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Identifying the Dead: Methods Utilized by the Pima County (Arizona) Office of the Medical Examiner for Undocumented Border Crossers: 2001–2006*

ABSTRACT: The Pima County (Arizona) Office of the Medical Examiner has seen a dramatic rise over the past 6 years in the number of deaths related to the illegal crossing of our international border with Mexico. This rise in deaths is undoubtedly related to an increase in the number of foreign nationals who cross into the various Arizona jurisdictions that utilize the Pima County Medical Examiner to investigate their unnatural deaths. Because of the utterly dangerous nature of trekking across the Sonoran Desert, especially in the summer months, many of these unfortunate migrants succumb to the effects of heat-related illness and perish along the journey. The combined effects of a dry, hot environment and the remoteness of some of the trekking corridors can quickly render a deceased person unidentifiable by visual means. Thus, our office is faced with not only an increase in the number of deaths requiring medico-legal investigation but also an increase in the number of decedents needing additional specialized examinations in an effort to effect identification. This paper attempts to outline the problems and the methods utilized by our office over the past 6 years in the identification process of undocumented border crossers. It is hoped that this paper, as well as the others presented at this symposium, will allow for the sharing of information amongst all medical investigators who assist in the identification of these migrants. The identification of these individuals takes on added importance when one considers the possible nationalities, and perhaps motivation for entering into the US, of those that remain unidentified.

KEYWORDS: forensic sciences, forensic anthropology, undocumented border crossers, foreign nationals, methods of identification

The United States shares a border with Mexico of some 2000 miles, 281 (14%) of which constitute what is designated by the US Border Patrol (USBP) as the Tucson Sector (see Fig. 1). The Pima County Office of the Medical Examiner, in Tucson, Arizona, provides medico-legal death investigation over the western two-thirds of this sector's southern border with Mexico. Various USBP operations over the past 13 years have served to make it more difficult for foreign nationals to illegally cross into the United States via some urban routes of entry within the nine USBP sectors (see Fig. 2). Operation Hold the Line (1993) attempted to secure El Paso, Operation Gatekeeper (1994) attempted to secure San Diego, and Operation Safeguard (1995) attempted to secure Nogales, to name but three of these operations. Without a doubt, the decade of the 1990s witnessed most of the undocumented border crossings occurring in Texas and California (1,2), while the Tucson Sector experienced comparatively low numbers of undocumented crossers. Indeed, the number of deaths associated with the illegal entry of foreign nationals into the *entire* Tucson Sector from 1985 through 1998 averaged 19 per year (see Fig. 3). This number has dramatically changed since then, with a precipitous climb from 29 in 1998 to 75 in 2001, and then a doubling by the next year (see Fig. 4). For this calendar year (2007), it is likely that our office will investigate the deaths of 200 of these individuals. Without a doubt, the beautiful yet dangerous Sonoran Desert, once deemed too risky to

cross, has become the primary route into the United States for these migrants seeking out a better life. The US Border Patrol has reported that for fiscal year 2004, 43% of all apprehensions (491,771 of the total 1,139,282) along the Mexican border occurred within the 281 mile Tucson Sector. That translates to 43% of the apprehensions within 14% of the US–Mexico border. The total number of crossings by undocumented foreign nationals into the US is unknown, with USBP apprehension data being the only measure thought to be related to crossings. But with unknown recidivism rates and uneven patrolling across the 2000 mile border, exactly how apprehensions relate to crossings is a bit of a guess. But what is known is this: What was once a major issue in California and Texas has now become a major issue in Arizona. The focus of this paper will be to describe the various ways that the Pima County Medical Examiner's Office is identifying these foreign nationals. The identification of these individuals takes on added importance when one considers the possible national origins of those left unidentified. Because of the events of 11 September 2001 have pushed America to secure each of our international borders, the porous nature of our border with Mexico allows virtually anyone wishing to harm American interests to enter undocumented and subsequently travel anywhere within the United States.

By far, heat-related illness is associated with most of the deaths of these undocumented border crossers (UBC) (3). As Fig. 4 illustrates (month of recovery equates to month of death in most cases), the vast majority of these deaths occur between May and September, when daytime temperatures frequently reach 100–110°F. The relative numbers of heat-related deaths can be seen in Fig. 5 through 10, which provide both the “type of death” and the recovery location of each individual considered to have died while illegally crossing into the Tucson Sector from Mexico for each of the past six fiscal years. Because of the ambient

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FIG. 1—Map of the southwest United States with the US Border Patrol’s Tucson Sector highlighted (courtesy of USBP).

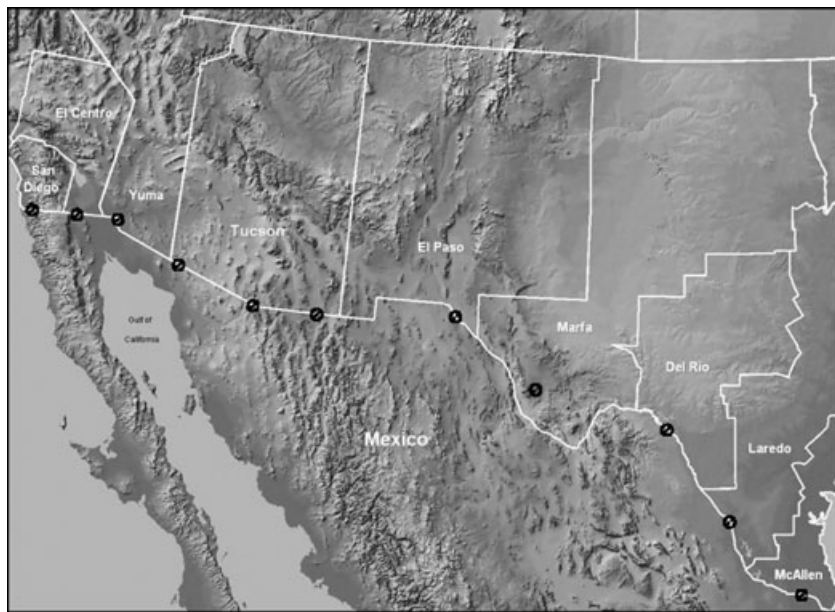


FIG. 2—Map depicting the nine US Border Patrol sectors. Circles indicate major urban areas where USBP has curtailed undocumented immigration (courtesy of USBP).

Tucson Sector deaths per year, 1985 - 1998

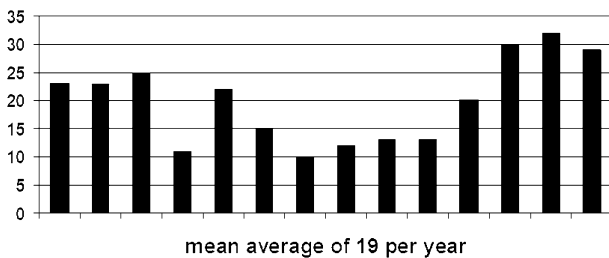


FIG. 3—Graph of the number of deaths associated with undocumented immigration for the Tucson Sector from 1985 through 1998. This data is summarized from the Center for Immigration Research in Houston, Texas (1).

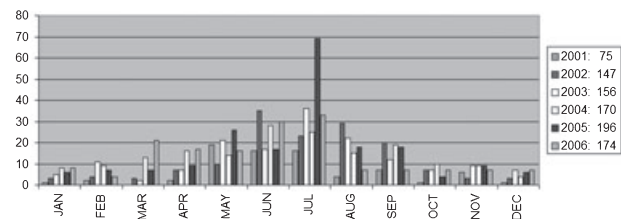


FIG. 4—Graph of the number of deaths, by remains recovery month, for undocumented border crosser cases investigated by the Pima County Office of the Medical Examiner from 2001 through 2006.



FIG. 5—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2001 (courtesy of USBP).



FIG. 6—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2002 (courtesy of USBP).

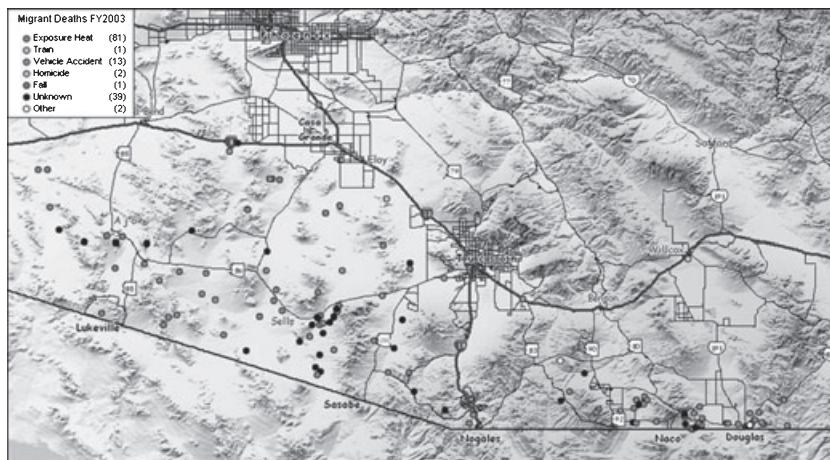


FIG. 7—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2003 (courtesy of USBP).

temperatures associated with heat-related deaths, as well as the elevated body temperature, decomposition can be greatly accelerated. Add to this the fact that bodies frequently are not recovered on the day of death, and one can see how visual types of

identification can be quickly rendered useless. Indeed, previous research on human deaths that were recovered as surface deposits on the Sonoran Desert has documented this rapid rate of decomposition (4).



FIG. 8—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2004 (courtesy of USBP).

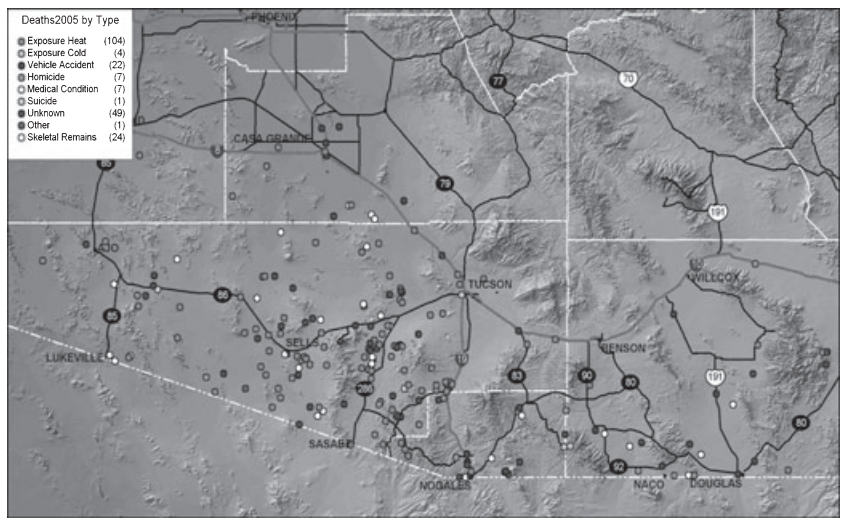


FIG. 9—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2005 (courtesy of USBP).

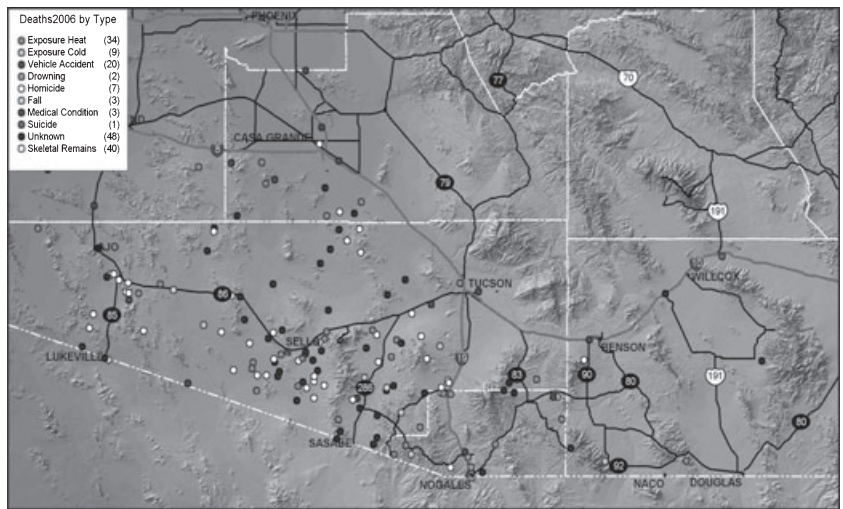


FIG. 10—Map of recovery locations for deaths associated with undocumented immigration for fiscal year 2006 (courtesy of USBP).

We utilize two levels of identification at the Pima County Office of the Medical Examiner, the familiar categories of *positive* and *circumstantial*. For a positive identification to be effected, one of

two scenarios occur: Someone who knows the decedent provides the means of identification, usually through visual recognition of face; or a medico-legal investigator (e.g., forensic anthropologist,

forensic pathologist, forensic odontologist, fingerprint examiner, DNA analyst) conducts a point-by-point comparison of antemortem and postmortem records. Some examples are comparisons of radiographic films (both dental and medical), comparisons of fingerprints, and comparisons of nuclear DNA profiles. Upon completion of the comparative analysis, the medico-legal investigator then renders the opinion that both the antemortem record and the postmortem record are of the same individual, *and* at the exclusion of any other person. This is positive identification. For a circumstantial identification to be effected, all consistencies between the decedent and the presumptive person are duly noted and no *unexplainable* inconsistencies can be present. The greater number of consistencies the better, but even one consistency, if considered sufficiently unique, can be the basis for a circumstantial identification. Examples are dental descriptions; tattoo descriptions; descriptions of healed osseous fractures; descriptions of scars, nevi, and freckles; body size descriptors; skull-photo superimposition analysis (some consider this technique to be potentially a form of positive identification); and mitochondrial DNA comparisons (deemed circumstantial because of the lack of discrimination between maternal relatives).

Upon completion of noting the consistencies in traits between the decedent and the presumptive person, the medico-legal investigator renders the opinion that the decedent is *thought to be* the same individual whose traits are being compared. Again, it is imperative that no unexplainable inconsistencies are present. An example of an *explainable* inconsistency is the presence of a tattoo on a decedent of which the next-of-kin (NOK) are unaware. An example of an *unexplainable* inconsistency is the presence of a viable tooth in the mouth of a decedent that the NOK are certain was extracted by a dentist. Thus, circumstantial identification exists at a lower level than positive identification because the medico-legal investigator acknowledges some degree (hopefully small!) of uncertainty. At our office, NOK are always made aware of the level of identification prior to the release of the decedent to a mortuary. Some families of those individuals circumstantially identified have requested positive identification. When feasible, our office accommodates these families.

The superiority of a positive identification is obvious; however, it is not always possible to secure the appropriate antemortem records on which to base one. This can be a daunting problem facing the medico-legal investigator when attempting to identify foreign nationals who die while crossing the US border as undocumented migrants. The lack of dental records is the major impediment to fast, confident identifications in many cases. Table 1 lists the methods utilized by the Pima County Office of the Medical examiner to identify UBC for each of the past six calendar years. It is apparent from these charts that circumstantial identifications constitute either the primary or secondary method of

identification for each of the last 6 years. What should also be apparent is the steady increase over time in the use of DNA (mtDNA usually) to resolve identity. The percentage of UBC who are eventually identified is woefully below 100%, but thought to be ahead of the national average, estimated at 40% (2,5). Our office works diligently with the Office of the Mexican Consulate (as well as other foreign consulates) to attempt to identify all of these individuals deemed to be UBC. However, some individuals are recovered with absolutely no personal effects or physical attributes that would allow for the contact of potential NOK. These are the individuals who will likely remain unidentified until the day arrives when a large database of the missing and the deceased can be used to generate presumptive identifications that mtDNA analysis (see Baker and Baker, [5]) can hopefully resolve.

Undocumented Border Crosser (UBC)

As is obvious from Table 1, the Pima County Office of the Medical Examiner is including unidentified individuals in the total count of UBC. Because many of these unidentified individuals are recovered with information that leads our office to conclude that they had crossed the border in an undocumented fashion, to exclude these people would result in a significant under-reporting of the number of deaths associated with the illegal crossing of our border with Mexico. Consequently, our office practice is to include anyone who fits a pre-established profile (see below) that indicates that the decedent was engaged in the undocumented crossing of our southern border. This practice acknowledges that we may be slightly over-reporting the number of border-crossing deaths. Our office considers this potential issue preferable to the vast under-reporting that would result if these unidentified individuals were excluded from the rolls of the unsuccessful migrants.

The profile that is utilized in the determination of an UBC consists of personal effects, geographic location, and biological characteristics. Examples of pertinent personal effects are identification media, such as Mexican voter registration cards, birth and marriage certificates; address books and scraps of paper with telephone numbers (both foreign and domestic); foreign currency; and cultural accoutrements, for example religious icons such as "scapulars" of the *Virgen de Guadalupe*, or local patron saints. Geographic provenience is utilized under the assumption that certain, remote areas of the desert are almost assuredly restricted as trekking corridors for the trafficking of undocumented migrants or drugs. The final criterion, biological characteristics, is a combination of phenotypic and genotypic information. Phenotypic observations such as hair form, facial morphology, dental restorations, skeletal discrete traits (6), osteometrics (7), and genotypic data in the form of mtDNA sequences (5) have been used to characterize unidentified individuals as Southwest Hispanics (defined here as admixed European/Indigenous Native America/possibly African). For example, if skeletal remains, without any personal effects, are found in an area of the desert known to be used to traffic illegal migrants, and are deemed to biologically consistent with Southwest Hispanic ancestry, this individual will likely be included as an UBC if no missing Americans are consistent in physical attributes. However, if this same set of skeletal remains appeared consistent with Polynesian ancestry, then no such placement would occur until further investigation could be accomplished. Thus, the combination of biology, culture, and geography is utilized to categorize unidentified individuals as likely UBCs. In the near future, geo-location of residence (8) may be added to this battery of discriminators.

TABLE 1—Summary table of the methods utilized to identify undocumented border crosser (UBC) for 2001 through 2006.

Methods of identification	2001	2002	2003	2004	2005	2006	Total
Visual	23	66	44	51	55	51	290
Circumstantial	29	29	36	37	35	22	188
Fingerprints	4	20	20	24	40	22	130
DNA	0	3	13	14*	13*	8*	51*
Dental	0	2	0	2	1	0	5
Radiography	0	0	1	2	0	0	3
Total identified	56	120	114	130*	142*	96*	667*
Total UBCs	75	147	156	170	196	174	918
% Identified	75	82	73	77	74	59	73

*More pending.

TABLE 2—Summary table of nationalities of the identified undocumented border crosser (UBC) for 2001 through 2006.

UBC nationalities	2001	2002	2003	2004	2005	2006	Total
Mexican	56	117	98	114	133	93	611
Guatemalan	0	0	7	6	6	6	25
Salvadoran	0	0	4	4	2	0	10
Brazilian	0	1	1	1	1	0	4
Honduran	0	0	1	1	1	1	4
Ecuadoran	0	0	0	2	0	1	3
Unknown	0	0	1	0	0	2	3
Colombian	0	1	0	1	0	0	2
Dominican	0	0	2	0	0	0	2
Costa Rican	0	1	0	0	0	0	1
Chilean	0	0	0	1	0	0	1
Peruvian	0	0	0	0	1	0	1
Total	56	120	114	130	144	103	667
% Mexican	100	98	86	88	92	92	92

While 92% (611 of the identified 667) of the unsuccessful migrants were identified as Mexican Nationals (see Table 2), the other 8% can all be considered “Hispanic.” This contention is tempered a bit with the admittance that a few of these individuals from Meso-America appeared, skeletally, to be American Indian, thus reflecting the likely fact that some individuals are less admixed than others. Nonetheless, the above-listed criteria for including the unidentified as UBCs would seem to be valid on biological grounds. For discussion of the sometimes-difficult task of distinguishing between UBCs and US citizens of Southwest Hispanic heritage, see Birkby (6).

The age and sex statistics are provided in Table 3. Age cohorts are provided only for the identified, whereas sex assessments are made for all UBCs (this is performed principally to assign “Jane Doe” or “John Doe” status). As can be seen, females constitute 25% or less for each of the past 6 years, although for July of 2005, a puzzling 57% (39 of 69) of the deaths involved women. USBP reports that women and girls represented *c.* 17% of the total number of apprehensions for the past six fiscal years, although given the recidivism issue, this number is best viewed as an estimate. The calculated mean age of 30.5 years of age for each of the past 6 years should be viewed in light of the total number of individuals within the 21–30 year cohort and the 31–50 year cohorts, which is essentially equal (248 and 265, respectively.) Thus, the calculated median age is lower than 30 years of age, undoubtedly reflecting the needs of the US labor market that awaits the arrival of the successful migrant worker.

TABLE 3—Summary table of undocumented border crosser (UBC) age (identified individuals) and sex (all individuals) demographics for 2001 through 2006.

UBC demographics	2001	2002	2003	2004	2005	2006	Total
<21 years	5	24	20	20	27	26	122
21–30 years	29	42	43	52	51	31	248
31–40 years	10	33	33	32	41	28	177
41–50 years	10	15	12	19	20	12	88
>51 years	2	6	6	7	5	5	31
Total	56	120	114	130	142	96	666
Age range	15–54	10–58	0–64	13–63	0–57	3–66	0–66
Mean age	30.6	30.3	30.4	31.1	30.2	30.1	30.5
Median age	28	28	29	28	28	29	28.3
Modal age	24	18	38	26	27, 35	20, 29	
Female	19	36	36	33	40	33	197
Male	56	111	120	137	156	141	721
% Female	25	25	23	19	20	19	22

Discussion

So, the typical decedent who is characterized by the Pima County Office of the Medical Examiner as being an UBC is a Mexican National between 21 and 30 years old, three times more likely to be a male, and who is only identified 73% of the time. Given that our office’s identification rate for American citizens is much closer to 100%, this discrepancy requires attention. Given that there exists the very real possibility that additional UBC human remains are strewn across the desert and have yet to be recovered, this discrepancy is probably wider. The reasons are fairly obvious for the difficulties encountered in identification, with remote areas of death perhaps heading the list. When a person dies literally in the middle of nowhere, and is left alone, the only means of identification are found on that person and any personal effects that can be associated with the decedent. As time passes, the effects of scavenging (the body by animals and personal effects by subsequent human trekkers) can serve to reduce the available evidence that might lead to identification. The effects of weathering, especially intense and protracted sunlight, can render paper and plastic items (e.g., identification documents) unreadable, not to mention the fading and eventual destruction of most clothing items. Thus, the length of exposure substantially decreases the chance of associating a name, and thus possible identification. The human body is, of course, not immune to these destructive forces. Hot and dry weather conditions can render tattoos, scars, and other such identifiers difficult to see within a day, sometimes more quickly. The anterior dentition (teeth with conical roots) fall from the alveolus during the decomposition process, likely aided by the jostling of the skull during carnivore scavenging. Because these are the teeth most likely to be recognized by those who knew the decedent, an important identifier can be lost if these loose teeth are not recovered with the principal remains. Given that most of the recoveries are carried out by law enforcement, screening of soil is seldom performed. Bones and teeth, if exposed to the direct effects of sunlight for a year or so (4), begin to crack and thus potentially lose surface detail and identification potential. As is true with personal effects, the longer a body is subjected to the effects of weathering and scavenging, less of it will be recovered.

These postmortem problems are further amplified by antemortem problems. Chief amongst these is a virtual lack of dental or medical records for most of these border crossers. Mexican Nationals with presumptive identifications, many with distinctive dental work, are less likely than the other nationalities listed in Table 2 to have corresponding dental records. Given that many of these would-be migrants are from impoverished families, this is perhaps not surprising. Medical or dental records, when available, are much more likely to be from a US facility where the decedent received treatment during a prior stay in this country. The added hurdle of fictitious names must be cleared when utilizing US records on many of those individuals who were illegal entrants at a previous time and place. Another problem, although the Tucson Office of the Mexican Consulate minimizes the issue of our office, is that families are many times not able to come to the US to aid in the identification process. A decided minority have easy access to fax machines, the Internet, and even telephones in some cases. Thus, we are forced to communicate our findings, the postmortem description of a decedent and any personal effects, through an interpreter (usually a foreign Consulate). This additional step serves to delay, and at times, inhibit, the identification process. On occasion, I am told, some families refuse to participate in even the most elementary facet of identifying a decedent. For either fear of confronting the unbearable, or fear that some legal action will be taken against the

surviving family members, some individuals are reluctant to even acknowledge that a family member is missing, let alone admit to the illegal crossing of the border and the lack of communication from them for an uncomfortable length of time. Obviously, if a family will not cooperate with the necessary exchange of information vital to the identification process, then the decedent may never be identified. The recent increase in human trafficking by unsavory elements further creates fear amongst the families of the missing and has at times, even led to deaths by a manner quite unnatural (9).

But just because UBC identifications create some problems not usually associated with the deaths of US citizens, our office must persevere. When visual identifications are not possible, when adequate fingerprint records can not be obtained, and when no ante-mortem medical or dental records exist (or can be provided), circumstantial identifications must become more reliant. Family members are routinely shown digital photographs of clothing, other pertinent personal effects, anterior dentition, and, when appropriate, the face itself. These photographs are typically taken by dedicated staff members of the Mexican Consulate (Tucson and Nogales Offices) in the presence of Medical Examiner personnel and usually after the postmortem examination has been performed. Many times telephone numbers and addresses (some discovered during this "second examination" of the personal effects) are found that directly lead to a name association (when there was none) and an eventual identification. At times during this second examination, the decedent is deemed more likely not to be a Mexican National. At these times, other foreign consulates are contacted and asked for assistance in the exchange of postmortem information.

Our office has, when necessary, relied upon our colleagues in other forensic science offices to assist in the identification process of individuals thought to be UBCs. Although this practice comes at some additional expense and perhaps significant delay in the identification process, we feel it is justified owing to the tremendous responsibility of correctly identifying all individuals whose deaths are investigated by our office. The anthropologic technique of skull-photo superimposition was utilized in resolving the identities of two women who died together and whose skeletal remains were thoroughly commingled. Because our office does not have the requisite equipment to administer this technique, we enlisted the help of anthropological colleagues at another forensic science laboratory (10), who reached conclusions that allowed our office to recommend circumstantial identifications on each of the two women.

Our office is fortunate to be able to resolve some of our UBC cases with DNA examinations, usually mtDNA. The Arizona Department of Public Safety (our state police) has derived nuclear DNA profiles from a few of these cases and thus allowed successful resolution in terms of an identification. More recently, and now (thanks to a Mexican funding source) more often, mitochondrial DNA (mtDNA) is utilized by another anthropological colleague (5) to resolve dozens of our current cases that can not be identified by other means. The Mexican funding source, sponsored by the *Secretaria de Relaciones Exteriores* (SRE, the equivalent of the US Department of State) is a part of a program for finding missing Mexican citizens and is known by the acronym *SIRLI* (*Sistema de Identificacion Restos y Localizacion de Individuos*). This program became functional early in 2005 and has already funded mtDNA analyses in dozens of our cases. This tool, mtDNA, not only holds great promise to resolve current cases with name associations (and, thus, families to provide the essential reference sample) but also holds the promise to identify at some later date some of the dozens of individuals who have not been identified over the past 6 years.

Recall that only 667 of 918 individuals have been identified, to date, from 2001 through 2006. Perhaps two dozen of the currently 251 unidentified have valid name associations and are awaiting a mtDNA examination. The remaining individuals are destined for burial in an indigent graveyard in Arizona, or given a recent change in state law, awaiting cremation. But before any body is released from our office to a mortuary, a complete series of post-mortem examinations are performed, to include dental radiographs and retention of tissue samples. Thus, a buried body, and even a cremated one, still has the potential to be identified at some future time. With the continued funding provided through *SIRLI*, and the committed efforts of Baker and Baker (5), additional identifications will undoubtedly be effected.

The issue of identification is usually viewed from the perspective of the families of the missing, and rightfully so. Part of what is performed at a medical examiner's office is to properly identify and subsequently return decedents to waiting families. However, another way to look at identifications, or more precisely, the lack of same, is from the perspective of society. To wit, of the unidentified, who *are* these people? Although most illegal migrants, as far as I have been able to tell, come into this country to work an honest job, some number undoubtedly come for the express purpose of committing crimes (I ask the reader to set aside the oft-cited crime of entering into the US as undocumented). Nefarious activities, such as being involved in the illicit drug trade, are being conducted by some of the same smugglers (*coyotes* or *polleros*) that also funnel people across our southern border. With known gang members, such as those reportedly belonging to the violent MS-13 gang, bragging of the ease in illegally crossing our southern border at will, we should have a societal concern in knowing just *whom* these unidentified people are. Further, in this post 11 September 2001 climate of national security, having a porous southern border takes on added importance. It is possible that some of the unidentified persons remain in that status for the precise reason that they do not come from the same Meso-American populations that the identified individuals do. To put a finer point on it, these unidentified individuals could potentially be anyone, from the migrant looking for a better life in the US to the terrorist looking to end his life in the US.

Each of the papers in this published symposium makes a contribution to the resolution of the identification of these unknowns, and thus not only to helping individual families, but also to American society. With one exception (8), each of the papers published here were presented at the 56th annual meeting of the American Academy of Forensic Sciences in 2004, when we gathered for a specially formed symposium to address some of these very issues. Some, including this one (11), have been revised and brought up to date. Collectively, each of these papers represents a concerted effort to address the problem of recognizing and identifying those UBC who die while entering this country. It is hoped that our initial efforts will be joined by others who investigate the deaths of these would-be migrants so that our collective success in identification can reach nearer to 100%. The risk of not expending this effort could be enormous.

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