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napa bulletin 13

Race, Ethnicity, and Applied Bioanthropology

■ Claire C. Gordon, ed.

National Association for the Practice of Anthropology
A Unit of the American Anthropological Association

NAPA Bulletins are occasional publications of the National Association for the Practice of Anthropology, a Unit of the American Anthropological Association.

Pamela Amoss and Ralph J. Bishop
General Editors

Library of Congress Cataloging-in-Publication Data

Race, ethnicity, and applied bioanthropology / Claire C. Gordon, editor
p. cm.—(NAPA bulletin ; 13)
Includes bibliographical references.
ISBN 0-913167-59-2
1. Race. 2. Physical anthropology. 3. Applied anthropology.
I. Gordon, Claire C. II. Series.
GN269.R33 1993
573—dc20

93-35791
CIP

ISBN 0-913167-59-2

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Problems of Racial and Ethnic Self-Identification and Classification

Claire C. Gordon and Nancy A. Bell

Racial and ethnic classification is a fundamental research tool in applied bioanthropology. In human-factors engineering, for example, these classifications specify groups that differ significantly in their body size and shape distributions. Stratified sampling is then used to ensure that materiel design and testing are done with samples representative of a design's user population. Racial classification also aids identification of minority groups at risk for poor fit even when designs are engineered and tested using representative samples. Racial and ethnic classification in forensic anthropology focuses on groups that differ quantitatively or qualitatively in one or several physical traits that may be observed in the skeleton, dentition, or other remains. These data are then employed in narrowing the pool of potential matches for an unknown individual. In epidemiological research, racial and ethnic classifications specify groups that share common biological and/or cultural features thought to influence disease risk. In application, epidemiological data reported by racial and ethnic group are then used to select high-risk populations for further study/intervention.

Racial and ethnic classification in these applied settings share a common feature: the population groupings recognized are often problem-specific (Crews and Bindon 1991; Molnar 1983). They do not necessarily reflect evolutionary histories and, in fact, may serve as proxies for both genetic and environmental influences on the variables of interest (Buehler et al. 1989; Damon 1971). However, while applied bioanthropologists may approach racial and ethnic classification from a somewhat special perspective, they share a global concern with other researchers: reliability of the data once a classification system has been defined.

A variety of factors are known to influence the reliability of racial identifications. Self-reported racial data are generally acknowledged to be more accurate than those estimated by an observer (Brues 1977). However, when self-reported racial and ethnic data are obtained from questionnaires, the terminology used, the form of the question, and even their proximity to other questions can influence subject responses (Farley 1990). In addition, Census Bureau research indicates that ethnic minority groups such as Negroes, Mexicans, and Puerto Ricans provide more consistent responses than do subjects with Western European origins, and that reliability of ethnicity data in American whites is inversely related to the number of generations one's family has been in the United States (Johnson 1974).

Racial and ethnic data reliability are of particular concern in such widely-used reference data bases as those maintained by the Census Bureau and by the Department of Defense. In this article, we specifically contrast racial and ethnic questionnaire data in an official U.S. Army data base with identifications made by interview with an anthropologist. The racial/ethnic classification model used is that of Federal Directive 15 (1978): white, not of Hispanic Origin; black, not of Hispanic Origin; Hispanic; Asian or Pacific Islander; American Indian or Alaskan Native.

Materials and Methods

Subjects in this study were drawn from 23,560 active-duty enlisted soldiers screened during sample selection for the 1988 U.S. Army Anthropometric Survey (ANSUR) (Gordon et al. 1989). Random samples of 100 males and 100 females each were drawn from five racial groupings: whites, blacks, Hispanics, Asian/Pacific Islanders, and mixed-race individuals. Sample sizes were smaller for American Indians, where a 100 percent sample rendered only 92 males and 54 females. Table 1 presents a race-specific summary of the most frequently declared ethnicities in these study groups.

Individuals were matched by gender, birth date, and name to their official 1988 U.S. Army records derived from DD Form 1966/1 and maintained by the Personnel Information Systems Command (PERSINSCOM). Because racial classification in the PERSINSCOM system differs slightly from the ANSUR system, some recoding was required before racial identifications in the two systems could be fairly compared.

Table 2 illustrates racial and ethnic classification in the two systems. Both comply with Federal Directive 15 (Federal Register 1978) in that a separate Hispanic group is either directly or indirectly identifiable in addition to four traditional racial groups: whites, blacks, Asian/Pacific Islanders, and American Indians/Alaskan Natives. The PERSINSCOM racial classification, however, does not directly identify Hispanics. Instead, cross-classification with the PERSINSCOM ethnicity categories Cuban, Latin American of Hispanic Descent, Mexican, Puerto Rican, and other Hispanic creates the necessary Hispanic category. Similarly, PERSINSCOM does not identify Pacific Islanders in its racial classification system, so cross-classification with ethnicity codes Micronesian, Melanesian, and other Pacific Islander is used to meet the Federal Directive 15 requirement.

A crucial feature of the PERSINSCOM system is the absence of a category for individuals of mixed racial heritage and the fact that no instructions are provided regarding the disposition of such people in primary categories. In contrast, ANSUR racial classification required that parentage be 75 percent or higher in the nonmixed categories (similar to Hazuda et al. 1986), and data on parental race, ethnicity, and birthplace were used to verify each subject's classification. ANSUR subjects of mixed-race were

Table 1
Ethnic Frequencies in the Study Sample

Race	Ethnicity	
White	American	69.00%
(*n* = 200)	German	12.50%
	Irish	5.00%
	English	2.50%
	Italian	2.50%
		91.50%
Black	Black/Negro/Afro-American	79.00%
(*n* = 200)	American	18.00%
		97.00%
Hispanic	Puerto Rican	41.00%
(*n* = 200)	Mexican	14.50%
	Mexican American	15.00%
	Hispanic American	10.00%
	American	5.00%
	Dominican	3.50%
		89.00%
Asian/Pacific	Filipino	40.00%
Islander	Samoan	15.50%
(*n* = 200)	Chamorro	11.50%
	Korean	9.00%
	Japanese	6.00%
	Hawaiian	3.00%
		85.00%
Amerindian	Navajo	18.50%
(*n* = 146)	Cherokee	13.70%
	Sioux	11.60%
	Native American/American Indian	6.90%
	Lumbee	5.50%
	Chippewa	4.80%
		61.00%
Mixed	American	45.50%
(*n* = 200)	Black/Negro-American	18.00%
	Puerto Rican	9.80%
	Filipino	9.40%
	Mexican American	4.20%
	Hispanic American	4.00%
		90.90%

classified separately and encouraged to specify two or more racial components as further identifiers. In this study, the disposition of mixed-race indi-

Table 2
PERSINSCOM and ANSUR Race and Ethnicity Categories

PERSINSCOM Race	ANSUR Race
White	White, not of Hispanic Origin
Black	Black, not of Hispanic Origin
	Hispanic
Asian	Asian/Pacific Islander
American Indian/Alaskan Native	American Indian/Alaskan Native
Other (Specify)	Other (Specify)
Unknown	Unknown
	Mixed (Specify)

PERSINSCOM Ethnicity	ANSUR Ethnicity
None	Fill in the Blank
Other	
Cuban	
Latin American (Hispanic)	
Mexican	
Puerto Rican	
Other Hispanic	
Chinese	
Filipino	
Japanese	
Korean	
Vietnamese	
Indian	
Other Asian	
Micronesian	
Melanesian	
Other Pacific Islander	
Aleut	
Eskimo	
U.S./Canadian Tribes	
Other American Indian	
Unknown	

viduals within the PERSINSCOM system is addressed descriptively as a separate problem altogether.

It should be noted that methods of administration differ significantly between ANSUR and PERSINSCOM data bases. Directions for the administration of DD Form 1966/1 indicate that "the applicant, under supervision of recruiter" completes both the race and ethnicity elements of the form (Army Regulation 601-210, U.S. Army 1990). The form itself does not define

race or ethnicity, nor does it list acceptable choices for ethnicity. This information is presumably provided by the recruiter, who has access to an Army Regulation (AR 601-210) in which more detailed direction is given.

ANSUR race and birthplace questions were also administered by questionnaire; however, these data were checked for consistency by an anthropologist during an interview to determine each subject's ethnicity. Ethnicity interviews involved using synonyms to explain the concept, including national origin, family heritage, family descent, family ancestry, and cultural affiliation or family tradition. Examples were occasionally provided, but in no cases were appropriate responses suggested or supplied for the respondent.

Because the ANSUR data included supporting information on parental race, ethnicity, and birthplace, and because they involved interview, review, and reconciliation of inconsistencies on site in the presence of the subject, ANSUR determinations of race and ethnicity are treated in this study as the reference data against which PERSINSCOM records are compared.

Results

Table 3 presents rates of concordant racial classification in the 1,146 soldiers studied. Overall, only 687 of 946 subjects (73 percent) in the five primary racial classes had concordant racial/ethnic codes present in the PERSINSCOM data base. Racial misclassification is not evenly distributed across groups; no misclassification occurs in whites and blacks, whereas misclassification rates for army minority groups are 43 percent for American Indians, 48 percent for Hispanics, and 50 percent for Asian/Pacific Islanders.

Misclassification of Hispanic Soldiers

Table 4 presents an overview of Hispanic classifications in the PERSINSCOM data base. Upon review, only one of the 96 Hispanic misclassifications in Table 4 can be attributed to a "mistake." In that case, the

Table 3
Racial Misclassification Results

Subject's Race	PERSINSCOM Code(s)	# Correct
White	White	200/200 (100%)
Black	Black	200/200 (100%)
Hispanic	White or Black or Other w/Hispanic Ethnicity	104/200 (52%)
Asian/PI	Asian or Other w/PI Ethnicity	100/200 (50%)
American Indian	American Indian	93/146 (57%)

Table 4
Classification of Hispanic Soldiers in PERSINSCOM

PERSINSCOM Ethnic Group	PERSINSCOM Race					
	White	Black	Asian	American Indian	Other	Total
Hispanic[a]	22	2	0	0	80	104
Non-Hispanic	0	0	0	0	1	1
Other	55	6	0	0	34	95
Totals	77	8	0	0	115	200

[a]Hispanic ethnicity codes in PERSINSCOM are: Cuban, Latin American of Hispanic Descent, Mexican, Puerto Rican, and Other Hispanic.

subject was incorrectly identified as being a U.S./Canadian Indian when neither he nor his parents are Indian. The other 95 Hispanic misclassification had either a blank (n = 1) or "Other" (n = 94) PERSINSCOM ethnicity code, and therefore could not be identified as Hispanic in the PERSINSCOM system. Such frequent use of category "Other" by Hispanics is unexpected, because "Other Hispanic" is also a PERSINSCOM ethnicity category.

Chi-Square testing of the five most frequent Hispanic ethnic groups (see Table 5) indicated that actual ethnic affiliation is not significantly associated with PERSINSCOM ethnic category "Other" (chi-square = 1.58, df = 4, p = .813). So at least in the five most frequent ethnicities, all Hispanics are equally likely to be misclassified in this way.

Because Hispanic identification in the PERSINSCOM system requires specific ethnicity data, extensive use of nonspecific ethnicity codes such as "Other" can contribute to underestimation of Hispanic representation in

Table 5
Hispanic Misclassifications Reported by ANSUR Ethnicity[a]

Ethnic Group	Racial Classification		Totals
	Correct	Incorrect	
American	5	5	10
Hispanic American	8	11	19
Mexican	28	31	59
Puerto Rican	52	29	81
Totals	93	76	169

[a]Only the four most frequently named ethnic groups are reported.
[b]Chi-Square = 5.50, df = 3, p = .138.

the army. In this study, nonspecific ethnicity data are almost exclusively responsible for a 48 percent (96/200) underestimation of Hispanics in the PERSINSCOM data base.

Although the magnitude of Hispanic underestimation in this study is disconcerting, it is not unique. Verdugo and Grafton (1988) note that Hispanic recruit frequencies based upon the 1986 New Recruit Survey were 7.6 percent, whereas an estimate based on official army data for these same subjects would have yielded a 3.4 percent figure. This amounts to an underestimation of approximately 55 percent in recruits, which is very close to our own figure of 48 percent in permanent party soldiers. Verdugo and Grafton (1988) attribute underestimation of Hispanic recruits to the fact that recruiters are filling out DD 1966/1 and may be reluctant to ask what they consider to be socially sensitive questions. In addition, race and ethnicity questions on the New Recruit Survey included a specific yes/no Hispanic ancestry question that may render a more accurate estimate of Hispanic representation than reliance upon declaration of a specific Hispanic ethnic group such as Mexican, Cuban, Puerto Rican.

Misclassification of American Indian Soldiers

As can be seen in Table 6, discordant racial classification occurred in 63 of 146 American Indian/Alaskan Native subjects (43 percent). Of those misclassified, 36 were identified as white, one as Asian, one as black, and 25 as other.

Chi-Square testing of soldiers with four American Indian grandparents (as determined by selfreported parental race) versus those with three of four Indian grandparents (see Table 7) indicates that there is a significant association between degree of Indian parentage and identification as Indian within PERSINSCOM (chi-square = 6.31, $df = 1$, $p = .012$). In this study, American Indians are 2.9 times more likely to be correctly classified within the PERSINSCOM system if both parents are also classified as American Indian.

Only 14 of the 63 misclassified American Indians had legitimate PERSINSCOM American Indian ethnic codes, so cross-classification with PERSINSCOM ethnicity could not substantially reduce American Indian racial underestimation in that system, even if it were added as an adjunct to the explicit American Indian/Alaskan Native racial code. Furthermore, only 40 of the 83 American Indians *correctly* classified by PERSINSCOM had legitimate Indian ethnicities in the PERSINSCOM system. Clearly PERSINSCOM ethnicity codes for U.S./Canadian Tribes, Eskimos, and Aleuts are not being used for the vast majority of Native American soldiers in this study. In fact, ethnicity was coded as "Other" for 84 of 146 American Indian soldiers, despite the fact that all but 12 of these 84 cited specific tribal affiliations during ANSUR interviews, and 10 of the remaining 12 chose "Native American," "American Indian," or some variant thereof.

Table 6
Classification of American Indian Soldiers in PERSINSCOM

PERSINSCOM Ethnic Group	PERSINSCOM Race					
	White	Black	Asian	American Indian	Other	Total
Indian[a]	2	0	1	40	11	54
Non-Indian	0	0	0	4	4	8
Other	34	1	0	39	10	84
Totals	36	1	1	83	25	146

[a]American Indian ethnicity codes in PERSINSCOM are: U.S./Canadian Tribes, Eskimo, and Aleut.

Table 7
American Indian Misclassification by Parentage

Indian Parentage	Racial Classification		Totals
	Correct	Incorrect	
3 Grandparents	10	18	28
4 Grandparents	73	45	118
Totals	83	63	146

[a]Chi-Square = 6.31, $df = 1$, $p = .012$.

Chi-Square testing of the four most frequent American Indian ethnicities indicates that tribal affiliation is significantly associated with racial misclassification (see Table 8). Navajo soldiers are 6.6 times more likely to be correctly classified by race than are Cherokee soldiers. Sioux soldiers are 4.3 times more likely to be correctly classified by race than are Cherokee soldiers.

As can be seen from the data above, misclassification of American Indians in the PERSINSCOM system is a serious problem. Based upon this study, which included *only* Indian soldiers with three of four grandparents also Indian, 43 percent of American Indians may not be identified as such in their official records. The fact that soldiers with four Indian grandparents are more likely to be correctly identified than those with three suggests that degree of admixture may be related to probability of misclassification. The fact that Navajo and Sioux soldiers are more likely to be correctly identified than Cherokee would also be consistent with this hypothesis (Spicer 1980; Stein et al. 1965; Williams et al. 1985).

One explanation for high American Indian misclassification rates is that recruiters are relying on visual inspection and using category "Other"

Table 8
American Indian Misclassifications Reported by ANSUR Ethnicity*

	Racial Classification		
Ethnic Group	Correct	Incorrect	Totals
Cherokee	6	14	20
Native American	5	5	10
Navajo	20	7	27
Sioux	11	6	17
Totals	42	32	74

[a]Only the four most frequently named ethnic groups are reported.
[b]Chi-Square = 9.76, $df = 3$, $p = .021$.

when they are not certain. Individuals with less admixture may look more "Indian" and are therefore more likely to be correctly classified. Significantly higher rates of American Indian identification were also obtained in the 1970 census when self-report rather than interviewer observation was used (Brues 1977).

Misclassification of Asian and Pacific Island Soldiers

Asians and Pacific Islanders also had high rates of discordance with PERSINSCOM codes: misclassification occurred in 100 of 200 cases (see Table 9).

A chi-square test (see Table 10) of Asian versus Pacific Island subjects indicates that there is no significant difference in misclassification rates in these groups. Of the Asian misclassifications, nine were coded white, one was coded black, one was coded American Indian, and 53 were coded as "Other." Large numbers of "Other" race codes in Asian soldiers are puzzling because 36 of the 53 (68 percent) had legitimate Asian ethnicities in the PERSINSCOM data base, and all declared Asian ethnic affiliations during ANSUR interviews. Of the Pacific Islander misclassifications, five were coded white, and 31 were coded as "Other" with either nonspecific (24/31) or non-Pacific Islander (7/31) ethnic codes in the PERSINSCOM data base. In contrast, some 35 of the 36 declared Pacific Island ethnicities during ANSUR interviews.

Table 11 presents a cross-tabulation of misclassification for the four most frequent Asian and Pacific Islander ethnic groups. Misclassification rates are similar for Filipinos and Samoans: 45 and 43 percent respectively. Chamorro soldiers, however, are 1.2 times more likely to be misclassified than Samoans, and Koreans are 4.6 times less likely to be misclassified than are Filipinos. It is likely that the "visual identification" hypothesis pre-

Table 9
Classification of Asian and Pacific Islander Soldiers

PERSINSCOM Ethnic Group	PERSINSCOM Race					
	White	Black	Asian	American Indian	Other	Totals
Asian	1	0	38	0	42	81
Pacific Islander	1	0	1	0	30	32
Non A/PI	0	0	0	0	1	1
Other	12	1	31	1	41	86
Totals	14	1	70	1	114	200

Table 10
Classification Accuracy of Asians and Pacific Islanders

Ethnic Group	Racial Classification		Totals
	Correct	Incorrect	
Asians	66	64	130
Pacific Islanders	34	36	70
Totals	100	100	200

[a]Chi-Square = .088, $df = 1$, $p = .767$.

Table 11
Asian/Pacific Islander Misclassifications by ANSUR Ethnicity[a]

Ethnic Group	Racial Classification		Totals
	Correct	Incorrect	
Filipino	36	44	80
Korean	15	4	19
Chamorro	9	14	23
Samoan	14	18	32
Totals	74	80	154

[a]Only the four most frequently named ethnic groups are reported.
[b]Chi-Square = 8.53, $df = 3$, $p = .036$.

Table 12
Racial Distribution of Mixed-Race Soldiers

Secondary Race	Primary Race					
	White	Black	Hispanic	Asian	American Indian	Totals
White	0	26	21	13	23	83
Black	6	0	8	2	5	21
Hispanic	22	10	0	3	1	36
Asian	16	7	1	0	0	24
American Indian	11	21	3	1	0	36
Totals	55	64	33	19	29	200

viously advanced for American Indian misclassifications may also be appropriate here.

Soldiers of Mixed Racial Ancestry

The disposition of mixed-race soldiers within official classification systems is not merely a matter of curiosity: the prevalence of mixed-race soldiers based on the ANSUR data base is estimated at 4.4 percent of the army. Table 12 presents a cross-tabulation of the primary and secondary racial groups for 200 randomly selected mixed-race soldiers. Primary racial group is defined as that category mentioned first by the subject.

As can be seen in Table 13, the rate of concordance between PERSINSCOM race and the subjects' self-reported primary race varied significantly among racial groups (chi-square = 81.127, $df = 4$, $p < .001$). In particular, concordant racial codes in "primarily" black subjects were five times more likely than for "primarily" white subjects; 26 times more likely than for "primarily" Asian/Pacific Islanders; 43 times more likely than "primarily" American Indians; and 70 times more likely than for "primarily" Hispanics. These results closely parallel previous observations that racial misclassification is greatest in the army's minorities: Hispanics, Asian/Pacific Islanders, and American Indians.

PERSINSCOM racial codes corresponded with the subjects' self-reported *secondary* race in 69 of 200 subjects. Overall then, the PERSINSCOM racial classification of these subjects corresponded to either their primary or secondary race 84 percent of the time. While this might seem unusually high given the discordant classifications in other portions of the PERSINSCOM data base, it should be noted that racial classification concordance was 100 percent in whites and blacks, and more than half the primary racial codes in this mixed-race study group are either white or black.

Table 13
Correspondence between PERSINSCOM Race and Self-Reported Primary Race in Soldiers of Mixed Racial Ancestry

PERSINSCOM Race	Primary Race					
	White	Black	Hispanic	Asian	American Indian	Totals
Concordant	32	56	3	4	4	99
Discordant	23	8	30	15	25	101
Totals	55	64	33	19	29	200

[a]Chi-Square = 81.13, $df = 4$, $p < .001$.

Discussion

The levels of Hispanic, Asian, and American Indian misclassification observed in this study have serious consequences in an applied setting. The army's official anthropometric data bases, for example, are race matched to PERSINSCOM distributions to ensure that materiel systems are designed on data that are representative of the contemporary army population. Significant underrepresentation of minority groups that have unique body size and shape distributions will result in protective clothing ensembles that systematically fit minorities poorly.

The levels of Asian and American Indian misclassification observed, the failure to identify individuals of mixed race, and the generally poor quality ethnicity data all will hamper forensic identifications of army casualties that rely on official records. Reliance on family-provided history should help to solve this problem.

It is ironic that minority groups most likely to report their ethnicity consistently according to the Census Bureau (Johnson 1974) are least likely to have correct racial/ethnic classifications in official army records. Several features of the PERSINSCOM system may be contributing to this result. Firstly, although racial/ethnic data are supposed to be self-reported, anecdotal information (Anonymous 1991; Verdugo and Grafton 1988) suggests that army recruiters are filling out the forms themselves, perhaps with little input from the recruit. In addition, the forms themselves lack adequate definitions of the terms "race" and "ethnicity" and their categories. Secondly, racial and ethnic categories "Other," which are of little use in classification, are used extensively even though individuals are clearly capable of providing more specific answers. Thirdly, reliance on ethnic cross-classification to recast PERSINSCOM data into the groupings required by Federal Directive 15 requires a level of ethnic specificity and reliance not currently present in this system.

Several specific recommendations are offered. Firstly, when identification of Hispanic individuals is required, as it is in many anthropological pro-

jects, either there should be a separate Hispanic category provided under the race question, or there should be a separate question altogether that requires a yes-or-no answer regarding Hispanic ancestry. Secondly, there should be either an open-ended ethnicity question or a more extensive list of ethnicities, such as that used in the 1980 Census (Farley 1990). This would decrease abuse of the "Other" categories. Finally, the system should not rely on a separately published army regulation to provide terminology guidance. This should be printed on the form or on its back, and the recruit should always be the one to answer these questions.

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