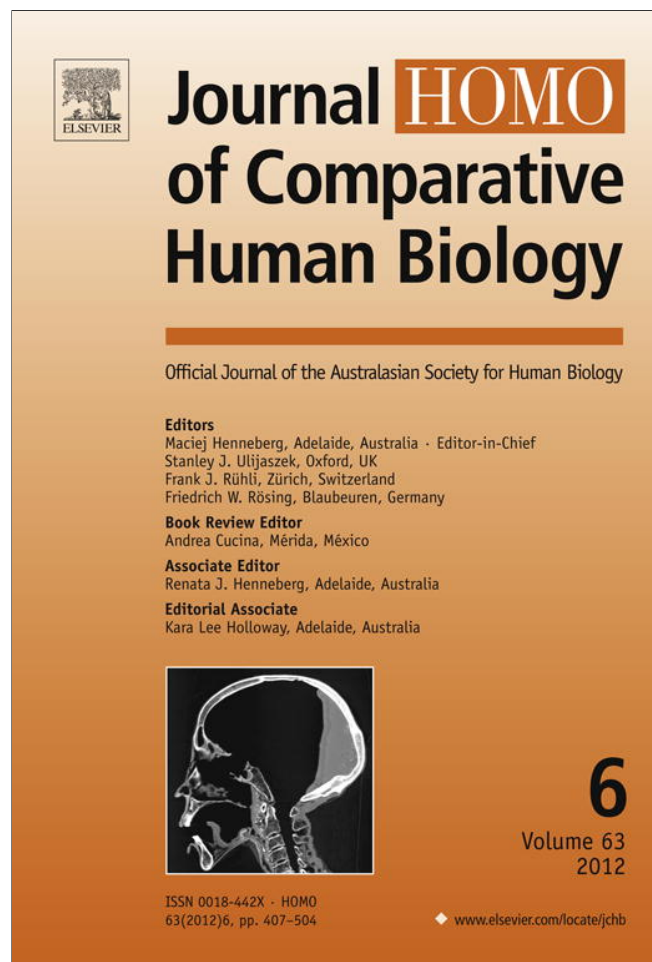


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Chacarita Project: Conformation and analysis of a modern and documented human osteological collection from Buenos Aires City – Theoretical, methodological and ethical aspects

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ABSTRACT

Osteological reference collections play a key role in bioanthropological research; they allow the development and testing of methods for sexing and ageing individuals using various bone and dental attributes. This paper presents the first stage results of the ongoing Chacarita Research Project, which aims to generate and study a reference collection of adult skeletons representative of the contemporary population of Buenos Aires city. The Chacarita Collection consists of unclaimed human remains of individuals of known nationality, sex, age, cause and date of death from the Chacarita Public Cemetery. Unlike other similar endeavours, this sample has been completely exhumed using archaeological techniques. So far, a total of 146 adult skeletons have been recovered (60 females – 41.1% and 86 males – 58.90%), the majority of which have ages-at-death in the range of 71–90 years. They were born primarily in Argentina ($n = 133$; 91.1%), although other nationalities are also represented. Dates of death range between 1987 and 2000. In the short term, the osteological study of this collection will allow assessment of the performance of classical methods of sex determination and age-at-death estimation in a local setting. A special

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priority will be given to the study of osteological changes in individuals over 50 years. As the sample is being retrieved by exhumation, the impact of taphonomic agents on the most diagnostic bone structures is also being assessed. In the long term, this osteological collection will be available to generate new population-specific techniques and to develop comparative biological studies.

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R E S U M E N

Las colecciones osteológicas de referencia juegan un papel clave en las investigaciones bioantropológicas, pues permiten el desarrollo y evaluación de métodos de determinación del sexo y estimación de la edad usando indicadores óseos y dentales. Se presentan aquí los resultados de la primera etapa del Proyecto Chacarita, cuyo objetivo es generar y estudiar una colección de referencia de esqueletos adultos representativa de la población contemporánea de la ciudad de Buenos Aires, Argentina. La colección está conformada por esqueletos no reclamados de individuos de identidad, sexo, edad, nacionalidad, causa y fecha de muerte conocidas, enterrados en el Cementerio de la Chacarita de Buenos Aires. A diferencia de otros proyectos similares, esta colección está siendo exhumada mediante técnicas arqueológicas. Hasta el momento, se han recuperado 146 esqueletos adultos (60 femeninos - 41.1% - y 86 masculinos - 58.90% -), la mayoría en el rango entre 71 y 90 años. Aunque también están representadas otras nacionalidades, la mayoría de los individuos son argentinos ($n = 133$; 91.1%), con fechas de muerte desde 1987 a 2000. El proyecto prestará especial atención al estudio de los cambios osteológicos de los individuos mayores de 50 años. Asimismo, otro objetivo específico es la evaluación del impacto de diferentes agentes tafonómicos sobre las estructuras óseas más diagnósticas para la asignación sexual y etaria. En el largo plazo, la colección estará disponible para la generación de nuevas técnicas específicas para esta población y para el desarrollo de diversos estudios comparativos.

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Introduction

Forensic anthropology involves the application of knowledge and techniques developed by biological anthropology to medico-legal problems. The overall goals are to identify partially or fully skeletonised remains and to determine causes of death. The bioanthropological study of the osteological manifestations of sexual dimorphism, as well as skeletal changes that occur during the processes of growth, development and ageing are crucial in the identification phase of the remains (Adams, 2007; Klepinger, 2006; Pickering and Bachman, 2009). Osteological reference collections play a key role in basic bioanthropological research, as they allow the development and testing of methods and techniques for the determination of sex and the estimation of age-at-death from the analysis of various skeletal and dental attributes. Most osteological reference collections from which specific technical standards have been developed were generated many decades ago – with some of them dating back to the late 18th century – mainly in various European countries and in the United States (Eliopoulos et al., 2007). Among these collections, the best worldwide known are the Hamman-Todd Collection from the Cleveland Museum of Natural History, the Terry Collection and the Huntington Collection, both from the Department of Anthropology at the National Museum of Natural History, and the Dart Collection from the Department of Anatomical Sciences at the University of the Witwatersrand, Johannesburg,

South Africa. All of them were formed during the first half of the 20th century (Dayal et al., 2009; Hunt and Albanese, 2005; İşcan and Miller-Shaivitz, 1986; Tobias, 1985, 1991; Usher, 2002).

Other very important reference collections are the Coimbra Identified Skeletal Collection, curated by the Anthropological Museum from the Faculty of Science and Technology at the University of Coimbra (Portugal), also created during the first half of the 20th century (Cunha, 1995; Cunha and Umbelino, 1995; Santos, 2000; Santos and Roberts, 2006), the Luis Lopes Skeletal Collection housed at the Bocage Museum (National Museum of Natural History) of the University of Lisbon, Portugal, created during the nineteenth and 20th centuries (Cardoso, 2006), the Christ Church Spitalfields Collection at the British Museum of Natural History, London, generated during the late 18th and 19th centuries (Cox, 1996; Molleson and Cox, 1993; Reeve and Adams, 1993), the Maxwell Museum Documented Collection, located at the University of Mexico and created during the late 20th century (Komar and Grivas, 2008), the William M. Bass donated skeletal collections, curated at the University of Tennessee, Knoxville (Mann et al., 1987; Rogers, 1999) and the large collection stored in the Natural History Museum in Vienna and at the University of Vienna (Szilvassy and Kritscher, 1990), to name some of the most well-known osteological reference collections (a thorough list can be found in Usher, 2002). Many methods for sex determination and age-at-death estimation have been developed using samples of these collections during the last four decades. Specifically, most of them have been based mainly on two of these reference samples: the Terry Collection and the Hamman-Todd Collection (Usher, 2002).

In Argentina, forensic investigations usually apply standards designed from these foreign reference samples. For example, for adult sex determination the methods developed by Phenice (1969) for the hip bone, and by Acsádi and Nemeskéri (1970) for the skull, are frequently chosen. For adult age-at-death estimation the most commonly applied techniques are those proposed by Todd (1921a, 1921b), Brooks and Suchey (1990), McKern and Stewart (1957) and Gilbert and McKern (1973) for the pubic symphysis, the sequence of morphological change proposed by Lovejoy et al. (1985) and Meindl and Lovejoy (1989) for the auricular surface of the ilium and by İşcan (1989) and İşcan et al. (1984, 1987) for the fourth rib, and, less frequently, the evaluation of the degree of suture closure designed by Meindl and Lovejoy (1985) for the skull. While the application of these methods has produced satisfactory results in many cases, it is widely recognised that bone manifestations of sex and age are dependent on specific phenotypic and behavioural characteristics in each population (e.g. Alunni-Perret et al., 2003; Asala, 2001; Burrows et al., 2003; Bruzek and Murail, 2006; Ferembach et al., 1980; İşcan et al., 1998; Kemkes and Göbel, 2006; Mays and Cox, 2000; Ríos Frutos, 2003; Spradley et al., 2008; Ubelaker, 1974, 2008; Wiredu et al., 1999). This means that they are influenced by factors such as ethnicity, physical activity patterns, nutrition, health and socio-economic status (Hamilton, 1982; Luna, 2008; Pucciarelli et al., 1996; Trancho et al., 1997). Consequently, there has been a growing tendency in basic forensic anthropology research around the world to adjust methods and techniques to the local characteristics of target populations through the creation of local reference samples (e.g. Barrio et al., 2006; Bidmos and Asala, 2003; King et al., 1998; Mall et al., 2000; Oettle and Steyn, 2000; Trancho et al., 1997; Steyn and İşcan, 1999; Wu, 1989, among many others).

This tendency is well exemplified in the recent development of several projects whose principal aim is to conform and study osteological reference collections, both in Argentina (i.e. Barboza et al., 2005; Bosio et al., 2009; Desántolo et al., 2007, 2009; Kullock et al., 2009, 2010; Luna et al., in press; Salceda et al., 2009, 2012; Segura, in preparation) and in other parts of the world such as South Africa (L'Abbé et al., 2005) and Greece (Eliopoulos et al., 2007).

It is also well known that the estimation of age-at-death of adult skeletons, particularly of individuals over 40 or 50 years, poses a challenge both in forensic anthropology and archaeology (e.g. Bocquet-Appel and Masset, 1982; Hoppa and Vaupel, 2002). Many of the above mentioned reference samples, from which classic ageing techniques have been developed, consist mainly of young and middle adults, making it difficult to tackle this problem. Documented samples with an adequate number of older individuals are needed to enable research focused on the development of appropriate techniques for estimating their age, thus contributing to the solution of this pervasive problem of forensic anthropology and bioarchaeology.

In this context, the aim of the Chacarita Research Project is the creation and study of an osteological reference collection representative of the contemporary population characteristics of Buenos Aires city. The first and ongoing stage of the project consists in the creation of a documented sample of

adult skeletons, with an even sex and age distribution and an adequate sample size for statistical analysis, composed exclusively of individuals of known nationality, sex, age, date and cause of death. A particular characteristic of the Chacarita Collection is that recovery takes place under carefully controlled conditions with skeletons exhumed by our research team using archaeological techniques (see below). In the short term, the osteological study of this collection will allow us to assess the validity of the application of classical methods of sex determination and age-at-death estimation in a local setting. It will also allow the evaluation of the performance of more recently developed alternative methods used when classical variables are not available. Particular importance will be given to the study of osteological changes in individuals over 50 years, since the methods of age estimation available today often yield highly inaccurate results for those age ranges. As the collection is being formed via the exhumation of each skeleton, a series of taphonomic variables and their impact on the most diagnostic bone structures for estimating sex and age are also being considered and assessed. Finally, in the long term, this osteological collection will be available to generate new population-specific techniques, and to develop comparative biological studies.

All the activities described are being carried out in the Public Cemetery of Chacarita (Buenos Aires city). A formal agreement is being written among the Direction of this institution, members of the research team and scholars from the Faculty of Medicine (University of Buenos Aires) and the Forensic Anthropology Service of the Forensic Medical Corps of the National Ministry of Justice (*Cuerpo Médico Forense del Poder Judicial de la Nación*). In the remainder of this paper we present the recovery and analysis protocol, the current composition of the collection, the storage and information management policy and the ethical aspects of the project.

Materials and methods

The activities are divided into two stages. The first stage is being developed since the beginning of the project in September 2006 and focuses on the formation and conservation of the osteological collection, while the second will focus on the protocol analysis (testing of methods and development of new ones).

First stage: generation of the reference collection

The collection is made of unclaimed skeletons from the Chacarita Cemetery exhumed by the research team. The fundamental criterion in the selection of the individuals for exhumation is that they have been freed to be moved to the general ossuary of the cemetery either by the specific request of their relatives, or due to the expiration of the pit use rights in the case of unclaimed skeletons. Other important criteria considered are the availability of death certificates with all the required information (name, age, date and cause of death, nationality) and the accuracy of age and sex information, directly derived from the National Identity Document. Exhumation of skeletons whose age has been estimated at autopsy from the external characteristics of the body is avoided. From the administrative point of view, death certificates for those in tombs to be exhumed are provided by the Graves Section of the Chacarita Cemetery. This section authorises the transfer of remains for analysis in accordance with current regulations and the convenience of the cemetery (see Legal framework section). Time elapsed from the moment of inhumation is also considered to ensure a complete or almost complete skeletonisation of the corpse and a relatively good state of preservation of the remains.

The exhumation methods follow the basics of archaeological excavation protocol: location of the grave, removal of sediment, excavation and retrieval of the skeleton, written and graphic (drawings and photographs) recording of the entire process, soil sampling, *etc.* The extraction of the sediments above the exhumed body (approximately 2 m³ per grave) is carried out with the collaboration of cemetery staff. The archaeological excavation is conducted by a team of specialists directed by the authors, using trowels, wooden sticks and brushes of various sizes, to minimise the deterioration of the remains. During the exhumation, taphonomic information is recorded and samples of sediments are taken from different parts of the pit. Each skeleton is assigned a unique identifying code. At the time of extraction, bones are classified by anatomical portion in labelled paper bags, marked with the

Table 1
Sex and age distribution of the Chacarita Collection.

Age interval (years)	Females		Males		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
21–30	0	0	2	1.37	2	1.37
31–40	4	2.74	10	6.85	14	9.59
41–50	2	1.37	10	6.85	12	8.22
51–60	4	2.74	14	9.59	18	12.33
61–70	7	4.79	15	10.27	22	15.07
71–80	13	8.90	21	14.38	34	23.29
81–90	23	15.75	11	7.53	34	23.29
91–100	7	4.79	3	2.05	10	6.85
Total	60	41.10	86	58.90	146	100

identifying code of the skeleton, the number of the tomb and the exhumation date. Every skeleton is packaged separately in a cardboard box.

The initial laboratory activity consists in the cleaning and restoration of each skeleton (see Conservation of the reference collection section).

Subsequently, a detailed inventory of each skeleton is produced, with a description of the elements present, their state of preservation and fragmentation. After compilation of the inventory, a graphic record that includes photographs and sketches of both the complete skeleton and particular bones is made. Finally, these data are included in a general database, which offers information of the overall sample size as well as of the specific size (and degree of integrity) of the subsample of available anatomical parts needed for each method to be tested. The management and access to this database is exclusive to members of this research team and personal data of individuals exhumed are not divulged in any instance of the work process (see Ethics section).

The first goal of the project was to reach a threshold 150 skeletons, exhumed and restored before moving to the second stage of the project, as we considered this to be the minimum sample size to allow for statistical treatment of the collection. So far, a total of 159 adult skeletons were recovered from different sectors of the cemetery. Of these, 146 (60 females – 41.1% and 86 males – 58.90%) have complete and reliable information about sex, age, nationality, cause and year of death. Sex and age composition of the Chacarita Collection to date is shown in Table 1.

Table 2 provides descriptive statistics for these data. To be noted are the higher frequencies of individuals between 71 and 90 years of age for both sexes and the fact that frequencies of women are lower for all age categories up to 80 years old, and higher only after that age. The year of death of these individuals ranges from 1987 to 2000. In most cases ($n = 116$; 79.45%), the cause of death reported in the death certificate is cardiopulmonary arrest, unrelated to trauma. This is followed in frequency by death due to acute pulmonary oedema ($n = 10$; 6.85%), traumatic lesions of different kinds ($n = 9$; 6.16%), including internal bleeding secondary to extensive trauma, asphyxiation and weapon injuries, and other causes ($n = 5$; 3.42%) such as carcinoma, pulmonary infection and cerebral bleeding unrelated to trauma. Finally, in 4.11% of the cases ($n = 6$), the cause of death could not be determined for different reasons, the most common of which was extensive decomposition of the body at the time it was found and buried. Individuals exhumed were born primarily in Argentina ($n = 133$; 91.1%), although the sample also includes individuals from Italy ($n = 5$; 3.42%), Uruguay ($n = 2$; 1.37%), Austria,

Table 2
Descriptive statistics for the Chacarita Collection.

Descriptive statistics (ages in years)	Females ($n = 60$)	Males ($n = 86$)	Total ($n = 146$)
Median age	80	65	72
Mean age	75.94	62.85	68.23
Standard deviation	15.66	17.43	17.82
Minimum age	32	24	24
Maximum age	96	92	96

Bolivia, Spain, Poland, Taiwan and Turkey ($n = 1$; 0.68% for each country). This is expected given the significant process of immigration which occurred in Argentina during the last decades, mainly from neighbouring countries, Asia and Central Europe.

The demographic characteristics of the sample are currently being compared with the demographic information available for Buenos Aires city using the data of the national censuses of 1991 and 2001 carried out by the National Institute of Censuses and Statistics (*Instituto Nacional de Estadísticas y Censos*; INDEC, 1991, 2001). Preliminary results show a general agreement between the sample information and these data sets, especially regarding the ratio between native and foreign population and the sex ratios of adults over 65 years. However, in order to deepen the analysis and present quantitative results further data, particularly mortality data, are still required.

Also underway are further studies of the preservation and taphonomic agents and processes affecting the integrity of the sample (Kulloock et al., 2009, 2010; Luna et al., *in press*). In this sense, it is important to point out that although, on the whole, the collection shows a good state of preservation, there is variation both between skeletons and between anatomical regions within a skeleton. Inventories showing the integrity and completeness of each skeleton, and the degree of preservation and fragmentation of each bone are currently being made. This will allow the selection of specific individuals that fulfil the integrity requirements for each of the analysis proposed in the second stage of the project. In parallel with these analyses, exhumation activities will continue in order to increase the size of the reference collection.

Finally, it is worth mentioning that, as the remainder 13 adult skeletons (nine males and four females) have incomplete information, it was decided to curate them (following the same protocols used in the whole collection) for teaching purposes only.

Second stage: analysis of the reference collection

The second phase of the project includes the testing of different methods for determining sex and estimating age-at-death in this reference collection. First, the most traditional and commonly used methods will be tested; in the second instance, more recently developed and alternative methods will be evaluated. In all cases, inter- and intra-observer error during documentation of the variables will be taken into account.

When evaluating sex determination techniques, the performance of both morphological (*i.e.* Acsádi and Nemeskéri, 1970; Bruzek, 2002; Buikstra and Ubelaker, 1994; Ferembach et al., 1980; Phenice, 1969) and metric (*i.e.* Krogman, 1962; Schuller-Ellis et al., 1983; Thieme, 1957; Washburn, 1948) methods for the hip bones and the skull will be studied. For the estimation of age-at-death from the skeleton and the dentition, the techniques tested will take into account morphological changes of different anatomical regions, such as the pubic symphysis (*i.e.* Katz and Suchey, 1986, 1989; Gilbert and McKern, 1973; McKern and Stewart, 1957; Suchey and Katz, 1998; Suchey et al., 1986; Todd, 1921a,b) and the auricular surface of hip bones (*i.e.* Bluckberry and Chamberlain, 2002; Igarashi et al., 2005; Lovejoy et al., 1985; Meindl and Lovejoy, 1989), skull sutures (*i.e.* Meindl and Lovejoy, 1985), the first rib (Kunos et al., 1999) and the costo-sternal epiphysis of the fourth rib (İşcan, 1989; İşcan et al., 1987; Loth and İşcan, 1989). The performance of ageing methods that consider changes in dental and periodontal tissues, such as the transparency of the root apex, degree of periodontal retraction and pulp chamber dimensions of uniradicular teeth (Drusini et al., 1991; Ermenc, 1997; Foti et al., 2001; Kvaal and Solheim, 1994; Lamendin et al., 1992; Megyesi et al., 2006; Prince and Ubelaker, 2002; Solheim, 1989; Xiaohu et al., 1991), will also be assessed.

Conservation of the reference collection

From the moment of exhumation, conservation and storage measures are taken to ensure a respectful treatment of the remains and to create and maintain a protective environment for the collection (ICOM, 2006; Walker, 2000).

First of all, each skeleton is individually treated on a single working-table, specially designed for the study of osteological remains, to avoid any loss or mixing of bones and teeth. The main objective is the stabilisation of each element. All preservation procedures are documented and reversible as

far as possible (ICOM, 2006; Walker, 2000). The first step of the conservation process consists of cleaning the bones with soft brushes to remove adhering sediment and other substances (soft tissues, metallic fragments, etc.). Subsequently, bones are carefully washed and rinsed under running water with soft brushes. No other substance is used for cleaning because future research projects may require chemical analyses, and in such case the biological and mineral content of the bones have to be intact. In the case of incompletely skeletonised remains, they are treated with an enzyme-active powdered detergent specifically designed to remove soft tissue from bone without altering its chemical structure (Tergazyme®). In all instances, during the cleaning process protective gloves and masks are used (Galloway and Snodgrass, 1998).

After cleaning, the remains are left to dry on absorbent paper for at least a week to prevent the formation of fungi and ensure complete drying. Once dried, each fragment of bone is labelled with the unique identifying code of the skeleton using a fine-point permanent ink marker. Postmortem fractured bones that can be reassembled are glued back together, using a silicone glue gun. Finally, all packing bags are replaced, and each box is stored on specially designed shelves, on which no more than two boxes can be stacked.

Regulatory and ethical aspects

Legal framework

The basic, *sine qua non*, criterion for the incorporation of human remains in the reference collection is that they have to be under the legal guardianship of the Chacarita Cemetery, which is the one that donates the remains to the project. The legal framework for this process is included in the articles of the Ordinance Number 27590 (AD 480.1; BM 14.537) of the Government of Buenos Aires City (MCBA, 1973) that stipulate the procedure for the removal and disposal of human remains from the graves after use-rights have expired, usually after a period of 3–5 years, depending on the age of the deceased. Specifically, the transfer of rights to the cemetery occurs in one of two ways: either explicitly, when the relatives responsible for the remains disclaim any right to dispose of them, or implicitly when, after several notifications to the families of the expiration of the grave use-rights, they fail to respond, leaving the remains automatically under the custody of the cemetery. In this latter case, it is worth noting that the institution previously sends letters on several occasions informing them of the expiration of the lease and publishes edicts for a term of five consecutive days in the Municipal Bulletin and in a wide-circulation newspaper of the city, ordering the removal of the remains. Given the fact that, at the time of the lease signature, the full procedure is communicated to the families, it is considered that the relatives do not answer because they do not wish to hold the contractual relationship with the cemetery. Thus, the institution comes to the legal right to dispose of both the space of inhumation and the exhumed remains. In either case, it is the cemetery which ultimately owns the rights to dispose of the skeletal remains and to cede them to their incorporation in the reference collection. However, if any legitimate and legal claim on a skeleton by the cemetery authorities (or persons who would show the right to have such claim) arises, the remains would be immediately returned to the care of the cemetery.

Ethics

Ethical issues considered in this project are consistent with the tenet goals of the American Board of Forensic Anthropology; one of its main objectives is “to encourage and promote adherence to high standards of ethics, conduct, and professional practice in forensic anthropology” (ABFA, 2011:3). The project also follows the general spirit of the Latin American Association of Forensic Anthropology, whose main goal is “to establish ethical and professional standards for the practice of forensic anthropology to ensure its quality and scientific independence” (ALAF, 2011; translation by the authors). This institution also holds that the scientific study of human biological remains is of interest to all humanity, regardless of nationality, origin, social status, creed, etc., and that it cannot be replaced by any other scientific and nonscientific approaches to the history of our species (ALAF, 2011).

In this context, this project is based on the same fundamental ethical statements as above. The most important is that the creation and study of a reference collection must be based on a general social need to promote the common good, and must be used for scientific purposes only. It is also an essential premise that human remains at large, and those included in this collection in particular, should be treated prioritising their dignity and respect (ICOM, 2006; Declaration of Helsinki, 2008; Ubelaker and Grant, 1989). Respectful treatment involves taking all necessary measures to ensure the identity and physical integrity of the remains, as well as the full documentation associated with them. In this sense, as stated before, only those remains that meet all necessary regulatory requirements are included in the collection. Finally, it is important to highlight that the creation and anthropological study of any osteological collection is a long term project, so the conservation and availability of the sample must be ensured for future scientific research (Walker, 2000; AAPA, 2003).

Consistent with all these aspects, this project has been evaluated and approved by the Committee on Bioethics of the Centre of Medical Education and Clinical Investigations (CEMIC; *Centro de Educación Médica e Investigaciones Clínicas*) of the City of Buenos Aires in July 2009. Moreover, all the activities of the project are scientifically and ethically endorsed by the following institutions: Chair of Legal Medicine and Institute of Anatomy and Morphology J. J. Naón and the Chair of Anatomy, both belonging to the Faculty of Medicine (University of Buenos Aires), and Argentine Forensic Anthropology Team (EAAF, *Equipo Argentino de Antropología Forense*).

The collection will remain in the laboratory located in the Chacarita Cemetery, which is a special facility granted by the Cemetery authorities only for the project, thus ensuring the safekeeping and adequate management of the collection.

Information management

The skeletal remains, labelled with the corresponding identifying codes, are separately stored from the folders that contain their corresponding death certificates and any additional graphic and written documentation available for each case. Thus, each individual can be easily identified, but both sets of information always remain dissociated. Following the recommendations of the ICOM (2006), the documentation includes the full identification and description of each item, its provenance, condition, state of preservation, treatment of conservation and present location. These data are kept in a safe place, and a search system for personnel and other legitimate users to consult is being developed.

In accordance with Article 11 of the Declaration of Helsinki (2008), at all levels of research and publication of results, personal data (name, sex, age, residence, cause and date of death, etc.) of each skeleton remain completely confidential. Only the members of the research team have access to the full database. At this point it should be noted that as the main focus of this research project is on population studies and not a specific case study, the relevant information for analyses relates primarily to sex and age, cause of death, etc. of groups of individuals. Thus, the information will be treated together, forming specific age and sex subgroups depending on the particular analysis, and in such way it will be treated in presentation of the results at scientific meetings and publications. In the long term, if the sample is available for research by other scholars, they will be trusted to proceed in the same manner, managing the confidential personal information in a way that ensures compliance of confidentiality and security protocols (ICOM, 2006; Walsh-Haney and Lieberman, 2005; Warren et al., 2000).

Expected results

The Chacarita Project is a long-term project planned to last at least a decade. The project is being carried out by a multidisciplinary team composed of scholars trained in forensic medicine, biological and forensic anthropology and archaeology under the direction of the authors of this paper. Particular attention is being paid to training students in forensic anthropology, seeking thereby to contribute to the development of the discipline in Argentina from the perspective of practical research and to ensure continuity, growth and eventual diversification of the project.

In the short term, it is expected that the development of the Chacarita Project will help deepen available knowledge of skeletal characteristics of the contemporary population of Buenos Aires, thus contributing to local forensic investigations regarding accuracy of results concerning sex and age. The

evaluation of different sexing and ageing techniques, commonly used in forensic analyses worldwide, on a collection that has other population characteristics than the original sample from which they were created, will help to identify those techniques and methods best suited to provide reliable and accurate results in the local context. In the long term, the Chacarita Collection will enable the design and development of new methods for sex determination and age-at-death estimation, specific to the local population profile. It is also expected that the age composition of the sample, abundant in middle and older adults, will help address the difficult issue of ageing older individuals using skeletal and dental markers. The specific characteristics of the sample will also allow for other lines of research to be pursued, such as the study of pathology, especially those conditions related to old age.

Finally, there is an explicit interest in maximising the state of preservation of the reference sample, by having control not only of conservation procedures but also of exhumation and retrieval of each skeleton. As noted before, valuable information regarding the taphonomic agents that affect preservation in this kind of setting is also being generated and analysed and the first results of these studies have recently been published (Luna et al., *in press*).

As stated at the beginning of this paper, the need for documented reference samples for the development of adequate methods in forensic and biological anthropology has long been recognised. However, it has not been until the last few years that this need has begun to be fulfilled in Argentina. We trust that along with other similar local endeavours, the Chacarita Project will help enhance the possibilities of conducting basic research in these disciplines in our country.

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