Discovery of an ethnic classification error in a survey for heart disease among school children in Denver, Colo., led to an improved method for Spanish surname recognition

Demographic Redefinition of Hispanos

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IN 1963 and 1964, 17,295 students in 52 parochial schools (total enrollment, 17,364) in Denver, Colo., were examined for evidence of cardiac disease by four screening methods: duplicate examinations by physicians, electrocardiograms, heart sound tape recordings, and a brief questionnaire. The survey was conducted to evaluate the sensitivity and specificity of cardiac screening methods (*1*) and to provide prevalence estimates for heart disease among Denver school children (*2–4*). The survey data were coded, most of the coding was checked, and IBM cards were punched, verified, and tabulated for the reports cited. Subsequently, when new code sheets for the electrocardiographic measurements were prepared, it was discovered that a large and possibly systematic error had been made in coding ethnic status ("race"). On preliminary inspection, the ethnic classification error seemed to consist primarily of an underestimate of the size of the Hispano group.

Ethnic classification involved five categories: Hispano (Spanish-American), other white, black, Oriental, and American Indian. With the exception of the Hispano category, coding decisions were based on identifying information supplied on forms filled out by students or teachers; missing information was obtained later by telephone inquiry. Hispanos were identified by two methods: (*a*) those who were identified as Spanish or Spanish-American on the forms or (*b*) those whose surname was Spanish.

The U.S. Bureau of the Census includes Hispanos among the "whites" in tabulations by race. However, for five southwestern States (Arizona, California, Colorado, New Mexico, and Texas) the agency has published special tabulations based on the Spanish-surname method of identification in an attempt to describe a more or less culturally distinct population group of largely Mexican descent (*5*). A considerable proportion of this minority population group has joined the migrant agricultural labor force with a virtually nationwide distribution and an increasing tendency to "settle out" in many of the localities where they have worked seasonally.

In the Denver study all identification data, including ethnic status, had been coded by a secretary-clerk whose work had been unusually accurate and whose knowledge of Spanish surnames was assumed to be considerable based on her weekly work in a church youth mission in the Hispano ghetto area of Denver. When the Hispano coding errors were discovered, I attempted to correct them myself and discovered the narrow limits of my knowledge of this subject.

This paper describes the methods by which the study's ethnic coding method was improved,

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the results of the ethnic code correction, and the probability of serious underestimation of the size of this population group in other published demographic descriptions.

Methods

On inquiry, no Spanish surname recognition system could be found in use in Colorado in 1967, and I was advised to write the U.S. Bureau of the Census for help. The Census Bureau provided two copies each of a master list of 7,718 Spanish surnames (*6*) and an abbreviated list of 568 common Spanish surnames (*7*). The Census Bureau list of Spanish surnames, last revised in 1960, was an expansion of a list first compiled in 1936 by George Lockwood in the U.S. Immigration and Naturalization Service from names of Spanish-born, relatively recent immigrants entering Atlantic and Gulf ports (*5*).

However, a large proportion of the Hispano residents of the southern Rocky Mountain region of the United States are descendants of Spanish settlers who came to Nueva España del Norte between 1594 and about 1750. These Hispanos were relatively isolated because of the long difficult journey to Mexico City, and as the years passed they retained their increasingly archaic costumes, dialect, and surname spellings. They were largely descendants of soldiers recruited from Spain's arid central tablelands (Castille, León, Extremadura) and its northwestern corner (Galicia). Residents of these areas were regarded as more politically and religiously reliable than those from other regions of Spain in that period of history when the Moors had been so recently expelled from the southern Iberian peninsula and when there was serious internal conflict over the Inquisition. More recent immigrants to the United States, since 1750 (Lockwood's source), have included representatives from all parts of Spain, particularly Cataláns and Basques, and their surnames have differed partially from those of the earlier waves of overland immigrants.

After careful search of the 1960 Census Bureau list of Spanish surnames, I considered it an inadequate demographic standard in Colorado because a number of locally common, easily recognized Hispano surnames were not included. The following persons in Denver were of great assistance in helping me to understand the complexity of the problem of recognizing Spanish surnames: Dr. Arthur Campa, chairman of the division of languages, University of Denver; John F. Garcia, executive director of LARASA, Inc.; Sr. Victor Romero Lopetegui, Consul de México; Fr. Max Santa Maria, St. Cajetans Catholic Church; Rev. Thomas Sepúlveda, Spanish Methodist Church; Charles Tafoya, Denver Community Relations Commission; and Dr. Daniel T. Valdes, professor of sociology, Metropolitan State College. However, their diverse opinions and recognition standards did not provide a sufficiently uniform index for demographic use.

For approximately 6 months, I devoted full time to an intensive systematic search for Spanish surnames and variants from as many sources as I could find (*8–15*). Of particular value for a perspective on surname origins and the temporal trends in spelling were the books by Maduell (*9*) and Chávez (*10*).

With the permission of the Census Bureau, I expanded the 1960 list of 7,718 Spanish surnames to 18,980 as of October 1967 (*16*). The expanded list follows the theme of the 1960 list in that the total category of Spanish surnames was judged to include those of Basque, Catalán, Galician, and Portuguese origins as well as those originating from the more central Spanish regions. This practice is justified by similarities of language (*17*) as well as patterns of identifying U.S. minority groups. Undoubtedly, many sources of Spanish surnames were not discovered by this investigation, so that the expanded list is still incomplete and considerably more so for Portuguese than for Spanish surnames.

A significant number of surnames are common to two or more languages and are found in each frequently enough to raise the question of native origin in either. Such links may have been forged by "permanent" invasions (Romans, Visigoths, Moors), by related original inhabitants (the Celtic tribes of Iberia, Gaul, Britain, Ireland), by immigrants from common sources (Greeks, Phoenicians, Israelis), or by foreign conquest (periods of Spanish rule over Sicily, southern Italy, Sardinia, and the Netherlands). It is also possible that some names common to different languages may have the

same current spelling by chance, having evolved independently from different origins for different reasons. Due to limited knowledge, certainty of the geographic origin of a surname is often impossible, and many decisions are educated guesses.

Names believed to be non-Spanish in origin were encountered frequently in the sources consulted and were excluded from the list when recognized. The list does include a number of Spanish names which might be recognized as also native to certain regions of France, Italy, north Africa, Greece, the Near East, and Romania; their inclusion is a matter of judgment related to the intended uses of the list, and opinions can be expected to vary. In contrast, Spanish names common to English were omitted because the list is intended for use in a predominantly "Anglo" culture. For example, the name Martín is the tenth commonest surname in Spain according to Maduell (*9*), but was omitted from the list because it was believed to be more commonly of French or English origin among U.S. inhabitants. Other, less common, Spanish surnames with equivalent English spellings also were omitted from this list.

Although in the 1967 revision I attempted to include all known spelling variants of a surname (Vázquez, Vásquez, Básquez) to facilitate use by code clerks, or, ultimately, automatic computer-guided coding systems, incomplete knowledge makes this revision of uncertain value for computer coding. The 1967 list is a definite improvement over the 1960 list for use by code clerks, but its completeness and accuracy will be enhanced if the coding is done by persons with at least rudimentary knowledge of the general style and spellings of surnames associated with the Romance languages.

It is difficult to foresee an endpoint for the completeness and specificity of future revisions of the Spanish surname list because (*a*) the dividing lines between surnames from different national origins are not sharp, (*b*) experts will disagree over the definition of the category of Spanish surnames, (*c*) the spelling of surnames continues to evolve (Anglicization is a strong influence in this country), and (*d*) the U.S.

Table 1. Students in 52 parochial schools in Denver, 1963–64: ethnic distribution according to an erroneous old code and a corrected new code

Ethnic group	Old code	New code	Difference		
			Number	Percent of old	Percent of new
Hispano	2,495	3,024	+529	+21.20	17.49
Other white	14,299	13,705	−594	−4.15	4.33
Black	524	573	+49	+9.35	8.55
Oriental	38	45	+7	+18.42	15.55
American Indian	10	17	+7	+70.00	41.18
Total	[1] 17,366	17,364	−2	−0.01	0.01

[1] Duplicate IBM cards were discovered for 2 students.

Table 2. Students in 52 parochial schools in Denver, 1963–64: corrected ethnic distribution with proportion of change from previous erroneous code, by grade in school

Grade in school	Nonwhite		Hispano		Other white		Total number
	Number	Percent change	Number	Percent change	Number	Percent change	
1–4	342	+11.0	1,314	+22.6	5,384	−4.9	7,040
5–8	202	+12.2	1,163	+22.2	5,132	−4.9	6,497
9–12	91	+8.3	547	+16.1	3,189	−1.6	3,827
Total	635	+11.0	3,024	+21.2	13,705	−4.2	17,364

Hispano minority group is gradually becoming more Anglicized and less identifiable by surname.

A major problem was the distinction between Spanish and Italian surnames, since a number of them are common to both nations. In particular, Catalán surnames are often found in southern France, northern Italy, and southeastern Switzerland, and these associations reflect similarities among languages in these areas. Although I sought guidance for recognition of Italian surnames (*18–20*), the 1967 list of Spanish surnames does contain an uncertain number which are also of Italian origin despite some improvements over the 1960 list.

Ethnic status in the Denver parochial school population study was recorded using the 1967 revision of the Census Bureau list as a standard for the Hispano category. Also coded as Hispano were the relatively small number of children with non-Spanish surnames who were listed in the records as "Spanish," a phenomenon which was almost entirely limited to residents of the Hispano ghetto area of Denver.

Results

All except four of the ethnic classification errors discovered involved a change between the "other white" category and one of the other four categories. Table 1 shows that the code correc-

Table 3. Students in 52 parochial schools in Denver, 1963–64: comparisons between erroneous old code and corrected new code for ethnic status, by socioeconomic status

Socioeconomic status [1]	Old code		New code		Difference		
	Number	Percent of total	Number	Percent of total	Number	Percent of old	Percent of new
Hispanos							
Total	2,495	100.0	3,024	100.0	+529	+21	17
1	13	0.5	5	0.2	−8	−62	160
2	29	1.2	49	1.6	+20	+69	41
3	165	6.6	265	8.8	+100	+61	38
4	503	20.2	676	22.3	+173	+34	26
5	587	23.5	682	22.5	+95	+16	14
6	532	21.3	620	20.5	+88	+17	14
7	664	26.6	725	24.0	+61	9	8
Other	2	.1	2	.1	0	----	----
Other white							
Total	14,298	100.0	13,705	100.0	−593	−4	4
1	357	2.5	365	2.7	+8	+2	2
2	2,608	18.3	2,587	18.9	−21	−1	1
3	3,489	24.4	3,377	24.6	−112	−3	3
4	5,433	38.0	5,251	38.3	−182	−3	3
5	1,534	10.7	1,422	10.4	−112	−7	8
6	543	3.8	436	3.2	−107	−20	25
7	303	2.1	237	1.7	−66	−22	28
Other	31	.2	30	.2	−1	−3	3
Nonwhite							
Total	573	100.0	635	100.0	+62	+11	10
1	0	.0	0	.0	0	----	----
2	5	.9	5	.8	0	----	----
3	144	25.1	154	24.3	+10	+7	6
4	81	14.1	91	14.3	+10	+12	11
5	237	41.4	255	40.2	+18	+8	7
6	67	11.7	86	13.5	+19	+28	22
7	39	6.8	44	6.9	+5	+13	11
Other	0	.0	0	.0	0	----	----

[1] Numbers progress from highest to lowest socioeconomic status. Index computed by unweighted mean rank of census tract according to (*a*) median family income, (*b*) median school years completed by persons 25 years or older, and (*c*) percentage of occupied housing units with 1.01 or more persons per room (source: reference 2).

Table 4. Students in 52 parochial schools in Denver, 1963–64: heart disease prevalence rates per 1,000 enrolled students, by grade in school

Grade in school	Nonwhite	Hispano	Other white	Total
	Congenital heart disease			
Total	6.3	4.0	4.7	4.7
1–4	8.8	3.0	4.5	4.4
5–8	5.0	5.2	4.9	4.9
9–12	.0	3.7	4.7	4.4
	Rheumatic heart disease			
Total	3.1	2.3	1.5	1.7
1–4	2.9	.8	.6	.7
5–8	.0	2.6	1.6	1.7
9–12	11.0	5.5	2.8	3.4
	History of rheumatic fever			
Total	11.0	11.6	11.5	11.5
1–4	5.8	4.6	3.7	4.0
5–8	9.9	15.5	12.3	12.8
9–12	33.0	20.1	23.5	23.3

tion increased the size of the Hispano group in this population by 21 percent and that about 17 percent of the Hispanos had been previously misclassified (unrecognized). Because the cardiovascular study had an additional card file arranged alphabetically by surname for requested information retrieval for individual persons, it was possible to note and re-query apparent intrafamily ethnic differences; by this method most of the ethnic classification errors among the nonwhite ethnic group were discovered. The consistency of the ethnic classification error (underenumeration of minority groups) is important, although these errors are probably partly voluntary and partly involuntary.

The corrected ethnic distribution is presented by grade in school in table 2 along with the proportion of change for each ethnic and grade category. The percentage of change (and previous error) was least among the older group of students. Perhaps this is partly because the proportion at risk (minority group students) was smaller in this age group which, in turn, reflects the generally higher school dropout rate among members of minority groups.

Table 3 is of particular interest because it illustrates the basis for a potential difference of opinion, depending upon one's attitude toward the ethnic classification error. The socioeconomic status progresses numerically from the top to the bottom of the scale as previously described (*2*), and the socioeconomic distribution differences among the three ethnic categories are readily apparent. The percentage distributions of the ethnic groups by socioeconomic status are almost unchanged by the ethnic code correction, and these comparisons might be used to justify minimization of error effects. In contrast, if the ethnic code differences are expressed as percentages of the correctly coded socioeconomic status totals (right hand column in table 3), then it becomes apparent that the socioeconomic distribution of the ethnic classification error was distinctly nonrandom and tended to systematically overstate the socioeconomic distribution differences between the Hispano and "Anglo" ethnic groups. I believe that the ethnic coding error was sociologically and epidemiologically significant and that tests of statistical significance of the coding difference would not assist this judgment.

Prevalence rates for congenital and rheumatic heart disease and for a history of rheumatic fever are presented in table 4 by ethnic group and grade in school. The 81 cases of congenital heart disease, which yielded a total prevalence rate of 4.7 per 1,000 enrolled, included four among the nonwhites (all were black), 12 among the Hispanos, and 65 among the other whites. The 29 cases of rheumatic heart disease

included two among the nonwhites (both were black), seven among the Hispanos, and 20 among the other whites. The 200 students with a history of definite rheumatic fever included seven nonwhites (all were black), 35 Hispanos, and 158 other whites. The previously published tabulations based on the erroneously coded data had suggested a major white-nonwhite difference in susceptibility to rheumatic fever (*4*), whereas the corrected tabulations showed that the frequency of a history of rheumatic fever is quite uniform among the three ethnic groups tabulated. Ethnic differences for prevalence rates of rheumatic and congenital heart disease were relatively unchanged from the previously published data (*3*, *4*).

Comment

The foregoing methods were applied and results were obtained before the work of Buechley was discovered (*21–23*). Starting from a similar point of dissatisfaction with the Census Bureau 1960 list of Spanish surnames, Buechley developed an automatic recognition system based on characteristic *endings* of Spanish surnames (*23*). This was a brilliant conception and may well be a more efficient method of recognizing Spanish surnames, although it should be tested in parallel with the 1967 expanded surname list which is the nearest to a standard that we have to date.

The most important implication of the recognition of the large underrecognition error for Hispanos in the present study is that a similar underrecognition error probably afflicts the data for five southwestern states (Arizona, California, Colorado, New Mexico, and Texas) gathered during the 1960 census (*5*) and the 1950 census (*24*). These official demographic descriptions are widely used to gauge the size, distribution, and characteristics of the Hispano minority group, so that the inclusion of a major underestimation error carries significant social and political implications. The size of the Census Bureau error is uncertain from my vantage point, since its error was not exactly the same as that discovered in the survey. One might use this study's estimate of 17.5 percent underrecognition as a minimum and use half the proportion of Spanish surnames newly listed in the 1967 revision (59.3 percent ÷ 2 = 29.7 percent) as a maximum. (The value of half is suggested because a considerable proportion of the new listings in the 1967 list are simple variants which could have been counted in the published Census Bureau tabulations if coding practices were sufficiently inclusive.) Then perhaps 17–30 percent of the Spanish surnames recorded in these censuses were not recognized and not counted in the tabulations.

Saunders (*25*) mentioned the omissions of the Census Bureau list of Spanish surnames as well as other causes for underenumeration of Hispanos; for example, the large proportion of Hispanos who belong to the agricultural migrant labor force. In a recent report of a significant positive association between a pesticide index and the death rate among Spanish-surnamed persons in California (*26*), the population identification method was a list attributed to the California State Department of Industrial Relations which was actually a direct transcription of the Bureau of the Census tabulations (personal communication, October 30, 1969, from W. E. Smith, University of California at Los Angeles). In view of the attention being devoted to alleviation of the longstanding socioeconomic problems of minority groups in general and the Hispano group in particular, a more complete enumeration of Hispanos in 1970 is a matter of importance to the Bureau of the Census and to those who need more evidence of social need to substantiate requests for community financial support.

I have described an expansion of a crude but useful demographic method of estimating ethnic group membership. However, because of rapid social changes, we cannot expect this ethnic identification tool to be useful indefinitely. According to Dr. Arthur Campa, chairman of the division of languages at the University of Denver, students with Spanish surnames who are entering his Spanish classes no longer have the ability to speak the language as did their parents a generation ago. The cultural cohesion of this minority group is weakening, exogamy is increasing, and probably by 1990 this method will be useless in the United States. By that time the problems of Hispanos may be different, more varied perhaps, and a better method may be available for identification of that proportion

of Hispanos who retain their separate cultural identity.

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EDITOR'S NOTE: In several of the following references, *Public Health Reports* departs from its policy of listing only sources which are readily available because of the rarity of source materials on Spanish surnames.

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Tearsheet Requests

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Education Notes

Master's Program in Medical Care Statistics. The department of biostatistics of the University of Pittsburgh Graduate School of Public Health is accepting applications for admission to a new master's degree program in September 1970.

The program is intended to prepare students to carry out research in health data and biostatistics. As medical care statisticians, graduates will work in government, hospitals, health planning agencies, health insurance plans, research organizations, and similar agencies.

The program is designed to be completed in 16 months, with the summer devoted to field training in one or more health agencies in the Pittsburgh area. Courses in biostatistics, medical care economics, computer science, public health practice, epidemiology, and related subjects will be offered.

Fellowship stipends begin at $2,400 for the first year, with increments for succeeding years. The stipends are supplemented by an additional $500 for each dependent and full tuition.

For an application or more information, write to Dr. Isidore Altman, Department of Biostatistics, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pa. 15213.

Doctoral Program in Public Health Administration. The University of Michigan School of Public Health is offering a doctoral program in public health administration.

The program is designed to prepare students to assume upper level positions involving research, evaluation, planning, or administration in official and voluntary health agencies or teaching and research positions in universities. Choice of Ph.D. or Dr.P.H. degree is determined by the career interests of the student and is made in consultation with an advisory committee.

Applicants must hold the master of public health degree or its equivalent and must present evidence of high scholastic aptitude. They should have at least 1 year of work experience in a public health setting and must meet the general admission requirements for doctoral studies in either the school of public health or the school of graduate studies. Preference is usually given to applicants with some background in the social sciences, statistics, and public health administration.

Completion of requirements for the doctoral degree normally requires eight academic terms of full-time study or 2⅔ calendar years.

Students admitted to the program may be eligible for predoctoral or postdoctoral Public Health Service traineeships, which provide several tax-free benefits: an annual stipend, full tuition, allowance for dependents, and assistance with dissertation expenses.

Additional information is available from Dr. Vlado A. Getting, Chairman, Department of Community Health Services, School of Public Health, University of Michigan, Ann Arbor, Mich. 48104.

Care of Premature and Other High-Risk Infants. The institutes for physicians and nurses in the care of premature and other high-risk infants at the New York Hospital-Cornell Medical Center, sponsored by the New York State Department of Health and the U.S. Department of Health, Education, and Welfare, will begin their 22d year in fall 1970. The institutes are designed to meet the needs of physicians and nurses in charge of hospital high-risk and premature infant nurseries and special centers and of medical and nursing directors and consultants in State and local programs for the care of such infants.

Five institutes are scheduled between September 1970 and May 1971. The sessions are 2 weeks for physicians and 4 weeks for nurses.

Physicians	*Nurses*
September 21–October 2	September 8–October 2
November 9–20	October 26–November 20
January 18–29	January 4–29
March 15–26	March 1–26
May 17–28	May 3–28

Attendance at each institute is limited to six physicians and six nurses. Early application for the institutes is essential because plans are contingent on the number of applications received.

Participants pay no tuition, and stipends are provided to help cover other expenses. For additional information write to Box 143, Institutes in the Care of Premature and Other High-Risk Infants, New York Hospital, 525 East 68th Street, New York, N.Y. 10021.

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