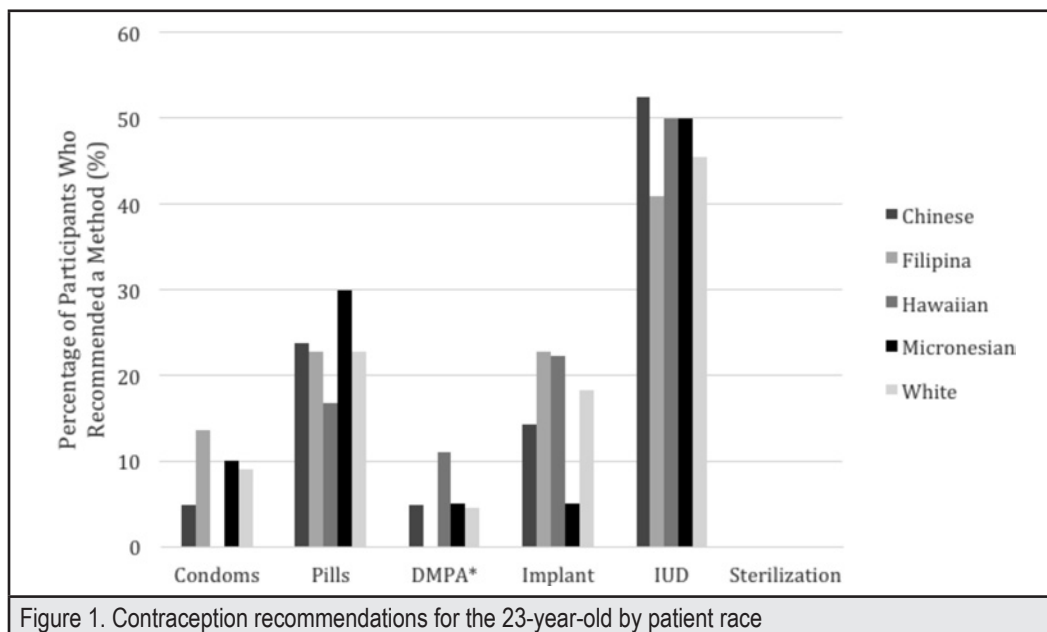


Figure 1. Contraception recommendations for the 23-year-old by patient race

*DMPA = Depot Medroxyprogesterone Acetate

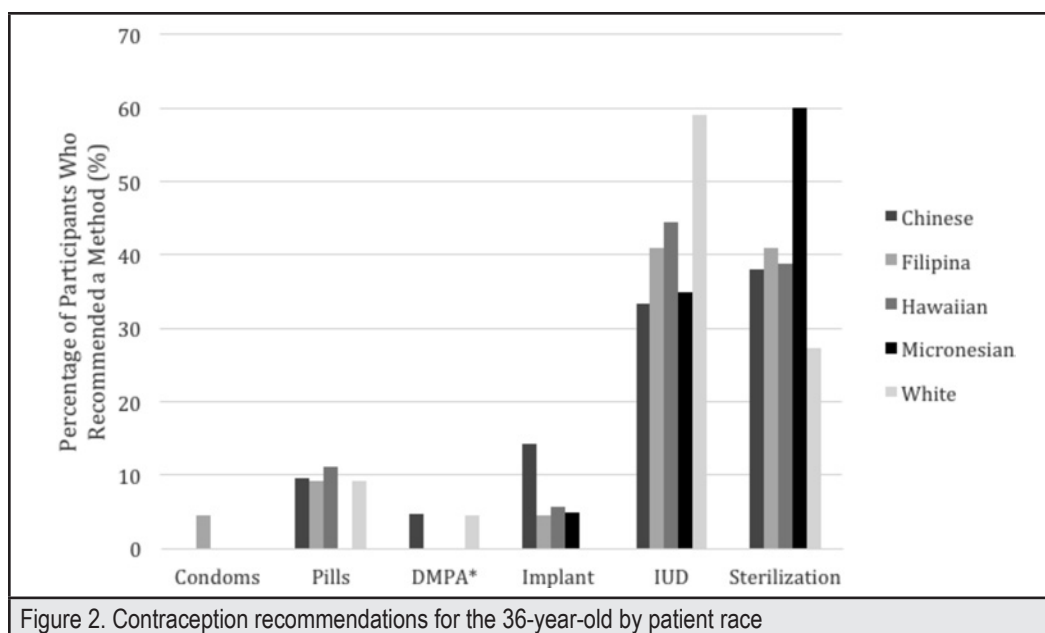


Figure 2. Contraception recommendations for the 36-year-old by patient race

*DMPA = Depot Medroxyprogesterone Acetate

For the 36-year-old patient, contraceptive recommendations did not differ by the student's race ($\chi^2(15)=15.44$, $P=.42$; Table 4). Recommendations were related to students' previous clinical experience with contraception (spearman correlation $r=.28$, $P=.005$) such that students who reported having more experience with contraception in a clinical setting were more likely to recommend increasingly effective methods (eg, IUDs, implants and sterilization). When examining recommendations for sterilization specifically, responses did not differ by participant race ($\chi^2(3)=2.02$, $P=.57$), but were related to experience (spearman correlation $r=.24$, $P=.018$) such that students who reported having more experience in a clinical setting were more likely to recommend sterilization.

Discussion

We found statistically significant differences in the frequency of recommendations for sterilization when identical case descriptions of a 36-year old woman requesting birth control were presented with variations in only the patient's name. This study adds to the literature exploring the role of a patient's race/ethnicity in recommendations for contraception. Although this topic has been examined in other published studies describing differences in contraceptive use in women of different races, the mechanisms underlying these differences are unclear.^{8,10} Social psychological research suggests that subconscious biases held toward certain groups of people is widespread, even among those who self-identify as non-discriminatory.^{23,24} Providers' personally held beliefs, in addition to their previous experience, could influence their interactions with patients and clinical recommendations, thereby contributing to continuing health disparities.^{4,5} Though we are unable to draw conclusions on the biases of health care providers early in their training,

our findings suggest that women of different races may receive different contraceptive recommendations.

That IUDs were most frequently recommended, regardless of the race/ethnicity of the patient, may reflect the increased emphasis for recommending long-acting reversible contraception (LARC) as a "top-tier" contraceptive.^{25,26} Medical students may recognize both the high efficacy and reversibility of LARC, particularly in younger women when future fertility is likely to be desired. Although participants may have identified the IUD as a "top-tier" method, their recommendations were not solely based on contraceptive efficacy. Though DMPA has a lower failure rate than oral contraceptive pills, pills were more commonly recommended than DMPA. We did not collect data on why participants recommended pills more frequently than DMPA in this survey. However, their recommendations parallel current contraceptive use in the United States where 4.5% of reproductive age women who use contraception select DMPA compared to 25.9% who select the oral contraceptive pill.²⁷ Additionally, participants may have perceived fewer barriers to the continuation of oral contraceptive pills which are often prescribed and refilled at 12 month intervals in contrast to DMPA which requires a return visit to a health center every 3 months for continuation.

While IUDs were commonly recommended for the older patients, particularly for White women, in line with other studies examining differences in contraceptive recommendations in racial minorities in the continental US, a trend toward Micronesians receiving more frequent recommendations for sterilization was noted.^{12,14,18,28} Though we did not elicit reasons for different contraceptive recommendations and therefore cannot draw conclusions on the etiology of different recommendations, biases of health care providers towards Micronesians has

Table 3. Contraception recommendations for the 23-year-old by participant demographics						
	Type of contraception					
	Condom n (%)	Pill n (%)	Depot Medroxypro- gesterone acetate n (%)	Etonogestrel implants n (%)	IUD* n (%)	Female Sterilization n (%)
Participant Race						
East/Southeast Asian (n = 60)	4 (7)	14 (23)	5 (8)	9 (15)	28 (47)	0
Multiracial (n = 17)	1 (6)	5 (29)	0	2 (12)	9 (53)	0
White (n = 13)	2 (15)	2 (15)	0	3 (23)	6 (46)	0
Hawaiian (n = 4)	0	3 (75)	0	0	1 (25)	0
Other/Missing (n = 9)	1 (11)	0	0	3 (33)	5 (56)	0
Participant Experience with Birth Control in a Clinical Setting						
None (n = 20)	4 (20)	6 (30)	3 (15)	2 (10)	5 (25)	0
Not Very Much (n = 17)	2 (12)	4 (24)	0	1 (6)	10 (59)	0
A Little (n = 21)	1 (5)	5 (24)	1 (5)	4 (19)	10 (48)	0
Some (n = 30)	1 (3)	7 (23)	1 (3)	6 (20)	15 (5)	0
Very Much (n = 9)	0	2 (22)	0	2 (22)	5 (56)	0
Substantial (n = 2)	0	0	0	1 (50)	1 (50)	0
Missing (n = 4)	0	0	0	1 (25)	3 (75)	0

*IUD = intrauterine device. Note. Regardless of Participant Race students more likely to recommend IUDs followed by the contraception pill and Etonogestrel implant ($\chi^2(4) = 59.86, P < .001$). Students who reported having more experience with contraception in a clinical setting were likely to recommend increasingly effective methods (Spearman correlation $r = .22, P = .029$).

Table 4. Contraception recommendations for the 36-year-old by participant demographics						
	Type of contraception					
	Condom n (%)	Pill n (%)	Depot Medroxypro- gesterone Acetate n (%)	Etonogestrel implants n (%)	IUD* n (%)	Female Sterilization n (%)
Participant Race						
East/Southeast Asian (n = 60)	0	5 (8)	1 (2)	2 (3)	23 (38)	29 (48)
Multiracial (n = 17)	0	1 (6)	0	0	9 (53)	7 (41)
White (n = 13)	1 (8)	1 (8)	0	1 (8)	6 (46)	4 (31)
Hawaiian (n = 4)	0	1 (25)	0	1 (25)	1 (25)	1 (25)
Other/Missing (n = 9)	0	1 (11)	1 (11)	1 (11)	5 (56)	1 (11)
Participant Experience with Birth Control in a Clinical Setting						
None (n = 20)	1 (5)	3 (15)	1 (5)	1 (5)	9 (45)	5 (25)
Not Very Much (n = 17)	0	2 (12)	0	0	10 (59)	5 (29)
A Little (n = 21)	0	3 (14)	1 (5)	2 (9)	5 (24)	10 (48)
Some (n = 30)	0	0	0	3 (10)	11 (37)	16 (53)
Very Much (n = 9)	0	0	0	0	5 (56)	4 (44)
Substantial (n = 2)	0	0	0	0	0	2 (100)
Missing (n = 4)	0	0	0	0	4 (100)	0

*IUD = intrauterine device. Note. Regardless of Participant Race students more likely to recommend IUDs and female sterilization ($\chi^2(5) = 118.65, P < .001$). Students who reported having more experience with contraception in a clinical setting were likely to recommend increasingly effective methods (Spearman correlation $r = .28, P = .006$), and female sterilization (Spearman correlation $r = .24, P = .018$).

been described.^{22,29} Micronesian migrants frequently cite limited economic resources in their western Pacific island of origin as a reason for moving to the US and are often categorized as “low income” once they arrive to the US.³⁰ These results are consistent with several previous studies demonstrating that, in comparison to White women, Black women and Hispanic women more frequently report that they were encouraged by providers to limit their family size.^{8, 10, 17, 31, 32} Whereas society may encourage white, middle-class women to become mothers, low-income, minority women may be discouraged from child-bearing both through media messages and public policy.^{8,17} For example, “welfare family caps”, policies which deny or reduce cash aid for babies born to women already receiving financial assistance exist in many states.¹⁷ When comparing hospital admission rates across a range of diseases (eg, cardiac, infections, cancer, endocrine, or substance abuse), in comparison to other racial/ethnic groups in Hawai‘i, Micronesians tend to be younger and manifest more severe symptoms.²² When socioeconomic standing is compounded with limited English proficiency, cultural differences in communication styles and limited skills in navigating a complex health care system, health care providers may classify Micronesian patients as “difficult” with a higher risk of non-compliance and loss to follow up.³⁰ This may have been why a method like sterilization, which requires no ongoing compliance or return visits on the part of the user to remain highly effective, was recommended more frequently for Micronesian patients.

Potential limitations should be noted. Prototypical names are frequently used to depict individuals from different racial groups within social psychological research.³³ The names used in this study were carefully selected to be representative of the targeted racial groups. It is still possible, however, that individual participants may not have associated names with the targeted race. Additionally, we did not state if the patient’s insurance covered all forms of contraception in the case studies, which may have limited the recommendations made by some of the students. Students may have recommended methods like the IUD not because of its characteristics but because patients could continue to use the method regardless of insurance status, access to health care providers or their ability to pay for ongoing use

which could be a problem with methods like condoms, DMPA or the oral contraceptive pill. Our measure of clinical experience was subjective; whether participants used similar criteria to gauge previous experience is unclear.

Our findings suggest that the push by national organizations to increase the use of LARC has been successful. Participants were overall more likely to recommend IUDs, as compared to all other methods, to the 23-year-old patient and equally likely to recommend IUDs and sterilization to the 36-year-old patient; making IUDs the most recommended method across the entire study. The literature on health care disparities frequently attempts to address whether better or poorer health is due to individuals of different races being clinically different or being treated differently by clinicians. Our results draw attention to potential of racial/ethnic differences in patient counseling and the need for awareness of potential differences when promoting sterilization. Future research must investigate ways to promote patient-centered, unbiased care in order to help reduce current health disparities.

Conflict of Interest

None of the authors identify any conflict of interest.

Disclosure Statement

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Authors’ Affiliations:

- Graduate School of Education, University of Bristol, United Kingdom (AW)
- Department of Obstetrics, Gynecology & Women’s Health, John A. Burns School of Medicine, University of Hawai‘i, Honolulu, HI (KK, RS, JS, JE, MT, BK)
- Department of Psychology, University of Hawai‘i, Honolulu, HI (KP)

Correspondence to:

Bliss Kaneshiro MD, MPH; Department of Obstetrics, Gynecology & Women’s Health, John A. Burns School of Medicine, University of Hawai‘i, 1319 Punahou St. #824, Honolulu, HI 96826; Email: blissk@hawaii.edu

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MEDICAL SCHOOL HOTLINE

School of Medicine Departments — Year in Review 2017, Part 1

Marla Berry PhD; John Chen PhD; Alan Hixon MD; Mariana Gerschenson PhD;
Nicholas James PhD; David Jameson PhD; Henry L. Lew MD, PhD; Scott Lozanoff PhD;
Robert Nichols PhD; Steven Seifried PhD; Dick Teshima MPH, MT (ASCP);
Kamal Masaki MD; Elizabeth Tam MD; Barbara Ward MS; and Steve Ward PhD

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

As we move into 2018, *The Year of the Dog*, there are many accomplishments that the John A. Burns School of Medicine (JABSOM) can reflect upon in 2017. In a two part series, scholarly research, and service activities from each department in calendar year 2017 are highlighted and presented. This issue includes the departments of anatomy, biochemistry & physiology, cell and molecular biology, communication sciences and disorders, complementary and integrative medicine, family medicine and community health, geriatric medicine, medical technology, and medicine.

Anatomy, Biochemistry & Physiology

The Department of Anatomy, Biochemistry & Physiology continues to strive for excellence in research, teaching, and service with respect to the overall mission of JABSOM. Several milestones were achieved in 2017. The Institute of Biogenesis Research remains the primary research component of the department. A fundable score on one R01 (W.S. Ward) and a very close score (13th percentile) on a second (M.A. Ward) were received. Two R03 Grants (V. Alarcon and Y. Marikawa) were awarded. The Institute of Biogenesis Research (IBR) partnered with the Department of Obstetrics, Gynecology & Women's Health to provide scientific mentorship for a new physician scientist: Dr. Stacy Tsai will be committing two years to laboratory work to develop her academic career. Dr. Men-Jean Lee, a more senior member from the same department, will also be performing laboratory studies in the IBR. The IBR has the only MD-PhD student in the medical school, Erica Warkus. She recently published a paper using a new model for assaying teratogenic compounds, developed by Dr. Yusuke Marikawa (PMID: 28184906). Several Development and Reproductive Biology (DRB) graduate students received research awards.

The department contributed to the University of Hawai'i (UH) at Manoa undergraduate teaching program by offering several courses that enrolled approximately 1000 students per semester. This achievement is credited to Drs. Deborah Merritt and Jason Higa as well as several DRB graduate students. Medical student teaching is conducted through the Office of

Medical Education problem-based learning program. This includes individual lectures, and gross anatomy and physiology laboratories, which contribute to the MD2 course curriculum (T. Matsui). The Willd Body Program (S. Labrash, Director) continues to expand as reflected by the annual memorial service that attracted nearly 600 attendees in April. A newly developed forensic medicine course (B. Mann) received accolades from the Western Association of Summer Sessions Administrators, while the continuing medical education program attracted over 2000 participants. Radial3D (J. Thompson), a spinoff company that capitalizes on the department's virtual reality technology initiative, and an X-Reality Visualization Core Lab were also initiated in 2017.

Cell and Molecular Biology

The mission of the Department of Cell and Molecular Biology (CMB) at JABSOM is to provide an outstanding environment for excellence in research and education in CMB and related biomedical disciplines. The CMB Graduate Program is multidisciplinary, offering PhD and MS degrees in health-related research. Seven PhD students graduated in 2017, an impressive accomplishment given a current enrollment of 17 PhD and 8 MS students. Recent graduates obtained postdoc positions at the Mayo Clinic, MD Anderson Cancer Center, and Harvard University.

Students and faculty won awards at scientific conferences, published in prestigious journals, and obtained highly competitive fellowships and grants from the National Institutes of Health (NIH) and other agencies. Drs. Marla Berry and Peter Hoffmann published a landmark article on the unique family of proteins containing selenium, recognized as a *Highlight of the Year* in the prestigious Journal of Biological Chemistry. Their expertise was further recognized by being selected to host the next International Selenium Meeting in Honolulu in 2021. Dr. David Jameson co-organized the 10th International Weber Symposium on Innovative Fluorescence Methodologies in Biochemistry and Medicine, held in Búzios, Brazil.

In the current competitive funding environment, the following accomplishments are outstanding and commendable. Faculty in CMB, including Drs. Mariana Gerschenson and Olivier LeSaux, were awarded an \$11 million grant to establish a Diabetes Center of Biomedical Research Excellence. Dr. Robert Nichols continues to lead the Hawai'i INBRE Program, now in its 15th year of mentoring junior investigators and providing research opportunities for undergraduates. NIH R01s were awarded to Drs. Berry and Hoffmann. Dr. Nicholas James is a key contributor to a new R01 grant, and Dr. Andre Seale was selected for a mentoring award.

Communication Sciences and Disorders

The Department of Communication Sciences and Disorders (CSD) continues to build the capacity of its educational and clinical programs by recruiting highly qualified faculty and students and maintaining its eight-year national accreditation. The CSD Ohana reviews its achievements and challenges, and plans for the future at its annual Strategic Planning Meeting every December.

Clients served in the Speech & Hearing Clinic increased. A new contract enabled audiological and traumatic brain injury assessments to veterans. Other firsts were initiation of an Autism Specialty Clinic, Aphasia Group, and telepractice services. Also, student recruitment in the Prerequisite Certification Program and externship opportunities have expanded. The UH Assessment Leadership Institute awarded the department with the Faculty Engagement Award. Collaboration with the Hawai'i Concussion Awareness Management Program and mainland researchers resulted in several publications, including an article on hearing disorders in Hawai'i, published in the Hawai'i Journal of Medicine & Public Health.

In service to the community, CSD supported activities with Wounded Warrior, amyotrophic lateral sclerosis (ALS), and Parkinson organizations. The department co-sponsored Hawai'i State professional conferences and workshops. Students provided hearing screenings for Special Olympics athletes and participated in the Hawai'i legislature's Children and Youth Day. The department and clinic are now a LGBTQ+ (Lesbian, Gay, Bisexual, Trans, Queer/Questioning, and others) Safe Zone.

Internationally, faculty members (Barbara Ward and Henry Lew) gave presentations about the CSD program in China, Japan, Singapore, and Taiwan. CSD continues to support the establishment of the first speech therapy program in China at Kunming Medical University (KMU) and hosted KMU's visit to JABSOM. Students from Japan joined the department for cultural and educational learning opportunities and the international student from Taiwan was honored with the Minority Student Leadership Award.

Complementary and Integrative Medicine

In 2017 the Department of Complementary & Integrative Medicine (CIM) welcomed the addition of seven faculty and staff from the former Office of Biostatistics & Quantitative Health Sciences (BQHS). The merger of BQHS and CIM brought two critically important JABSOM quantitative cores under the

management of the department, the Bioinformatics Core and the Biostatistics Core. Faculty and staff of the two cores offer high quality, efficient and responsive support to several large infrastructure-building grants, such as U54 RMATRIX, P20 INBRE, P30 PCEIDR, and the newly funded U54 Ola HAWAII. The cores supported over 150 biomedical research projects from across JABSOM and the university in 2017.

Collaborating with other graduate faculty members, the newly combined departmental faculty worked closely to revamp and strengthen the Graduate Program in Biomedical Sciences, which is housed within the department. Enhancements include the expansion of expertise of actively involved graduate faculty, a thoroughly revised model for student participation, and a fully restructured and substantially extended curriculum with two parallel tracks in Clinical Research and Quantitative Health Sciences. The newly modified and approved graduate program will enroll its first class of students in the Fall of 2018. In 2017, CIM launched its department continuing medical education (CME) program, covering various evidence-based complementary and integrative medicine topics. Two CME events were offered: a workshop on Traditional Chinese Medicine in June and a Symposium on Medical Cannabis in November.

Family Medicine and Community Health

The following are highlights from the Department of Family Medicine and Community Health.

In 2017, the Family Medicine Residency Program celebrated the first anniversary of moving the residency and inpatient teaching service to the Hawai'i Pacific Health/Pali Momi Medical Center. In addition, emergency medicine and general surgery rotations moved to Pali Momi, providing an integrated experience in an outstanding clinical setting. In May, the Family Medicine Residency Program graduated six new Family Physicians, two are practicing on O'ahu and three continued on to the UH Geriatric Medicine Fellowship Program. In 2017, the department welcomed three faculty members, Damon Lee MD (JABSOM 1999), Komal Soin MD, MPH, and Kelley Withy MD, PhD.

The department's outpatient clinical practice (The Physician Center Mililani) was selected to participate in a Centers for Medicare & Medicaid Services national pilot program, Comprehensive Primary Care Plus (CPC+), aiming to strengthen primary care delivery.

The Pacific Cancer Research Program received continued funding from the Centers for Disease Control and Prevention for cancer prevention and control projects across the Pacific.

Dr. Seiji Yamada and two JABSOM alumni traveled to Ebeye, Republic of the Marshall Islands to participate in a global tuberculosis (TB) eradication project.

Dr. Chien-Wen Tseng was appointed to the US Preventive Services Task Force as the first USPSTF member appointed from the State of Hawai'i.

Dr. Neal Palafox joined the Polynesian Voyaging Society as kauka (physician) on the final leg from Tahiti to Hawai'i as part of the world-wide voyage of the canoes Hokule'a and Hikianalia.

Geriatric Medicine

The Department of Geriatric Medicine progressed in its mission for excellence in education, research, clinical activities and community service. The department is a nationally designated John A. Hartford Foundation Center of Excellence in Geriatrics.

As of 2017, the Geriatric Medicine Fellowship program had 185 graduates. It remains one of the largest in the country. Majority of the leaders in geriatrics in Hawai'i are graduates of this program. Training in geriatrics and palliative care for residents of all specialties is provided. The department continues to develop, teach, and evaluate innovative new curricula every year at JABSOM. This year a new "Geri-Lab" experience was introduced into the MD7 curriculum. With faculty guidance, six JABSOM medical students received scholarships from the national Medical Student Training in Aging Research (MSTAR) Program for training in aging research. The Geriatrics Workforce Enhancement Program (GWEP) grant from the Health Resources & Services Administration sponsored an all-day geriatrics track at the annual Healthcare Summit in September 2017, and enhanced interprofessional training sites at the Physicians Center at Mililani and the Kokua Kalihi Valley (KKV) clinic. The department provided education in geriatrics to hundreds of medical and allied healthcare workers and students, patients, and caregivers. Partnerships with other health professions schools at University of Hawai'i for interprofessional education were strengthened.

In research, over 25 scientific abstracts were presented at international, national, and local conferences, and over 10 publications were accepted in peer-reviewed journals. In partnership with Kuakini Medical Center, faculty are resubmitting an NIH grant for a Center of Biomedical Research Excellence (COBRE). The faculty practice provided services to frail, older patients in 15 nursing homes, partially fulfilling a huge need in the State. Many faculty members participating in the faculty practice serve as medical directors for nursing homes and hospices.

Medical Technology

The only accredited program in Medical Laboratory Science in Hawai'i, the Department of Medical Technology continues to generate qualified lab professionals for the entire State. Recent graduates are currently completing their post-baccalaureate clinical training at affiliate labs: Clinical Labs of Hawai'i, Tripler Army Medical Center, Kuakini Medical Center, Kaiser Permanente, and Diagnostic Lab Services. Soon, the students will be challenging the national certification exam, in which the department's graduates consistently demonstrate high pass rates.

At the 2017 JABSOM Biomedical Sciences and Health Disparities Symposium, students presented a poster entitled "Degenerative Changes in Blood Cell Morphology as EDTA Samples Age." The project showed how blood cells undergo morphological changes over time, an issue that must be consid-

ered when samples collected at remote sites are transported to a centralized testing facility (a common practice in the industry). A full article of this project was published in the Medical Lab Observer, a peer-reviewed journal.

During the year, the department opened a new admission route for "second bachelor's degree" students, thus enlarging the total enrollment. There were many requests for information about this option, which indicates that many college graduates are strongly motivated to enter the healthcare field but were unaware of these programs. This new option also helps to alleviate workforce shortages in the State.

Medicine

In 2017, the Department of Medicine contributed to the educational, research and patient care missions of JABSOM in vital ways.

In education, the department celebrated JABSOM's successful accreditation, and continues to promote excellence through the efforts of its staff and more than 56 regular and 330 clinical or adjunct faculty members. The department provided robust clinical learning experiences for the third-year clinical clerkship and senior electives, and contributed to pre-clinical, graduate, and continuing medical education. Eighteen of the MD Class of 2017 entered residencies in Internal Medicine, including three in the UH Internal Medicine Residency Program (UHIMRP). In 2017, six UHIMRP graduates joined the General Internal Medicine faculty in Primary Care or Hospital Medicine, and nine matched to competitive sub-specialty fellowship. The Cardiovascular Fellowship graduated three fellows. The department participated in a second Accreditation Council for Graduate Medical Education Clinical Learning Environment Review, assuring continued development of training programs.

In patient care, the department continues to solidify inpatient medical team care in hospital and critical care medicine. The department has developed processes to integrate more fully with longitudinal care and population health through advanced practice models of comprehensive primary care. In July 2018, the department will initiate within UHIMRP a curriculum with primary care emphasis.

In research, the faculty continued vital funded programs in the Hawai'i Center for AIDS Research, the Center for Cardiovascular Research, and the Neurology/Magnetic Resonance Imaging (NMRI) Center. In addition, faculty, fellows, residents, and students generated abstracts, case reports, presentations, and manuscripts presented through the American College of Physicians and other regional and national medicine subspecialty meetings and journals.

Authors' Affiliation:

- John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI

INSIGHTS IN PUBLIC HEALTH

Stepping Up Vector Control's Program Capacity To Prevent Arboviral Disease Transmission in Hawai'i

Christopher Jacobsen BS; Bernard Asuncion; and Eric Honda MPH

Insights in Public Health is a monthly solicited column from the public health community and is coordinated by HJMPH Contributing Editors Tetine L. Sentell PhD from the Office of Public Health Studies at the University of Hawai'i at Manoa and Donald Hayes MD, MPH from the Hawai'i Department of Health in collaboration with HJMPH Associate Editors Ranjani R. Starr MPH and Lance K. Ching PhD, MPH from the Hawai'i Department of Health.

On October 22, 2015, the Hawai'i District Health Office (HDHO) was notified by the Disease Outbreak Control Division (DOCD) of a confirmed dengue case with no travel history; this was the first locally transmitted dengue case of the 2015 Big Island outbreak. The HDHO's response team, composed of four Vector Control and 10 Sanitation staff, was minimal. Immediate vector response efforts, to reduce or eliminate transmission risk, included field spraying to control adult mosquitos, larvaciding and mosquito breeding source reduction, and public education outreach activities within a 200-yard radius around the case's property. Initial efforts were not successful in containing further dengue cases.

By the end of November 2015, the Department of Health had confirmed 112 dengue cases, with the HDHO response team working seven days a week spraying a total of 195 properties and conducting mosquito surveys on more than 1,000 properties. It was evident early in the outbreak the initial 14 staff could not sustain the rigorous response demands; additional resources from across the state were requested. An estimated 30 Department of Health individuals from neighbor island Vector Control, Sanitation, and Indoor Radiological Health programs were enlisted. Additionally, an estimated 30 staff, including from HDHO Public Health Nursing, HDHO administrative office, and the County of Hawai'i, participated in the response.

The Hawai'i Island Dengue outbreak lasted seven months with 264 confirmed cases of dengue recorded, 879 properties sprayed, and more than 5,000 properties surveyed. The dengue outbreak was a stressful and daunting experience for the response teams and communities as well as the victims themselves.

Following the outbreak, HDHO self-assessment along with the US Centers for Disease Control and Prevention's (CDC) assessment of the response afforded opportunity to identify shortcomings and improve vector program operations to improve future response. To date the program has focused efforts in three main areas: preparation, prevention, and response.

Preparation

Both HDHO and CDC assessment processes concluded a lack of trained vector control staff severely limited capacity to respond to arboviral (viruses transmitted by arthropod vectors)

outbreaks.¹ The inadequacy also prevented routine work in areas of mosquito surveillance, mapping, monitoring for resistance, and mosquito suppression, key components of an integrated approach to mosquito management.² This program deficiency is directly attributed to the 2008 reduction in workforce that resulted in terminating 10 of 14 positions including vector inspectors, workers, a laboratory assistant, and an entomologist. A tremendous effort to restore the Vector Control program was undertaken with the legislature and administration creating a total of 30 new positions statewide since the 2015 outbreak. Ten were allocated to Hawai'i Island, increasing the current HDHO Vector Control program in that area to 14 positions.

Staff training is an essential component of program preparedness and has been a major area of emphasis following the outbreak. Training sessions have included day-long classroom sessions, field exercises, mock responses, as well as a two-and-one-half day statewide conference where specialists from Hawai'i and the mainland presented topics related to mosquito management and response strategies for arbovirus introductions.

All staff personnel have received training on the safe and proper use of the pesticidal abatement products and the various types of equipment used by the program, and were certified as pesticide applicators for public health pest control. Such training and certification ensures chemical interventions will have the least possible nontarget impacts, be in full compliance with applicable laws, and be safe for residents within treated areas. Staff knowledge and understanding of the modes of action of chemicals employed prepares them to discuss with and ensure risks are aptly conveyed to residents, who are often fearful of pesticides, the nature of the products, and equipment in use.

Staff personnel have also received extensive training in the biology of Hawaii's various vector organisms, habitats, and environments in which vectors thrive; the biology of disease organisms with elevated potential to enter the islands; and nuances of interactions between the vector and the disease it may carry. Not only is such knowledge important for on-site risk assessment and treatment considerations, but it is also important for educational outreach aspects of Vector Control program activities.

The final major limitation identified as related to preparedness was a lack of equipment and supplies to respond to emergencies or even conduct routine surveillance and laboratory activities. The Vector Control program accessed state emergency funds and a CDC Epidemiology and Laboratory Capacity for Infectious Diseases grant to purchase vehicles, pesticide products, various types of application equipment, water transporting containers, safety equipment, a droplet calibration device, microscopes, insect rearing supplies, surveillance traps, trap batteries, and field assay kits for testing mosquitoes for disease. The field kits are not definitive but only serve as a tool to assess disease risk quickly to guide emergency response efforts should an arboviral disease begin circulating on the island. At this time, the program has regained capacity to respond to multiple locations at once, employ various strategies as needed to abate mosquitoes, educate and allay fears of the public, and conduct surveillance to determine mosquito densities and efficacy of strategies.

Prevention

Although Hawai'i is fortunate to be free from endemic arboviral diseases, vector species themselves are present year-round in many parts of the islands and can spread pathogens, such as dengue, upon importation. The program is strategically aiming to lessen future risks by suppressing mosquitoes through sanitation and larval source reduction (sanctioned effective methods to reduce mosquitoes^{2,4}) and mitigating exceptional opportunities for disease entry in the following ways.

First, routine surveillance and larval breeding source reduction have been restored at ports of entry to reduce the potential for establishment of new vectors in Hawai'i. Vector Control staff have created a database listing sites capable of supporting mosquitoes. Subsequently, mosquitoes have either been permanently eliminated or mosquito suppression measures including regularly treating with larvicides to prevent mosquito development have been employed at those identified sites. Staff also conduct weekly trapping of mosquitoes to monitor population trends and identify immigrant species.

Next, areas hosting events that attract large crowds, especially with many international visitors, (eg, Ironman Triathlon, Kailua-Kona) are surveyed, and mosquitoes are suppressed in the weeks preceding the occasion in mid-October. The rationale for this strategy is to reduce the chance of contact between an infected individual arriving in Hawai'i and mosquitoes that could potentially transmit the pathogen. In the example of the Ironman Triathlon, resorts and parks along the western coastal areas of the island spanning more than 75 miles are covered. For the same reason, scenic points and parks island-wide are regularly surveyed and mosquito suppression measures are implemented.

Vector Control routinely goes door-to-door within communities to educate the public and reduce mosquito breeding sites. Recognizing our limitations and need for community adoption of practices and behaviors that reduce mosquito populations and the risk of being bitten, this strategy is deemed valuable despite its labor intensity. Community interactions are mostly

positive, and the program has begun to implement mechanisms to assess lasting impact of these activities. Side benefits of work in residential areas are that this activity creates familiarity with Vector Control program methods, allows some mosquito surveillance, and provides an opportunity to inventory habitat and artificial breeding sources, which can be used for future risk analysis or to determine the need for special community-based projects such as organized cleanups.

A final area of prevention activities is directed towards residential housing for the elderly as well as school areas, where human populations deemed potentially more vulnerable are concentrated.^{5,6} As with previously described activities, staff regularly visit these areas and look for opportunities to disrupt mosquito development and assess mosquito population levels and species present.

Discernably the program has adopted a proactive approach through its emphasis and use of considerable resources on prevention detailed above. Activities are strategic, have clear goals, and assessment mechanisms are being implemented.

Response

Experiences during the 2015–16 dengue outbreak highlighted challenges and shortcomings of the singular approach to adult mosquito control implemented by the Vector Control program. That approach consisted exclusively of Aqueslin (permethrin + PBO, Bayer) applied with ultra-low volume backpack equipment (Hudson Porta-pak, HD Hudson Manufacturing). While the efficacy of both the product and approach is known,² there are some shortcomings. The strategy relies on tiny droplets (<30microns) of pesticide solution drifting through the environment and contacting mosquitoes. This approach gains higher efficacy with relatively wide areas of applications but provides no residual control; can be impeded by dense vegetation; and is negatively influenced by weather events such as low humidity, wind, or air currents rising from the ground.² These factors, coupled with an intrinsic behavior of the mosquitoes to become less active and potentially sheltered in cryptic environments from mid-morning to late afternoon when most adulticide spraying occurred, led CDC to conclude there was an unknown capacity to control mosquitoes since some research has found applications outside of periods of activity may not be as effective.^{1,7} CDC encouraged adoption of strategies to evaluate efficacy and develop methods to improve on knockdown of adult mosquitoes for greater periods of time. They also recommended adoption of a neighborhood scale approach rather than applications limited to a 25-yard radius surrounding residences with confirmed/suspected dengue cases. In their assessment, CDC also referenced the challenges in obtaining approval to treat properties and the lack of organic options as obstacles to overcome to improve the chemical control aspect of responding to disease outbreaks.¹ Since the outbreak, the Vector Control program has taken aggressive steps to overcome the challenges and address recommendations.

First the program has aligned itself with CDC recommendations on response, specifically using the "Zika CDC Interim

Response Plan” and their “Surveillance and Control of *Aedes aegypti* and *Aedes albopictus* in the United States” as guidance. The program now both surveys and sprays wider focal areas (150 m radius), utilizes a range of products, adopts barrier or residual spraying where appropriate, and monitors the effect of interventions as well as resistant mosquito populations.^{3,8} Activities are initiated when we are notified of a suspected arbovirus infected case.

Included among the new products are organic adulticides and larvicides that can be used on Organic Materials Review Institute (OMRI) certified organic farms as well as for homes opposed to traditional approaches. Also in inventory are products with a wider crop labelling to have capacity to apply treatments to fruit tree and food crops found on many properties. These options alone increase the overall treatment area and percentage of homes receiving mosquito abatement within target areas. Coverage of affected areas are often a predictor of mosquito population reduction.²

As mentioned earlier, the program has invested in new spray equipment. Among them are Stihl mistblowers (model SR450) designed to apply pesticides with a much coarser spray (500+ microns) and at much higher volumes. Mistblowers also have the capacity to achieve greater penetration into areas of dense foliage and cryptic environments. These types of applications are commonly known as either barrier or residual applications and have demonstrated efficacy.^{9,10} Newly adopted mosquito surveillance activities following treatment in various habitat types have regularly found greater than 95% reduction in mosquito captures with control lasting more than two weeks. This approach overcomes several weaknesses identified during the 2015 outbreak. In most instances properties will not require a second application within a known case’s period of viremia, which frees manpower to focus on newly identified cases or to extend the area of treatment around the case. Residual activity of the strategy reduces reliance on mosquito activity during the time of application as mosquitoes will continue to be killed days after the application as they rest on treated surfaces. Residents that decline treatment or are not at home during abatement activities will also gain some benefit since the spray strategy creates barriers to immigration and emigration of mosquitoes creating isolated populations. The barrier and residual strategies are also applied with traditional hand pumps to sides of buildings or other situations where drift is a concern and extends treatment right to people’s doorways where peridomestic mosquitoes frequent and rest. In the past, efficacy was often limited in those types of locations because of a pesticide’s interaction with construction material. To counter this effect the program has obtained a special polymer formulated product (Suspend Polyzone, deltamethrin, Bayer) to extend efficacy to concrete and rock surfaces.¹¹

Changes in response to disease introductions have been profound and are believed to substantially reduce risk to our residents as compared with the period prior to the dengue outbreak. Despite these and other positive actions in preparedness and prevention, the Vector Control program continues to strive for advances, recognizing the challenge and threat that introduced mosquito-borne diseases represent. We endeavor to keep the state free of arboviral diseases, contributing our share to realize the department’s motto: “Healthy Communities, Healthy Islands, Healthy People.”

Acknowledgements

We would like to acknowledge the efforts of sister agencies and their staff within the Hawai’i Department of Health (ie, Disease Outbreak Control Division, Hawai’i State Laboratories Division, and Public Health Nursing Branch) that also expended immense resources and energy to inform Vector Control Program efforts and helped bring the outbreak to an end. We are grateful for these individuals and agencies that continue to be devoted to public health protection. Unfortunately, their contributions and activities are beyond the scope of this writing. Ruth Niino-DuPonte provided valuable recommendations to improve an early version of this work. Finally, the Epidemiology and Laboratory Capacity for Infectious Diseases- Building and Strengthening Epidemiology, Laboratory and Health Information Systems Capacity; cooperative agreement 6NU50CK000415 for providing funding to improve Vector Control arboviral disease response and assuring capacity to conduct mosquito surveillance.

Authors’ Affiliations:

- Department of Health, Hawai’i District Health Office, Vector Control Branch, Hilo, HI (CJ, BA)
- Department of Health, Hawai’i District Health Office, Environmental Health, Hilo, HI (EH)

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General Recommendations on Data Presentation and Statistical Reporting (Biostatistical Guideline for HJM&PH)

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

Percentages: Report percentages to one decimal place (eg, 26.7%) when sample size is ≥ 200 . For smaller samples (< 200), do not use decimal places (eg, 26%, not 26.7%), to avoid the appearance of a level of precision that is not present.

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

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

P values: Using P values to present statistical significance, the actual observed P value should be presented. For P values between .001 and .20, please report the value to the nearest thousandth (eg,

$P = .123$). For P values greater than .20, please report the value to the nearest hundredth (eg, $P = .34$). If the observed P value is greater than .999, it should be expressed as “ $P > .99$ ”. For a P value less than .001, report as “ $P < .001$ ”. Under no circumstance should the symbol “NS” or “ns” (for not significant) be used in place of actual P values.

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

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

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

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

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

Clinically meaningful estimates: Report results using meaningful metrics rather than reporting raw results. For example, instead of the

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The following are general guidelines for publication of supplements:

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2. Supplements must have educational value, be useful to HJM&PH readership, and contain data not previously published to be considered for publication.
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THE WEATHERVANE

RUSSELL T. STODD MD; CONTRIBUTING EDITOR

SPEAK SOFTLY AND CARRY LOGIC.

One hundred twelve years ago, the President of the United States summoned coaches and athletic directors of Harvard, Yale, and Princeton to the White House for an extended discussion. It was October 9, 1905 the year that football killed 18 young athletes (11 of them high school students), and seriously injured dozens of others, including his own son who played at Harvard. At the height of his power and popularity Teddy Roosevelt urged the leading football powers of the day, to introduce innovations and reduce the brutality of this game that they all loved. The following month Columbia terminated its football program, and New York University and Stanford prepared to also. The President discouraged those steps, and urged reform but not abolish the sport. Their rule changes included; offensive players would no longer lock arms to break open a running lane; they established a neutral zone separating the offensive and defensive lines; the offense would have three downs, instead of five to gain 10 yards and legalized the forward pass, a revolutionary change. With Teddy's push, marginal improvement was noted, but damaged joints, fractures and especially brain damage with dementia still persisted. In time, professional athletes entered the game and now the National Football League declared "Medical considerations must always come first." The current White House occupant is unlikely to provide athletic safety leadership.

AT LAST! RECOGNITION OF A DISEASE.

After months of procrastination the US Food and Drug Administration (FDA) has acknowledged that America has an opioid addiction disorder. Opioid overdoses killed 33,901 Americans in 2015, 16% increase from the previous year, according to the Centers for Disease Control and Prevention (CDC). "We are facing an opioid epidemic — a public health crisis, and we must take all necessary steps to reduce the scope of opioid misuse and abuse," said FDA Commissioner Scott Gottlieb. "We will continue to make regulatory steps when we see situations where an opioid product's risks outweighs its benefits." Many public health officials believe the addiction crisis began with the widespread prescription of painkillers. In Mobile, Alabama, the criminal trial of two doctors accused of overprescribing and dispensing fentanyl through their own pharmacy was revealing. The doctors allegedly received \$115,000 in kickbacks from Insys Therapeutics for prescribing large amounts of fentanyl, brand name Subsys. They conspired with Insys employees to defraud insurance companies by misleading them with patients' diagnoses. The trial is the first of more than a dozen federal prosecutors have brought involving bribes by Insys employees. In addition, the FDA asked Endo Pharmaceuticals to voluntarily remove the painkiller Opana ER from the market. "Should the company choose not to remove the product, the agency intends to take steps to formally require its removal."

ARTIFICIAL INTELLIGENCE WILL REPLACE MANY EMPLOYEES. NOT.

Recently, a team of computer scientists at Stanford University said their artificial-intelligence (AI) had diagnosed pneumonia on chest X-rays more accurately than radiologists. Does this indicate a threat to radiologists? Hardly! They already have to confront an increasing mass of data. AI can sift through and spot patterns humans might miss, but machines don't know what to do with that info. Every year some

800 million radiology exams generating roughly 60 billion images are produced, estimates Steve Tolle, VP of global strategy at IBM's Watson Health Imaging. "We have the expectation they are getting it right every time." Responding to all that data is why some images in Britain go for weeks without being read, and so many burn out despite high salaries. IBM believes AI can relieve much of that strain. In one experiment IBM Watson diagnosed the presence of melanoma on skin lesions with 76% accuracy, compared to 71% average of 8 dermatologists. Since AI learns from patterns identified by humans, it cannot know more than humans. But AI does not forget so it can be more consistent and less biased in applying knowledge. The panic over AI stealing jobs is reminiscent of past anxiety about outsourcing jobs overseas. Didn't happen. US regulators do not want unregulated doctors making clinical decisions. Moreover, the number of US radiologists has increased more than 40% since 1995.

BUILD A BETTER MOUSETRAP AND THE WORLD WILL BEAT A ...LATER MAYBE.

The football helmet manufacturer Vicis, a Seattle company could hardly have started better. It attracted \$40 million in funding after its first product tested better for safety than any NFL helmet in history. Many high profile players signed on as investors. The NFL athletes should have been excited to wear the helmet and eagerly jumped on the bandwagon, but no. Of the leagues, 1,700 players, only 50, about 3%, took the field in the Vicis helmet. Xenith which has three of the top six helmets, isn't doing much better in the pro ranks with about 7.5% wearing their product. Riddell still has 55% of the league market as well as a licensing deal for collectible merchandise with Schutt. These two have long outfitted most NFL players. Even at a time when more attention than ever is paid to CBE, chronic brain encephalopathy, few athletes think they are vulnerable. Jeff Crandall, a biomedical engineer from the University of Virginia, who oversees helmet testing for the NFL said the analysis essentially measures how well a helmet prevents the head from jarring and twisting in different directions on impact. Professor Crandall said the Vicis helmet scored better "across the board" than the other helmets.

ADDENDA

- Economist (mag) stated that parents now spend twice as much time with their children than they did 50 years ago.
- The squirting cucumber can shoot its seeds up to 40 feet.
- Record for most costume changes by an actor for a single film: 65 Elizabeth Taylor for Cleopatra.
- Victory goes to the player who makes the next-to-last mistake.
- An eighty-five year-old British woman had "Do not resuscitate." tattooed across her chest. Here you can just tattoo "HMO."
- Democracy is being allowed to vote for the candidate you dislike least.

ALOHA AND KEEP THE FAITH rts

(Editorial comment is strictly that of the writer.)

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