

The BLEND Methodology to Examine Health Behavior and Risk among Female Adolescents of Multiple Ethnicities in Hawaii



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Rethinking Definitions of Race and Ethnicity

- Race – a component of ethnicity
 - “The social group a person belongs to because of *a mix of physical features*, themselves attributable to genetic differences arising from evolution in a particular place” (Bhopal R 2001, p. 21)
- Ethnicity
 - “A group identity based on a *shared set of biological, cultural and socio-political characteristics*” (Bhopal R 2001, p. 36)

Bhopal R. Ethnicity and race as epidemiological variables: centrality of purpose and context. In: Macbeth H, Shetty P, eds. *Health and Ethnicity*. London: Taylor & Frances; 2001.



Our Thinking

- Ethnicity encompasses racial, behavioral, and cultural aspects of identity.
- We add further measurement if the focus is on a physical trait, a dietary factor, or a cultural preference.

Hawaii: A Model of Ethnic Blending

- Hawaii has been described as a “melting pot,” a term not currently in vogue but an epitome of ethnic blending.
- Hawaii provides an opportunity to contribute to the “nature vs. nurture” conversation by:
 - controlling a number of environmental factors
 - examining the role of ethnic mixing on indicators of health & risk factors for disease

Ethnic Mixing in Hawaii



- Sorenson (2003) examined 11 data sets in Hawaii and found 100 separate ethnic categories, with inconsistent spelling and combining of groups.
- 61% of babies were identified as mixed ethnicity in 2000 (State of Hawaii, 2001).
- OMB guidelines only denote *mixed ethnicity*, mixing all different combinations in one group.

Sorenson C, Wood B, Prince E. Race & ethnicity data: developing a common language for public health surveillance in Hawaii. *Californian J Health Promot.* 2003;1:91-104.
State of Hawaii. The State of Hawaii data book 2000. Available at:
<http://www.state.hi.us/dbedt/db00/db2000.pdf>. Accessed November 29, 2003.



Female Adolescent Maturation (FAM) Study

- Study population
 - Female adolescents
 - Randomly selected at age 9 to 14 years
 - Kaiser Permanente Oahu membership
- Cohort study design
- Study purpose:
 - Examined ethnic and behavioral factors influencing maturation and body composition
 - Developed the BLEND methodology to describe ethnicity
 - Obtained information on the girls' ethnicity from their parents/guardians
 - Asked parents/guardians to provide every ethnicity of the biologic parents of the girl

The BLEND Question:

What is the ethnicity of each biologic parent of this child?
(Estimate percent ethnicity of each parent)

Mother	Percent
<u>Native American</u>	_____
<u>African American/Black</u>	_____
<u>Asian</u>	
Chinese	_____
Filipino	_____
Japanese	_____
Korean	_____
Other (Write in) _____	_____
<u>Hispanic</u>	_____
<u>Native Hawaiian or Other Pacific Islander</u>	
Hawaiian/Part-Hawaiian	_____
Other Pacific Islander (<i>specify</i>) _____	_____
<u>White</u>	_____
Other (<i>write in</i>) _____	_____
<u>Mixed</u>	_____
<u>Other (Write in)</u> _____	_____
<u>Refused/ Don't Know</u>	_____

Father	Percent
<u>Native American</u>	_____
<u>African American/Black</u>	_____
<u>Asian</u>	
Chinese	_____
Filipino	_____
Japanese	_____
Korean	_____
Other (Write in) _____	_____
<u>Hispanic</u>	_____
<u>Native Hawaiian or Other Pacific Islander</u>	
Hawaiian/Part-Hawaiian	_____
Other Pacific Islander (<i>specify</i>) _____	_____
<u>White</u>	_____
Other (<i>write in</i>) _____	_____
<u>Mixed</u>	_____
<u>Other (Write in)</u> _____	_____
<u>Refused/ Don't Know</u>	_____



BLEND Definition of Ethnicity

- Used OMB 1993, Directive 15 main categories to name ethnicities, with further detail to reflect the most common ethnicities in the Hawaii population
- Derived ethnicity from the summed combination of both mother's and father's ethnicity

For example, if a girl's father was 50% Asian and 50% White, while her mother was 25% Asian, 75% White, the girls' ethnicity was assumed to be half of each and recorded to be 37.5% Asian and 62.5% White

- Reported Asian ethnicities including Japanese, Korean, Chinese, Filipino, Indian, Thai and Vietnamese ancestry



Presentation & Use of Ethnic Data

- Ethnicity data collected in percent
- Allows classification or analysis in percent
 - For example:
 - Classified based on percent of a particular ethnicity
 - Asian (100%)
 - White (100%)
 - Mixed
 - Percent Asian-ness of a girl

FAM Baseline Daily Nutrient Intake from 3-Day Food Records (ANOVA, n=316)

	White N = 51 Mean ± SD	Asian N = 67 Mean ± SD	Mixed N = 198 Mean ± SD	US Recommendations
Kcal	1832 ± 469	1751 ± 428	1815 ± 522	2200 ¹
Carbohydrate (g and % of calories)	249 ± 74	229 ± 63	234 ± 71	130 ¹
	54%	52%	52%	45-65% ¹
Protein (g and % of calories)	64 ± 20	69 ± 19	66 ± 21	34 ¹
	14%	16%	15%	10-30% ¹
Fat (g and % of calories)	67 ± 22	64 ± 20	70 ± 26	-
	33%	33%	35%	25-35% ¹
Total calcium (mg)	922 ± 439	705 ± 368*	704 ± 344*	1300 ²
Dairy calcium (mg)	645 ± 426	425 ± 284*	438 ± 290*	-
Non-dairy calcium (mg)	257 ± 103	261 ± 164	240 ± 112	-
Dietary calcium (mg)	901 ± 446	685 ± 347*	678 ± 328*	-
Supplemental calcium (mg) ³	97 ± 92	111 ± 116	147 ± 131	-
Fiber (g)	13 ± 4	10 ± 4*	11 ± 5*	26 ¹
Iron (mg)	13 ± 4	10 ± 4*	11 ± 4*	8 ²
Folate (mcg DFE)	414 ± 153	305 ± 145*	343 ± 149*	300 ²
Isoflavone (mg)	16 ± 26	17 ± 22	21 ± 35	-

* Comparison of "A" or "M" with "W" significant at the 0.05 level

¹ RDA, AMDR, and AI values from Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat and Fatty Acids, Cholesterol, Protein and Amino Acids (Macronutrients), National Academy of Sciences (RDA with a moderate physical activity level)

² Dietary Reference Intakes from National Academy of Sciences

³ n=58 (W=11, A=12, and M=35)

FAM Baseline Daily Food Group Intake (ANOVA, n=316)

	White N = 51 Mean ± SD	Asian N = 68 Mean ± SD	Mixed N = 198 Mean ± SD	U.S. Recommendation ⁵
Grain (servings ¹)	6.88 ± 1.57	6.57 ± 2.21	6.75 ± 2.03	6-11
Vegetable (servings ²)	2.18 ± 1.18	1.73 ± 1.06	1.81 ± 1.30	3-5
Fruits (servings ³)	1.69 ± 1.20	1.29 ± 1.22	1.35 ± 1.22	2-4
Meat (oz)	3.41 ± 1.66	5.39 ± 2.29*	5.01 ± 2.53*	4-9
Nuts (oz)	0.19 ± 0.28	0.12 ± 0.22	0.15 ± 0.50	
Dairy (servings ⁴)	2.01 ± 1.36	1.34 ± 0.98*	1.34 ± .98*	2-3
Soda (g)	657 ± 524	683 ± 442	807 ± 726	-
Sugar (tsp)	19.3 ± 11.3	14.3 ± 7.7*	15.8 ± 9.6	Sparingly
Tofu (g)	0.51 ± 2.4	4.25 ± 10.57	3.28 ± 19.39	-
Soy (oz)	0.08 ± 0.24	0.05 ± 0.15	0.03 ± 0.17	-

1 1 serving = 1 slice bread, 1 oz ready-to-eat cereal, ½ cup cooked cereal, rice or pasta

2 1 serving = 1 cup raw leafy vegetables, ½ cup other vegetables, cooked or chopped raw, ¾ cup vegetable juice

3 1 serving = 1 medium apple, banana, orange, ½ cup chopped, cooked or canned fruit, ¾ cup fruit juice

4 1 serving = 1 cup milk or yogurt, 1 ounce cheese or nuts

5 Food Guide Pyramid, USDA.

* Comparison of "A" or "M" with "W" significant at the 0.05 level

‡ Comparison between "A" and "M" significant at the 0.05 level

FAM Baseline Measures (ANOVA, n=316)

	White N = 51 (Mean ± SD)	Asian N = 69 (Mean ± SD)	Mixed N = 198 (Mean ± SD)
Age (yrs)	11.5 ± 1.5	11.7 ± 1.5	11.5 ± 1.4
Height (cm)	150.1 ± 10.03	146.1 ± 12.65	147.7 ± 11.9
Weight (kg)	43.3 ± 11.1	41.3 ± 11.2	45.6 ± 13.7‡
BMI (kg/m ²)	19.0 ± 3.3	19.2 ± 3.8	20.7 ± 5.4
Subscapular skinfold (mm)	9.1 ± 4.2	10.7 ± 5.4	11.8 ± 6.6*
Iliac skinfold (mm)	10.5 ± 4.8	12.2 ± 6.4	12.6 ± 6.1*
Physical Activity (MET/hr)	52.3 ± 43.7	34.6 ± 33.3*	44.4 ± 38.8

* Comparison of “A” or “M” with “W” significant at the 0.05 level

‡ Comparison between “A” and “M” significant at the 0.05 level

DXA Body Fat and Lean Mass Characteristics of the FAM Study Population at Exam 2 (Mean ± SD)

	<i>Asian (N=40)</i>	<i>White (N=26)</i>	<i>Mixed (N=41)</i>	<i>ANOVA P value</i>
Arm fat mass, kg	0.98 ± 0.49	1.17 ± 0.48	1.27 ± 0.89	0.16
Arm lean mass, kg	2.98 ± 0.47	3.36 ± 0.57	3.24 ± 0.75	0.04
Leg fat mass, kg	4.95 ± 1.82	6.15 ± 1.70	6.06 ± 3.21	0.07
Leg lean mass, kg	10.94 ± 1.57	11.52 ± 1.57	11.52 ± 2.12	0.27
Trunk fat mass, kg	6.03 ± 2.69	6.21 ± 2.10	7.32 ± 4.34	0.18
Trunk lean mass, kg	15.02 ± 2.01	15.51 ± 2.18	15.68 ± 2.68	0.42
Total body fat mass, kg	12.54 ± 5.01	14.11 ± 4.16	15.26 ± 8.55	0.17
Total body fat percent ¹	27.27 ± 7.60	29.21 ± 6.03	29.53 ± 9.44	0.41
Total body lean mass, kg	32.72 ± 4.59	33.40 ± 4.33	33.55 ± 5.57	0.73
Periphery fat mass, ² kg	5.94 ± 2.28	7.32 ± 2.13	7.33 ± 4.08	0.08
Periphery lean mass, ³ kg	13.91 ± 1.97	14.88 ± 2.08	14.76 ± 2.80	0.17
Trunk-to-periphery fat ratio, ⁴ kg	1.00 ± 0.15	0.84 ± 0.15	0.98 ± 0.15	0.0001
Trunk-to-periphery lean ratio, ⁵ kg	1.08 ± 0.07	1.04 ± 0.06	1.07 ± 0.08	0.12

1 Total body fat percent = [Total body fat mass / (Total body fat mass + Total body lean mass)] * 100

2 Periphery fat mass = DXA arm fat mass + DXA leg fat mass

3 Periphery lean mass = DXA arm lean mass + DXA leg lean mass

4 Trunk-to-periphery fat ratio = DXA trunk fat mass / [DXA arm fat mass + DXA leg fat mass]

5 Trunk-to-periphery lean ratio = DXA trunk lean mass / [DXA arm fat mass + DXA leg fat mass]

Multiple Regression of DXA Trunk-to-Periphery Fat Ratio¹ on Various Variables² (n=102)

	Regression Coefficient	Std. Error	P value
Intercept	0.67.	0.319	
Age, yr	0.004	0.013	0.741
<i>Asian ethnicity, %</i>	<i>0.138</i>	<i>0.041</i>	<i>0.001</i>
Tanner pubic hair stage, 1-5	0.018	0.021	0.384
Physical activity, MET · h/wk	- 0.117	0.406	0.773
Energy intake, kj/d	- 0.015	0.010	0.120
Biacromial breadth, cm	0.003	0.011	0.802
<i>Bi-iliac breadth, cm</i>	<i>0.034</i>	<i>0.011</i>	<i>0.002</i>
Height, mt	- 0.004	0.003	0.189
<i>Birth weight, kg</i>	<i>- 0.068</i>	<i>0.029</i>	<i>0.021</i>

Adjusted R²=29%

1 Trunk-to-Periphery Fat Ratio = DXA trunk fat mass / [DXA arm fat mass + DXA leg fat mass].

2 All independent variables were entered in the multiple regression. Independent variables were from Exam 2 except physical activity and energy values for Exam 1 and 2 were averaged to increase reliability.



Differences in Health Risk Among Girls

- Using the BLEND method, and *classifying*:
 - Girls of Mixed ethnicity and Asian ethnicity
 - consumed less calcium and folate than White girls (Daida et al. 2006)
 - consumed more meat and less dairy than White girls (Daida et al. 2006, Novotny et al. 2006)
 - Girls of Mixed ethnicity
 - consumed sweetened carbonated beverages at the highest levels (Daida et al. 2006, Novotny et al. 2006)
 - had more body fat than either Asian or White girls (Daida et al. 2006, Novotny et al. 2006)
- Using the BLEND method, in *percent*:
 - Girls who had a higher percent Asian ethnicity had more upper body fat, than those who had a higher percent White ethnicity (Novotny et al. 2006)

FAM Summary



- Adolescent girls of Mixed ethnicity and Asian ethnicity demonstrated higher risk for chronic diseases associated with obesity than girls of White ethnicity.
- We saw striking differences in health risk propensity across these ethnic groups detectable using the BLEND method.



Application: Healthy Living in the Pacific Islands (HLPI) Initiative

- A Health Survey was conducted in the Commonwealth of the Northern Marianas Islands (CNMI), a population of 50,000 people.
- We needed to administer the survey in 9 languages [English, Chamorro, Carolinian, Chuukese, Chinese Mandarin (both traditional & simplified), Korean, Thai, Tagalog], due to the many ethnic groups recently immigrated to the CNMI.
- The BLEND method was applied to examine obesity among children 6 months to 10 years
- 199 of 346 children were of Mixed ethnicity

Blending Trends



In the 2000 census:

- 900,000 husbands, 1 million wives, and 1.8 million children identified themselves as having two or more ethnicities. (Lee & Edmonston, 2005)
- >50 percent of Mixed adults reported White as one of their ethnicities. The other major ethnicities were:
 - Asian (18 %)
 - American Indian or Alaska Native (11 %)
 - Black (3 %)

Ethnic measurement challenges, such as we face in Hawaii and the Pacific Region, will be increasingly important nationally and internationally.

Lee SM, Edmonston B. New marriages, new families: U.S. racial and Hispanic intermarriage. *Popul Bull.* 2005;60(2).