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Identifying Southwest Hispanics Using Nonmetric Traits and the Cultural Profile*

ABSTRACT: Due to the increasing number of Southwest Hispanics in the United States, as well as the overwhelming number of foreign nationals that die every year trying to enter the United States along the southern United States border with Mexico, new methods for classifying individuals have been established at the Pima County Office of the Medical Examiner in Tucson, Arizona (PCOME). For each of the past 5 years, the PCOME has investigated a record number of deaths associated with these border crossings. The overwhelming majority of the identified decedents are Mexican Nationals. However, approximately 25% of these undocumented border crossers have yet to be identified, making it clear that improved methods for human identification are greatly needed. The first goal of this paper is to delineate the suite of skeletal nonmetric traits utilized in assessing Southwest Hispanic ancestry at the PCOME. This suite of nonmetric traits has proven to be an effective component in establishing the "biological profile" of unknown individuals in these cases. The second goal of this paper is to introduce methods used at the PCOME to establish the "cultural profile" of individuals in these cases. The "cultural profile" is a set of identification criteria that include: the geographic context of recovery, personal effects, dental health, and cultural accoutrements. Establishing the "cultural profile" in these cases is essential in identifying individuals as foreign nationals who have died trying to cross the border.

KEYWORDS: forensic science, forensic anthropology, Southwest Hispanics, ancestry, border crossers, nonmetric traits, cultural profile, personal effects, cultural accoutrements

The Pima County Office of the Medical Examiner (PCOME) in Tucson, Arizona is tasked with investigating the deaths of a significant and growing number of foreign nationals of Southwest Hispanic ancestry who die while crossing the United States-Mexico border. In the past 5 years, nearly 750 of these deaths have occurred within the jurisdiction of PCOME. Approximately 94% of those identified were Mexican Nationals, with the remainder of the identified individuals being from other countries within Latin America (1,2). Typically, the border crossers who die in southern Arizona can be characterized as low-income individuals coming from rural areas in Mexico and other Latin American countries. Most of these individuals are young adults between the ages of 20 and 30. The ancestry of most of these individuals is admixed European and Native American. These individuals often display shorter stature, poor dental health (including more caries, more crowns destroyed by caries, and more enamel hypoplasias). In addition, specific cultural accoutrements, such as cosmetic dental work, are often observed in these cases.

Unfortunately, only 75% of the 750 presumed foreign nationals have currently been identified (DNA comparisons are pending in more than a dozen cases). This unfortunate fact creates an additional problem for the PCOME, namely, how to properly characterize such a large number of unidentified individuals. Being able to distinguish illegal immigrants who have died trying to cross the border from individuals legally in the United States is necessary for several reasons. First, the PCOME works closely with the Tucson and Nogales Offices of the Mexican Consulate in the resolution of any death that may involve a Mexican citizen. For the border crossers who die in Southern Arizona, the Mexican Consulate plays a critical role in case resolution, even for some foreign nationals who are eventually identified as non-Mexicans. Thus, the PCOME tries to avoid encumbering the Mexican Consulate with those cases that relate to United States citizens. Second, missing person databases in the United States, such as the National Crime Information Center (NCIC) and the National Center for Missing and Exploited Children (NCMEC), do not normally list amongst their rosters these would be migrants from foreign countries. Therefore, it is in the best interest of the PCOME to be able to separate unknown individuals suspected of being in the United States legally from those suspected of being illegal immigrants. Third, and lastly, until recently the United States Border Patrol (USBP) did not consider unidentified skeletal remains in the various tallies of "undocumented aliens" (UDAs). Due, at least in part, to the PCOME characterization of some of these unknown individuals as probable UDAs (the PCOME now refers to these individuals as "undocumented border-crossers" or UBCs), the Border Patrol now includes on their rolls skeletal and other unidentified remains found in known migrant trafficking corridors. The PCOME acknowledges that some degree of over-reporting is possible in assigning presumptive nationality to an unidentified person, but to exclude the nearly two hundred unidentified individuals over the past 5 years would vastly under-report the number of border-crossing deaths. Because this issue is of national interest, it is our goal to estimate as accurately as possible the number of deaths relating to UBCs. As a result, an assessment of both ancestry and nationality is necessary to generate an accurate count. This paper explains how these assessments are accomplished at the PCOME.

Nonmetric Traits and Ancestry

The determination of ancestry from human skeletal remains can be accomplished by both metric and nonmetric assessment. The

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1990 volume titled *Skeletal Attribution of Race* edited by Gill and Rhine (3) represented the first attempt to compile a comprehensive reference on the assessment of ancestry for forensic anthropologists. This volume has proven to be an effective resource over the past 17 years. Within this volume is Rhine's benchmark chapter titled "Nonmetric Skull Racing" (4) which presents three sets of drawings depicting typical American Caucasoid, Southwestern Mongoloid, and American Black skulls. These drawings have had a major influence on American forensic anthropology, and they remain useful today. Also within this volume, Brues (5) presents an historical perspective on the diagnosis of race. She traces the history of skeletal nonmetrics beginning with the "Harvard forms," the data recording forms from Earnest Hooton's physical anthropology laboratory at Harvard that contained 102 nonmetric observations. In fact, most of the nonmetric traits used by forensic anthropologists today to assess ancestry came directly from the "Harvard List." In 2004, Hefner et al. (6) discussed Hooton's research and views on cranial nonmetrics as criteria for determining ancestry.

Recently, there has been a renewed research interest in nonmetric traits and the attribution ancestry (7–12). Leading the way has been Hefner (7,8), whose work has focused on detailed anatomical descriptions of nonmetric traits, as well as testing the utility of nonmetric traits in the determination of ancestry. In the first study Hefner (7) tested the distribution of five nonmetric traits within Mongoloid, Caucasoid, and Negroid samples. These traits included: inferior nasal aperture morphology, nasal bone external surface contour, nasal aperture width, interorbital breadth, and postbregmatic depression. Hefner (7, p. 232) reports that "the more common nonmetric cranial traits historically used in the determination of ancestry do correlate well with the three main ancestral groups." In his second study (8), Hefner tested the distribution of five different nonmetric traits: nasal spine prominence, zygomaticomaxillary suture shape, transverse palatine suture shape, posterior zygomatic tubercle, and malar tubercle. The results of this Hefner study (8, p. 245) indicate that those five traits do "do not show significant differences between ancestral groups". This emphasizes the fact that nonmetric traits possess varying predictive values for assessing ancestry. This underscores the importance of identifying the most useful suites of nonmetric traits, which is a goal of the current paper for individuals of Southwest Hispanic ancestry.

Rhine and Southwest Hispanic Ancestry

According to Rhine (4:13), the term Hispanic is "a biological category indicating varying combinations of European and Amerindian stocks." When Rhine (4) published the drawings depicting "typical" skulls of the American Caucasoid, Southwest Mongoloid, and American Black, he did not include a drawing of a typical Hispanic. Instead, he placed the individuals he referred to as "Hispanic" within his Caucasoid group. Despite this fact, a major goal of Rhine's chapter was to present the results of his study that tested the validity of nonmetric traits in distinguishing among individuals from four different groups: Anglo, Hispanic, Indian, and Black. Rhine's results indicated that the clearest distinction was between the Anglo and Indian groups, with the Hispanic group displaying both Anglo and Indian traits.

In his study, Rhine (4) reported that Hispanics in the American Southwest display the following morphological features: slight alveolar prognathism, a nasal aperture of intermediate width, tented nasals, a blurred, dull nasal sill (and a guttered sill in some cases), slight nasal depression, nasal overgrowth, rounded and sloping orbits, a malar tubercle, rotated incisors, enamel extensions and buccal (protostylid) pits of molars, an elliptical dental arcade, bilobate chin, pinched mandibular ramus, a bulging palatine suture, and a curved zygomaxillary suture.

Rhine's chapter set the stage for the importance of future research on distinguishing individuals of European ancestry from individuals of Southwest Hispanic ancestry. Rhine describes his Hispanic sample as "a highly variable group, and any given individual will show considerable variation from this picture. Some appear much more Anglo, while others look much more Indian." (4: p. 15). As a result, assessing ancestry of individuals from these admixed populations can be challenging. Yet, the authors of this paper agree with Rhine when he says "should one be assessing a skull in which most markers indicate Caucasoid, but a rather significant number point to Amerindian, the individual would perhaps best be described as *Hispanic* in the context of the present sample" (4: p. 18). On nearly a daily basis at the PCOME, two of the authors (Birkby and Anderson) see individuals that display a combination of skeletal nonmetric traits from both European and Native American ancestral groups from Mexico, Latin America, and the Southwest United States that are classified as individuals of Southwest Hispanic ancestry.

New Research on the Attribution of Hispanic Ancestry

Until recently, very little research has focused on the skeletal attribution of individuals referred to as "Hispanic". Ross et al. (13) explain "in the U.S., the term *Hispanic* includes all persons of Spanish speaking countries." Clearly, using the term Hispanic is problematic because the skeletal attribution of ancestry by the forensic anthropologist has nothing to do with the language spoken by an individual. Ross et al. (13) also state "in the forensic setting, the use of such an umbrella term is problematic because it ignores the different ethnohistories and migration patterns of each geographical region." This is a very valid point, and indeed, it is the primary critique of the use of racial stocks in assessing the ancestry of individuals in a medicolegal setting. As a result, Ross et al. (13) posit that the application of traditional craniometric and nonmetric methods are not appropriate for all Hispanic populations grouped together. They emphasize the need for regional research on various "Hispanic" populations to establish population-specific morphological criteria. In response to the need for regional research, there has been a recent focus in forensic anthropology on evaluating the attribution of ancestry of various Hispanic populations. Examples of this new focus on documenting some of the diversity of modern Hispanic populations include Ross et al. (13), Ross et al. (14), Slice et al. (15), Ross et al. (16), Jantz (17), and Spradley et al. (18).

In the study by Ross et al. (16), the analyzed samples included modern Panamanians, Afro-Antillean or west Indian Panamanians, modern Cubans, prehistoric Cubans, prehistoric Ecuadorans, Spaniards, Mexicans, American Whites, and "Terry" Blacks. Their results clearly show that the populations generally referred to as "Hispanic" are not homogenous. Their findings are in agreement with the craniometric research by Jantz (17) and Spradley (18).

The recent work by Jantz (17) on the assessment of Hispanic ancestry focuses on the craniometric evaluation of Hispanics from Mexico. In this study, the sample of Hispanic crania is reported to be "sufficiently distinctive to distinguish them from other groups." Research by Spradley et al. (18) demonstrates that variation among Hispanic peoples of the Americas exists when analyzing both craniometric and postcranial data.

Assessing Southwest Hispanic Ancestry Using Skeletal Nonmetric Traits

The main goal of this paper is to identify and describe the suite of skeletal nonmetric traits that Dr. Walter Birkby and his students have found to be prevalent in individuals of Southwest Hispanic ancestry recovered in southern Arizona (19). This suite of nonmetric traits includes a specific subset of the discrete traits that Rhine (4) outlined, along with a few traits added by Dr. Birkby and students (19–21). The term "Southwest Hispanic ancestry" is used to regionally differentiate individuals with Amerindian and European admixture from Hispanics from other regions. Individuals of Southwest Hispanic ancestry display the impact of European (predominantly Spanish) gene flow on the Native American gene pool (encompassing a number of Indian groups from Mexico, Central America, and Southwest United States). The authors certainly agree with Ross et al. (16) that not all Hispanic groups are the same. As a result, it is expected that individuals of Southwest Hispanic ancestry will display different morphological traits than "Hispanics" in the southeast United States and the Caribbean, where a much larger African genetic component is observed (13–16). Therefore, this paper only focuses on the suite of nonmetric traits observed in individuals of Southwest Hispanic ancestry.

The majority of individuals of Southwest Hispanic ancestry display nonmetric skeletal traits from *both* Native American and European gene pools. The nonmetric traits used at the PCOME to identify individuals of European ancestry include: sharp nasal sill, long nasal spine, narrow nasal aperture, visibility of the oval window with wide porous opening, long posterior occipital shelf, receding malars, nasal root pinched, narrow frontal process of the zygomatic, vault shape elongate, and subtrochanteric region of the femur is rounded. The nonmetric traits used to identify Southwest American Indian ancestry at PCOME include: blunt nasal sill, small nasal spine, nasal aperture moderately wide, oval window not visible and porous opening is pinched, nasal root broader, anterior malar projection, short posterior occipital shelf, wide frontal process of the zygomatic to include tubercle, shovel-shaped incisors (21–23), enamel extensions, protostylid pits, and the subtrochanteric region of the femur displays platymeria as well as a sharp medial crest.

It is a combination of these traits, or often, intermediate expression of these traits, that most often classifies individuals of Southwest Hispanic ancestry in southern Arizona. It is important to point out here that the combination of nonmetric traits displayed by Southwest Hispanics can be variable. For example, some individuals exhibit more European traits than Amerindian, whereas others exhibit more Amerindian traits than European traits. However, it is common for these admixed individuals to more strongly display the Native American nonmetric traits, as indicated in the list below. The suite of nonmetric traits found to be effective at the PCOME for classifying individuals of Southwest Hispanic ancestry includes:

- shoveled anterior teeth,
- anterior malar projection,
- short posterior occipital shelf,
- less elaborate nasal sill (tending towards dull),
- oval window visualization between zero and partial (Fig. 1),
- enamel extensions on molars,
- nasal overgrowth,
- wide frontal process of the zygomatic,
- platymeria of the subtrochanteric region of the femur and a sharp medial crest.

Examples of the intermediate expression of traits in Southwest Hispanics include the sharpness of the nasal sill, expression of anterior malar projection, and the visualization of the oval window. Various grades of expression for these traits are encountered in these admixed individuals. For example, the nasal sill can be intermediate, meaning that it is somewhere in between the sharp and elevated expression seen in Europeans and the low sill seen in Native Americans. Anterior malar projection can also be intermediate, where the face is not receding, nor is it flat. Also, the visualization of the oval window can be intermediate, meaning that the oval window may be partially observed and the porous opening is neither pinched nor wide.

It should also be acknowledged that in certain areas of Mexico, some percentage of the local population has a small degree of African ancestry (24–26). Nonmetric skeletal traits that owe their presence to an African ancestry have been observed in several cases at the PCOME, although, in these cases, it is difficult to discern whether this is just as example of the normal range of morphological variation within Southwest Hispanics. In addition, in some of these cases, FORDISC 3 has identified known Southwest Hispanic individuals as "black". By factoring in the possibility of a small African component, the range of population variability in Southwest Hispanics is more complete.

Finally, when assessing ancestry, it is best to include as many nonmetric traits (or cranial measurements) in the analysis as possible. The final assessment of ancestry is based on the consideration of all available skeletal traits, dental or osseous, observed during the morphoscopic analysis. This has been the practice of the senior author for over 40 years, and it has become the practice of both junior authors.

Identifying Undocumented Border Crossers: Geographic Context, Personal Effects, and Cultural Accoutrements

The second goal of this paper is to discuss the methods used at the PCOME to distinguish the undocumented immigrants who have died crossing the border from individuals who are legally in the United States. These classification methods are based on geographic context, personal effects, condition of the teeth, stature, and cultural accoutrements (2).

Geographic context refers to the location in which the human remains are discovered. Specifically, remains that are discovered in well-established migrant corridors are strongly suggestive of border-crosser deaths. There are many of these corridors that run south to north in valleys between a series of small mountain ranges. The evidence that suggests these are well-established corridors is represented by the preponderance of discarded water bottles, backpacks and clothing.

Personal effects commonly observed and used in the classification of individuals at the PCOME include: identification media (voter card, birth, and marriage certificates); specific types and brands of clothing, shoes, and foodstuffs; foreign money and phone numbers; religious icons such as the Virgen de Guadelupe and other area-specific patrons/matrons (Fig. 2), and package amulets (pouches) for good luck or protection.

The condition of the teeth can also be useful in the attempt to identify individuals as border crossers. Poor dental conditions are frequently seen in the foreign nationals from Mexico and other Central American countries who die while crossing the border. Examples of these dental conditions include: increased number of carious lesions, associated abscesses, teeth missing antemortem, and greater occlusal wear. Many individuals do not display

amalgam restorations. Dental health can be an indicator of standard of living and health status. Because most of these individuals come from lower socioeconomic sectors of Mexico and Central American countries, adequate dental care is frequently lacking.

Cultural accoutrements also play an important role at the PCOME in identifying remains as foreign nationals from Mexico and Central American countries. Accoutrements consistent with such individuals include specific types of dental work and tattoos. When dental restorations are present, they frequently are poorly administered, providing yet another cultural clue as to nationality.

Prominent "cosmetic" dental work is another common finding in adult border crossers. This dental work often includes stylistically unique metal crowns on anterior teeth, usually worn as a form of personal adornment, but can also be a form of dental restoration. Because many of these cosmetic crowns are poorly fitted to the otherwise healthy tooth, they commonly result in the production of caries surrounding the cosmetic work.

Another common finding in these individuals is a shorter than typical adult stature. Full adult stature has likely gone unrealized in many of these individuals due to nutritional deficiencies. This difference in stature is not a primary tool in distinguishing between foreign nationals and U.S. citizens. It is not nearly as great as the average difference in body size between American servicemen and the Vietnamese, Lao, and Cambodians that were encountered in the Vietnam War. However, because the differences are noticeable, stature is frequently used to support the classification of remains as Mexican foreign nationals.

This, of course, is not to say that some American citizens do not suffer from poor nutrition and fail to achieve full adult stature, or have poor dental hygiene, or have prominent cosmetic work performed on anterior teeth. A percentage of American citizens certainly do. But, we operate on the premise that it is very unlikely for them to be found in remote parts of the desert and within known migrant corridors.

Conclusion

Due to the increasing number of individuals of Southwest Hispanic ancestry in the United States, as well as the large number of border crossers who die while trying to cross the United States-Mexico border, forensic human identification cases at the PCOME in Tucson, Arizona increasingly involve individuals of admixed European and Amerindian ancestry. Because individuals of Southwest Hispanic ancestry reside on both sides of the Arizona border with Mexico, deciphering the nationality of these individuals is an important job of the forensic anthropologists and pathologists at the PCOME. This paper presents a multifactoral, biocultural methodology used at the PCOME in differentiating foreign nationals who have died trying to cross the border from individuals who are in the United States legally.

This paper describes the suite of nonmetric skeletal traits used at the PCOME to identify individuals of Southwest Hispanic ancestry who share their heritage with European and Amerindian ancestral groups, typically exhibiting a combination or intermediate expression of traits from the two parental groups. It is not uncommon, however, for some individuals to appear decidedly more Amerindian or more European.

This paper also introduces the idea of the "cultural profile", and discusses how it is generated using geographic context, personal effects, dental health, and cultural accoutrements. In order for this methodology to be effective, the cultural evidence must be utilized in concert with the biological evidence.

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