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The Scientific Profiles of Documented Collections via Publication Data: Past, Present, and Future Directions in Forensic Anthropology

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Abstract: Human osteological documented collections (DCs), also referred to as "identified collections", are a valuable resource in biological and forensic anthropology, as they offer the possibility for hypothesis-driven research on sex and age-at-death estimation methods, human variability, and other morphometric-based parameters of individual identification. Consequently, they feature in many publications addressing the forensic sciences. The paper aims to explore the scientific profiles of DCs via publication using bibliometric data. The Dimensions databases were used to select the DC-related keywords in the title and abstracts of the publications. The search result analysis and extraction were conducted using VOSviewer. A total of 376 articles were found, published between 1969 and 2021 (November). The number of publications has increased over the years, specifically after 2011. The results show that most of the publications are associated with countries such as the United States and Portugal (the latter highlights the University of Coimbra), that the research tends to focus on human biological profiling (e.g., age, sex assessments), and that the journals with the highest numbers of publications were related to forensic sciences. This analysis shows a positive correlation between DC publications and the growth of forensic anthropology in recent years, with a slight shift towards the leading institutions that publish DC-based research. Hence, we can anticipate a change in the institutional leading profiles in the years to come.

Keywords: identified skeletal collections; human skeleton; bibliometric data; research networks; ethics

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1. Introduction

The early years of the 21st century gave rise to a more visible forensic anthropology, not only in academia, but also in society. This visibility may, in part, be a consequence of the "CSI effect", which highlights how popular culture has permeated forensic research in general, and forensic anthropology in particular [1–4]. Forensic anthropology courses within universities have grown, with scholars and universities worldwide investing and promoting programs on the study of human remains, with a stress on forensic anthropology. This wave of popularity has already been acknowledged by some well-known forensic scientists [5–8]. In this aftermath, we also observe a growing interest in the creation and curation of human osteological documented collections (DC), and the research development associated with, and about, these collections. The term "documented collections" is used here as a reference to human osteological identified collections, which are collections composed not only of human osteological remains, but also of biographical information and other associated data; thus, they are composed of "documented" human remains.

In 2018, Henderson and Alves-Cardoso edited the book, *Identified Skeletal Collections: The testing ground of anthropology*? [9]. The book's contributors not only highlighted the significance of human osteological collections in anthropological knowledge production, but, most importantly, also emphasized the limitations and ethical and legal issues related to the assemblage and creation of human identified osteological collections. This book provides various accounts on the histories of known identified collections (e.g., the Raymond A. Dart Skeletal Collection, the Pretoria Bone Collection, the Robert J. Terry Anatomical Skeletal Collection, and Portuguese Identified Collections), their genesis, and their associated limitations, including any significant biases that may hinder research. These biases include: time biases (related to collection chronologies), geographical biases, sample age and sex biases due to self-reported biographical data, sample composition biases, and even sociocultural biases, among others (for details, see [9]). Since then, other papers have offered an overview of identified collections (henceforth, "documented collections" (DC)), referring, en passant, to some of the abovementioned limitations, but placing the emphasis on the "why" of building such collections, as well as on their importance for scientific development, with a focus on the understanding of human variability and the production of representative samples [10–12]. To address human variability was, and is, to oppose the oversimplification and continental classification of humans, as practiced since the 19th century, thereby promoting a much needed new and non-racialized paradigm in the assessment of humans [13,14]. Aligned with the focus on a variability approach to human diversity is the argument of scientific proficiency. The larger and more diverse the sample sizes used in the hypothesis testing of biological profiling, the more feasible and accredited are the outputs (see Obertová et al., 2020, on statistics and probability in forensic anthropology [15]). However, it is also important to stress that, to infer a person's uniqueness, with the aim of positive identification in forensic anthropology, is to deviate from the praxis of exploring and sanctioning human variability via its statistical quantification and scientific validity. Often enough, a statistical significance is not sufficient to offer exact results, and a correlation is not necessarily an indicator of causation. Hence, we argue that the rigorous statistical approaches allowed by DC research also need to be revisited.

The aim of the current paper is to move beyond the focus of summarizing collection profiles worldwide; the importance of this has already been established by some authors [9–12]. One of the most recent attempts at data systematization from the collections worldwide is associated with the Forensic Anthropology Society of Europe (FASE) [10]. This technical note introduces a significant number of documented collections, incrementing past publication data (e.g., Santos had reported only 54 collections in 2019 [12], and, in 2020, Franklin and Blau had reported 72 collections [16]). Petaros and colleagues [10] report the existence of 153 collections from 41 countries, of which 43 are categorized as "contemporary", 55 as "noncontemporary", and 55 as collections of "uncertain temporal status". There is an effort to offer an interactive map, with collection locations and information, which is designed to be continuously updated, and, hence, is a valuable tool for those doing research. However, the authors also recognize some of its limitations, as " . . . for about a quarter of the collections, the data are either not retrievable or incomplete" (p. 4 of [15]). Furthermore, the collections listed are not limited to documented collections, as some are of archaeological provenance and are without biographical data associated with the individuals. Hence, although it is a very worthy research tool, data collection and systematization are still ongoing—and will be ongoing indefinitely—since collections are continuously being built and updated [17–20].

Moving beyond the mere profiling of the collections worldwide, this paper quantifies the knowledge production, and the impact, on the research developed with, and about, DCs, framing its content within the growing ethical and legal concerns related to the acquisition and use of human remains in research and teaching [21,22]. This will be carried out via published articles. Note that this paper is not an exhaustive summary of all of the published academic work conducted with and about DCs; i.e., it does not focus on all of the available peer-reviewed literature databases (e.g., Web of Knowledge, Scopus, and

Dimension). Moreover, it does not aggregate data from masters' and doctorate theses that remain unpublished (known as "grey" literature). Furthermore, the additional amount of research that circulates in conferences—not finding its way into academic journals—was not systematized or addressed. Furthermore, online "working papers" on academic platforms, such as Academia.edu, ResearchGate, and Zonedo, were also not aggregated. Regardless, the information considered in this paper is illustrative of the amount of research being performed and based on DCs, and its contribution to scientific development, specifically within forensic anthropology. This paper is organized as follows: (1) The profiling of publications on/and related to DCs; and (2) The profiling of the locations, chronologies, and the ethical and legal considerations associated with a few selected DCs. This approach is overarching, addressing major DC-related research and contributions. The selection of a few publications on DCs allows us to explore how the collections were built, and to gather information on some of the ethical and legal issues associated with the access to, and the use of, human remains in research, with an emphasis on the need for discussion.

2. Materials and Methodological Approach

The dataset used in this analysis was retrieved from the Dimensions database. Dimensions (accessed 19 November 2021: https://www.dimensions.ai/) allows access to millions of research publications with citation information, making multiple comparisons possible. The methodological approach to search for publications related to documented collections included the formulation of a Boolean query used to search titles and abstracts, with no data restriction. The query used was: "Identified Skeletal Collection" OR "Identified Collection" OR "Human Documented Collection" OR "Documented Collection" OR "Osteological Collection of Identified" OR "Documented Human Osteological Collection" OR "Skeletal Reference Collection" OR "Identified Human Skeletons" OR "Documented Human Skeletal Collection" OR "Human Skeletal Reference Collection" OR "Collection of Laboratorial Burned Human Skeletons" OR "Bone Collection" OR "Contemporary Italian Skeletal Collection" OR "Collections Ostéologiques Humaines Identifiées" OR "Colecções Humanas Identificadas" OR "Contemporary Colombian Skeletal Reference Collection". This search string was designed to be inclusive, multilingual (English, French, Portuguese), and focused on the collections, with the aim of including all relevant outputs, at the risk of introducing false positives (e.g., a publication with keywords such as "identified collection" not related to human collections). For this reason, the dataset collected was preprocessed with the aim of excluding "false positives".

The dataset analysis first focused on an overall assessment of the data, without journal titles and/or date of publication restrictions. This first approach to the data allowed us to identify the major networking research institutions and journals, how they relate to each other, and whether changes could be observed on the basis of the publication dates. It also identified the major research trends, and whether these were constant. Following the overall analysis, the journals with more publications—the TOP4 journals—were analyzed, with the intention of assessing whether the results agreed with the overall dataset assessment. This second analysis comprised only publications between 2010 and 2021, the last decade of DC-related research. The VOSviewer software was used to explore co-occurring networks of research collaborations between countries, as well as citation co-occurrences [23]. The VOSviewer text-mining functionality was used to analyze the terms employed in the titles and abstracts, providing insight into the main topics and research trends over the years, while also offering a visualization of the terminology network. A third set of analyses focused on papers that provide detailed collection descriptions with a focus on their origin, the provenance of the human remains, the chronology of the human remains, the data on death and the exhumation/acquisition of the remains, reference to ethical issues associated legislation, as well as other information that could help with the contextualization of the DCs.

3. Results and Discussion

3.1. Publications Outputs and Trends

The number of peer-reviewed publications is a measurable indicator of the development of a discipline. The Dimensions database search identified 376 papers related to DC research, published between the years 1969 and 2021 (November). As stated in the methodology section, this number of papers does not constitute the full body of work conducted on the documented collections worldwide. Nonetheless, it allows us to explore the research trends, the cooperation between countries and institutions, and the research impact on the basis of the citation information. The 376 papers were distributed in 92 journals, with 24 journals comprising 78.5% of the publications ($n \geq 3$ papers per publication, totaling 295 papers). The remaining journals (n = 68, 21.5% of the papers) accounted for the residual papers, with one or two publications per journal (n = 81, details may be found in the Supplementary Data, Table S1). From 2008 onwards, the number of publications steadily increased, with substantial growth from 2013, and from 2019 onwards (Figure 1). The journals with more publications were associated with forensic science research, except for the *American Journal of Physical Anthropology* (n = 42) (recently named: the *American Journal of Biological Anthropology*). The *American Journal of Physical Anthropology* has been a pillar in anthropological research at large, including biological and forensic anthropology, and has been published since 1918. The top three journals with papers related to forensic sciences were the *Forensic Science International* (n = 64), the *International Journal of Legal Medicine* (n = 39), and the *Journal of Forensic Sciences* (n = 21). These results are clear inklings of the rise in the interest in forensics in recent years, as well as of the contributions that DCs have made to research development and the associated publications.

Journal Title	Frequency	Percent
Forensic Science International	64	17.02
American Journal of Physical Anthropology	42	11.17
International Journal of Legal Medicine	39	10.37
Journal of Forensic Sciences	21	5.59
International Journal of Osteoarchaeology	19	5.05
Homo	15	3.99
Otology & Neurotology	10	2.66
Books / others	8	2.13
Anthropologischer Anzeiger	8	2.13
Antropologia Portuguesa	8	2.13
International Journal of Paleopathology	7	1.86
La Revue de Médecine Légale	6	1.60
The Laryngoscope	6	1.60
Annals of Otology Rhinology & Laryngology	5	1.33
Legal Medicine	5	1.33
American Journal of Human Biology	4	1.06
European Archives of Oto-Rhino-Laryngology	4	1.06
International Journal of Morphology	4	1.06
Journal of Forensic and Legal Medicine	4	1.06
Science & Justice	4	1.06
Annals of Anatomy - Anatomischer Anzeiger	3	0.80
Australian Journal of Forensic Sciences	3	0.80
Human Biology	3	0.80
PLOS ONE	3	0.80
[Remaining Journals]	2 or 1 publications	21.54

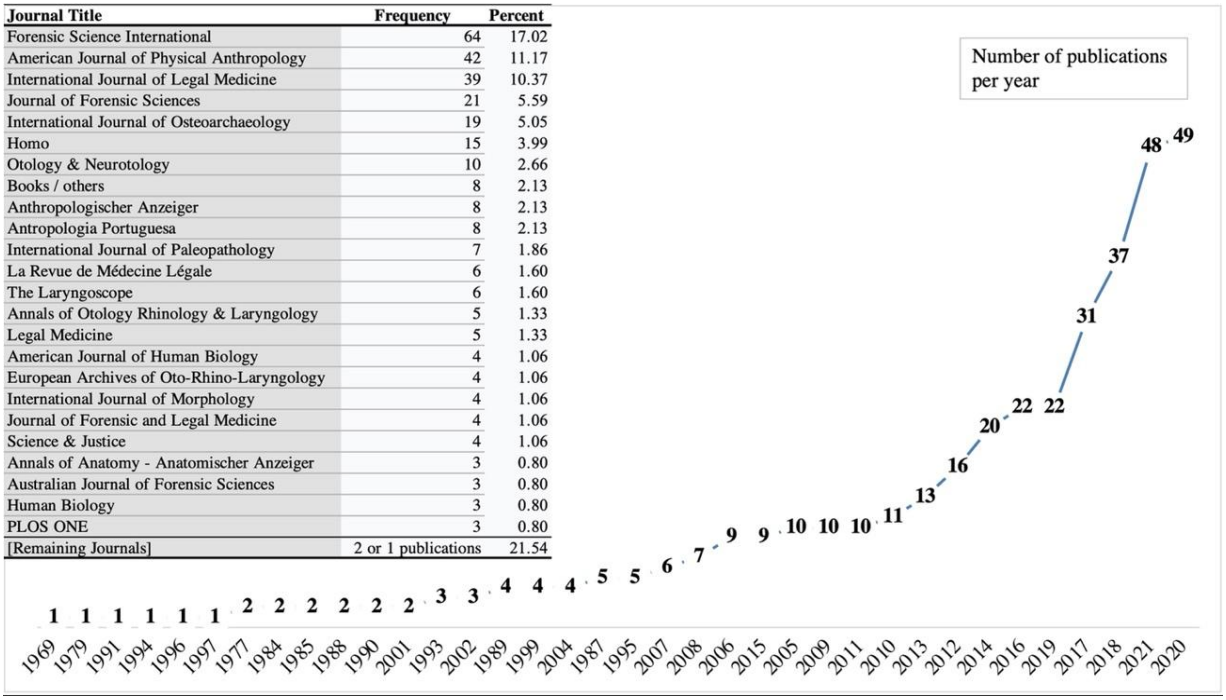


Figure 1. The graph (**right**) illustrates the numbers of publications related to documented collections per year. The table (**left**) shows the distributions of the publications per academic journal.

The oldest publications of the dataset on DCs address Wittmaack's temporal bone collection [24], the human osteological collection at the Department of Human Anatomy, the University of Torino, Italy [25], as well as the data on human collections from the Institute of Forensic Medicine and Criminology, Karl Marx University, Leipzig [26] (to name but a few). Overall, the most cited collections are the Portuguese Identified Collections, specifically those housed at Coimbra University. Either alone, or in co-authorship systems,

the Portuguese collections feature heavily in the published literature (to be discussed below).

3.1.1. Geographical and Institutional Research Cooperation

Each publication is assigned to at least a country and a research institution, on the basis of the authors' affiliations. A co-authorship analysis, per country—considering a minimum of three shared papers per country—highlights a functioning network that heavily depends on international collaborative work (Figure 2). Of the total of 54 countries linked to a publication, 29 were interlinked via publications and were aggregated into four major clusters of research collaboration (red, blue, light green, and dark green). The node size is proportional to the number of documents co-authored by each country, and the lines represent the collaborations and networking of the countries.

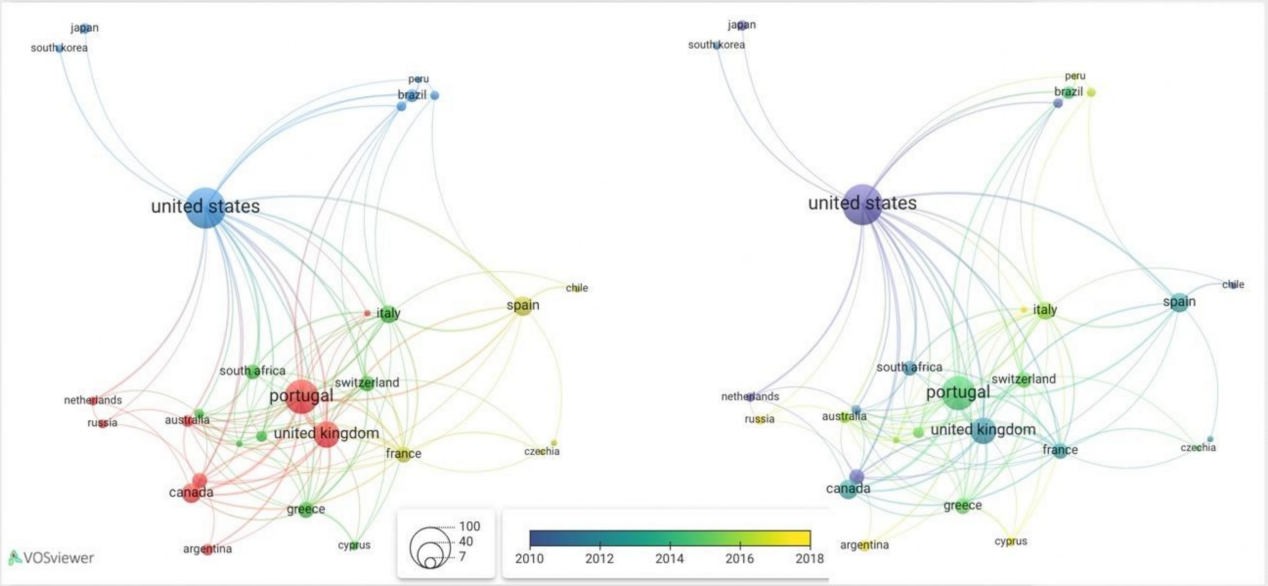


Figure 2. The figure shows the cooperation networks between countries (**left side**), and the average numbers of publications per year, per country/cluster network (**right side**). Four major clusters were identified (**left side**): red, blue, light green, and dark green (you can zoom in on the visualization map here: https://sites.google.com/view/francisca-alves-cardoso/research-profile/projects/bodiprint/article-si/figure-2?authuser=0, accessed on: 20 November 2021).

The United States, Portugal, the United Kingdom, and Canada have higher numbers of collaborative papers, with overlapping research. If we focus on the average projection of papers per year, the majority of the publication networks are geographically dispersed, aggregating not only in countries that have contributed a higher number of publications in the past (circa 2014) (e.g., the United States, Portugal, and United Kingdom), but also in new countries, especially from 2014 onwards (e.g., Argentina, Cyprus, Russia, and Italy). This is in line with the development of newer DCs worldwide, and with the growth of forensic anthropology in countries that were not mainstream in the field. For example, the constitution of the FASE (the Forensic Anthropology Society of Europe), in 2003, is a clear indicator of the rise of the forensic anthropology profile in Europe, allowing for a greater visibility in a higher number of countries. The inclusion of wider collaborative networks is well expressed in Figure 1, with a shift from the United States as an aggregating country from the early 21st century, to new countries, such as Portugal, Greece, Italy, and Brazil, from mid-2014 onwards. The networking fluctuation expresses the collaborative entanglements of DC-related research worldwide.

The visualization of the networking of the research centers highlights a total of 381 organizations, with 63 sharing at least one publication (Figure 3). A total of five

clusters emerged, with the University of Coimbra having a central spot. Some of the most cited organizations—and countries—are also those that house several identified human osteological collections, and that have a longstanding research profile on the study of human identified osteological remains. According to Petaros and colleagues [10], Portugal houses 8 collections, Italy houses 9, Spain houses 5, and the United States houses 33. In more recent years, research organizations with lower profiles (with regard to the publication networks) are gaining visibility and contributing to knowledge production, as is shown in Figure 3. This is indicative that newer research institutions, newer collaborative networks, and newer scholars are participating in research agendas and publications.

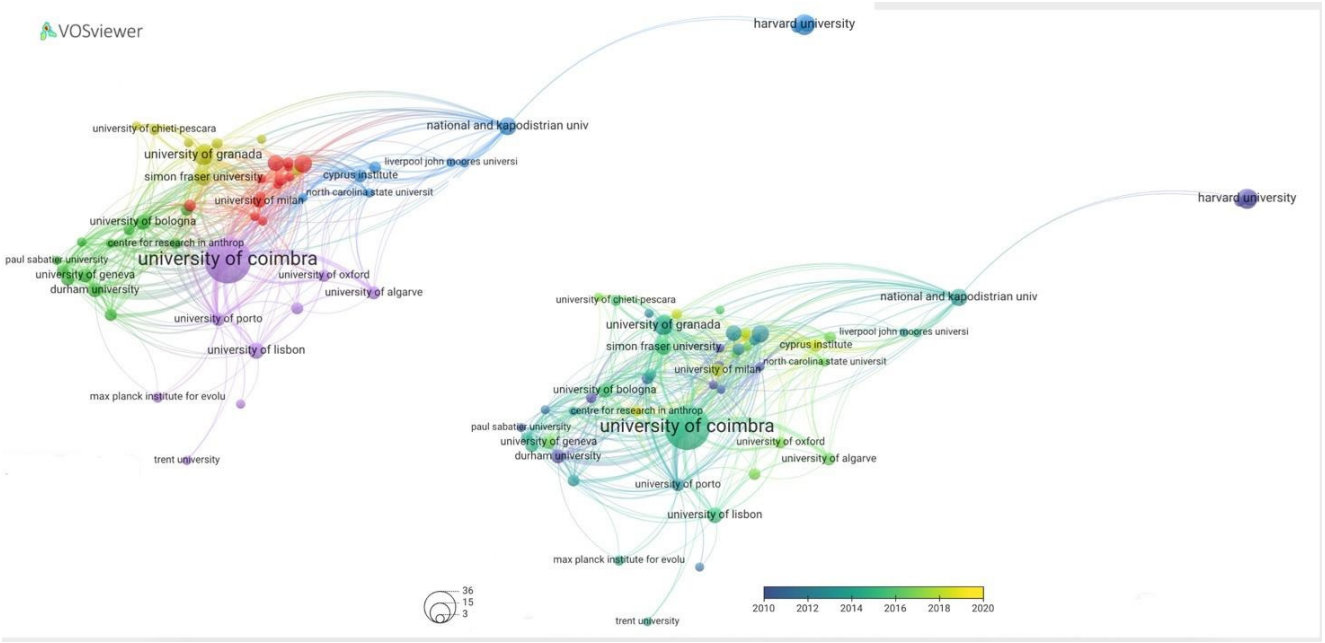


Figure 3. The figure shows the cooperation networks between research institutions (**top left**), and the average numbers of publications per year within these institutions (**bottom right**). Five major clusters were identified (**top left**): red, blue, light green, dark green, and purple, each aggregating different sets of countries, with a high level of connective networks overall (you can zoom in on the visualization map here: https://sites.google.com/view/francisca-alves-cardoso/research-profile/projects/bodiprint/article-si/figure-3?authuser=0, accessed on: 20 November 2021).

3.1.2. Research Topics and Term Analysis

The titles and abstracts of the papers were used to measure the research topic/term (word) networks. The search focused on words that appeared more than 10 times, either in the title or in the abstracts. A total of 105 terms were identified and were aggregated into six major clusters (Figure 4). The major research clusters gathered around topics of disease (green), sex profiling (red), anatomy/morphology (purple), and occupation (light blue). These results agree with the known use of DCs for the development of research-driven hypotheses on sex and age-at-death estimation methods, individual and population ancestry and variability, as well as behavior patterns and/or activity-related bone changes, as well as bone lesion correlation with the cause of death. Both the red and green clusters assemble the greatest numbers of publications. However, when the terms are analyzed according to the publication year, there is a clear shift towards biological profiling, and a distancing away from paleopathological analysis, with an emphasis on words such as "sex" and anatomy-related words, as well as the odd statistical terminology. This trend supports the relevance of statistically related research, stressing scientific rigor in hypothesis-testing research, and in sex and age-at-death estimation methods.

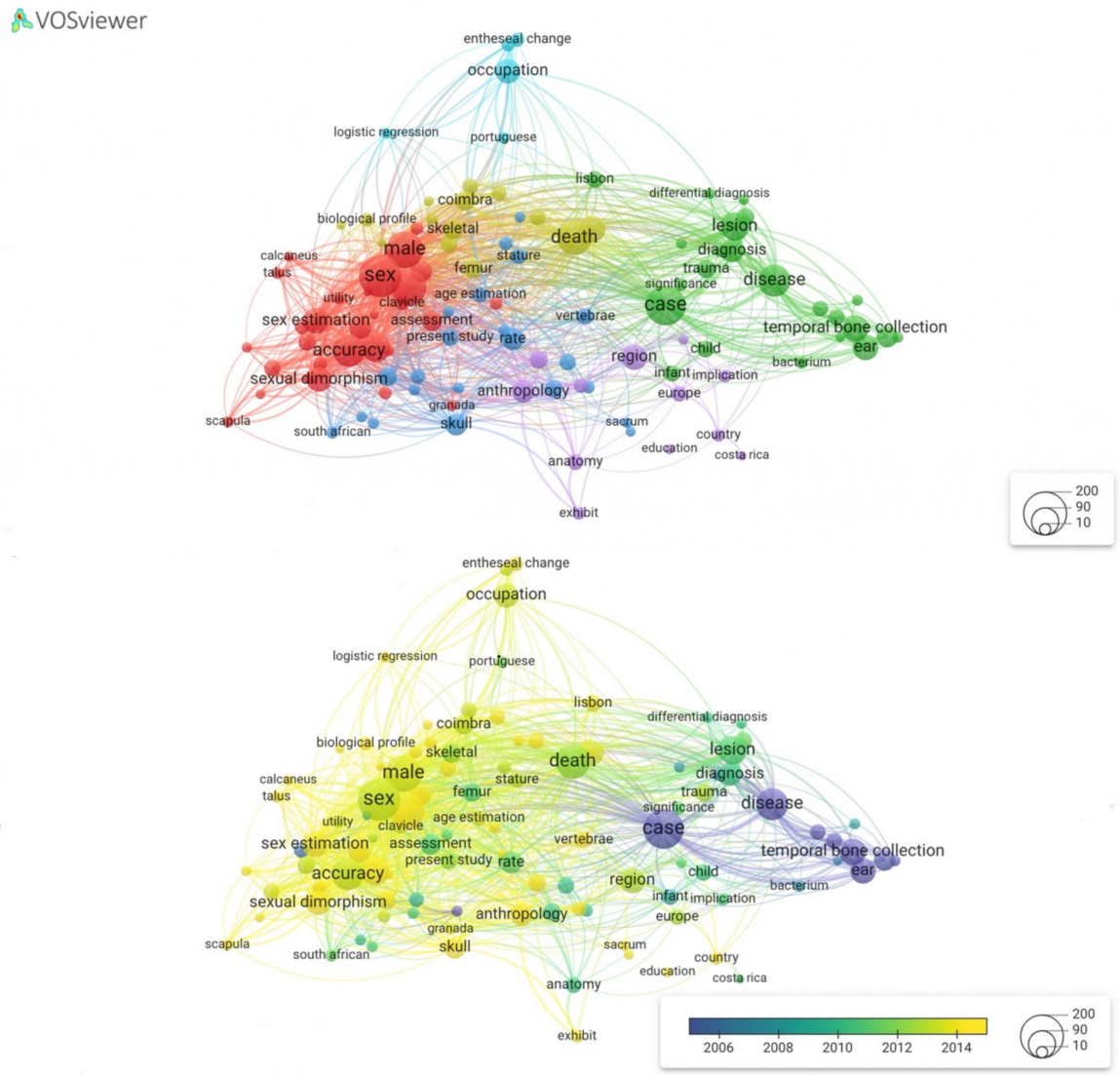


Figure 4. The figures show the relations between the most frequent terms used in the titles and abstracts of publications. Left map shows term association, identifying 6 clusters: red, light green, dark green, purple, light blue, and dark blue. The right map shows the averages of publications per year, per clustered terms (you can zoom in on the map visualization here: https://sites.google.com/view/francisca-alves-cardoso/research-profile/projects/bodiprint/article-si/figure-4?authuser=0, accessed on: 20 November 2021).

3.1.3. Citation Analysis and Co-Citation Analysis

Of the 376 papers, the average citation per article is 20.34. However, only 84 publications were cited over 20 times, and 86 publications have no citations. The year of publication varies between 1988 and 2021. If these (noncited publications) are excluded from the analysis, the average number of citations is 559.5. It is important to note that citation numbers do not necessarily reflect a publication's influence and/or notoriety, nor do they reflect the quality [27–29], and the cumulative effects of the years after the publication took place need to be taken into account. Moreover, citation numbers may reflect a specific paper's visibility, via its social media interests and influence. Another factor that may influence citations is the timing of publications, which is allied to the historical and cultural contexts. As an example, consider the number of publications and co-citations related to COVID-19. With this in mind, we complemented the citation analysis with the Altmetric Attention Score, which measures the attention given to papers via social media and other research outputs. On average, the altmetric score was 3.7. However, only 45 publications

have a score higher than 3, and 155 have no score at all. If the latter are excluded from the analysis, the average score is 38. Most papers with higher altmetric scores were published after 2012, reinforcing the idea that research visibility is allied to how academic papers permeate social media and nonacademic secondary sources of research outputs. Table 1 shows the five most cited publications, and the top five articles with the highest altmetric scores.

Table 1. TOP5 most cited papers, and TOP5 highest altmetric scores from the overall sample (n = 376).

Article Title (Most Cited)	Authors	Journal Title	Year of Publication	Citation Number *	Altmetric Attention Score *
Skeletal age determination based on the os pubis: A comparison of the Acsádi-Nemeskéri and Suchey-Brooks methods	Brooks and Suchey [30]	*Human Evolution*	1990	1118	7
Cochlear Pathology in Presbycusis	Schuknecht and Gacek [31]	*Annals of Otology, Rhinology, and Laryngology*	1993	546	6
Multichannel Cochlear Implants: Relation of Histopathology to Performance	Fayad and Linthicum [32]	*The Laryngoscope*	2006	176	
History and demographic composition of the Robert J. Terry anatomical collection	Hunt and Albanese [33]	*American Journal of Physical Anthropology*	2005	162	10
Enthesopathies as occupational stress markers: Evidence from the upper limb	Villotte et al. [34]	*American Journal of Physical Anthropology*	2009	158	4
Article Title (highest Altmetric Score)		**Journal Title**	**Year of Publication**	**Citation Number**	**Altmetric Attention Score**
The Ratón Pérez collection: Modern deciduous human teeth at the Centro Nacional de Investigación sobre la Evolución Humana (Burgos, Spain)	de Pinillos et al. [35]	*American Journal of Physical Anthropology*	2021	0	75
Distal Humerus Morphological Variation and Sex Estimation in Modern Thai Individuals	Tallman and Blanton [36]	*Journal of Forensic Sciences*	2019	5	44
Age estimation of immature human skeletal remains from mandibular and cranial bone dimensions in the postnatal period	Smith et al. [37]	*Forensic Science International*	2021	0	24
Decolonize this collection: Integrating black feminism and art to re-examine human skeletal remains in museums	Lans [39]	*Feminist Anthropology*	2020	3	20
A geometric morphometric approach to the study of sexual dimorphism in the modern human frontal bone	Del Bove et al. [38]	*American Journal of Physical Anthropology*	2020	1	17

* Citation and altmetric data were accessed via Dimensions, on 20 November 2021.

Of the TOP5 most cited papers, only one has a value above the average (559.5). The most cited paper is "Skeletal age determination based on the os pubis: A comparison of the Acsádi-Nemeskéri and Suchey-Brooks methods", by Brooks and Suchey. The paper has been cited 1118 times since its publication in 1990 [30]. This is a seminal paper on age-at-death assessment via the analysis of human osteological remains, and it serves as a basis for the incremental research on age at death that has taken place after its publication. This paper also reports on documented samples derived from modern individuals autopsied at the Office of the Chief Medical-Examiner, County of Los Angeles (California). The second and third most cited articles include research that is based on, and that uses, two distinctive temporal bone collections: the Human Temporal Bone Collection at the Massachusetts Eye and Ear, associated with Harvard University, and a temporal collection from the House Ear Institute (California) [31,32]. The fourth most cited article addresses the history

and composition of one of the most known and published documented collections: the Robert J. Terry anatomical collection [33]. The last most cited article explores activity-related entheseal changes using four DCs as testing samples: the Christ Church Spitalfields Collection at the British Museum of Natural History, London (UK); the Coimbra Identified Skeletal Collection, the University of Coimbra (Portugal); and the Sassari and Bologna collections of the Museum of Anthropology, the University of Bologna (Italy) [34]. These papers were published between 1990 and 2009. Their altmetric scores are well below the score average of 38.

When assessing the TOP5 articles on the basis of the altmetric scores, the absent or negligible citation scores are noteworthy. These are papers published in the years 2019/2021. The altmetric scores illustrate the relevance of social media and secondary sources or research to a given paper's visibility, and the importance of the social and cultural contexts when promoting research. Of the TOP5 papers, one introduces a new DC [35], and three papers address sex and age assessment estimations [36–38]. The paper with the highest score is mentioned in nine news stories and was tweeted 24 times. The other papers' altmetric profiles vary, with mentions in diverse news/social media outlets. The paper with the fourth highest score addresses a topic that is gaining momentum in academia and academic research on the basis of human remains, human collections, and ethics [39]. With #BlackLivesMatter, there has been a growing preoccupation with addressing the decolonization of museums and identified osteological collections, and a questioning of the scientific approach to vulnerable communities and to the acquisition of human remains, both in the past and in the present [40,41]. The paper was tweeted 27 times, mostly by members of the public, and the counts continue to grow, reflecting the public interest in this subject. The *American Journal of Physical Anthropology* is the only journal that features on both the TOP5 most cited and scored papers, perhaps because of its seniority and its inclusive profile, publishing articles in areas such as physical and biological anthropology, bioarcheology, paleoanthropology, skeletal biology, genetics, nonhuman primate behavior, and ecology, among others.

To complement the Table 1 information, a citation analysis was undertaken to explore the relationships between publications on the basis of the number of times that they cite each other. The analysis identified 22 papers that share at least two joint citations. The network shown in Figure 5 maps the journals that share the greatest numbers of citations. A total of seven clusters were identified; however, only a few are expressive: the blue cluster featuring the *Forensic Science International*; the green cluster featuring the *American Journal of Physical Anthropology*; the red cluster featuring the *International Journal of Legal Medicine*; and the purple cluster featuring the *International Journal of Osteoarchaeology*. The assessment of the network on the basis of the average number of citations per journal shows that the most cited papers are not necessarily those that cite each other the most. Except for the *American Journal of Physical Anthropology,* the other journals with the highest citation averages are the *Journal of Forensic Science*, and the journal, *Homo*. Furthermore, if the network is explored on the basis of the average number of publications per year, the trend is for journals with fewer citation numbers to feature the most publications. In recent years, circa 2016 and onwards, journals such as *Legal Medicine, Anthropologischer Anzeiger,* and *Antropologia Portuguesa* (among others) have gained visibility, despite their low numbers of citations.

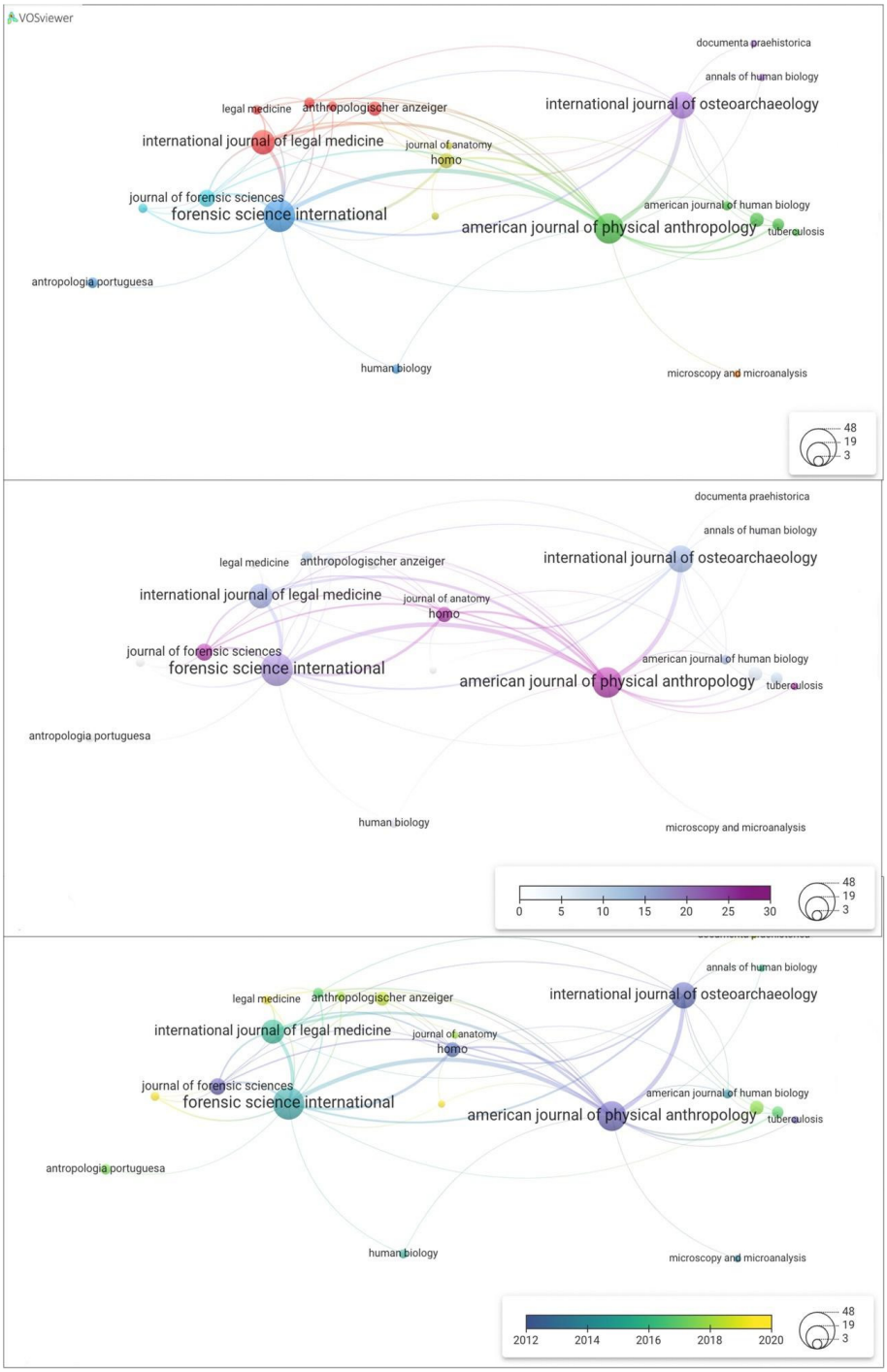
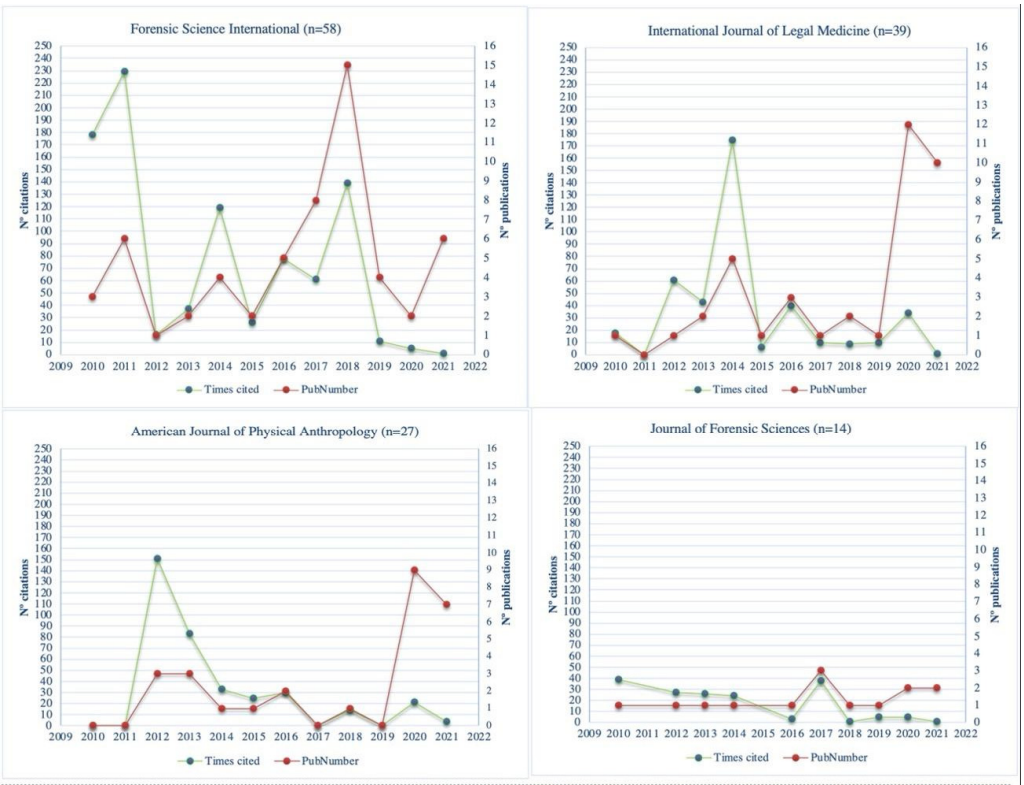


Figure 5. The figures show the existing networks between publications on the basis of the number of times they cite each other (**top map**), the average number of citations per journal (**middle map**), and the average number of publications per year (**bottom map**). You can zoom in on the map visualization here: https://sites.google.com/view/francisca-alves-cardoso/research-profile/projects/bodiprint/article-si/figure-5?authuser=0, accessed on: 20 November 2021.

3.2. TOP of the TOPs: The Four Journals with More Publications on DCs between 2010 and 2021

On the basis of the above results, a detailed analysis was undertaken on the TOP4 journals, i.e., those with the highest numbers of publications between the years 2010 and 2021. The analysis focused on the numbers of publications and citations, as well as on the research focuses. The journals that contributed the most to DC-related publications were the *Forensic Science International* (n = 58), the *International Journal of Legal Medicine*

(*n* = 39), the *American Journal of Physical Anthropology* (*n* = 27), and the *Journal of Forensic Sciences* (*n* = 14), totaling 138 papers (Figure 6). Various picks of publications were identified between 2010 and 2021, with an emphasis from 2017 onwards. There is one trend that stands out: as the publication numbers increase, the numbers of citations decrease. We offer several possibilities to justify this behavior: (1) The citation number is a variable that varies significantly, as it is influenced by the cumulative effects of the years after the publication (see Table 2 for an example of the most cited paper of this dataset [30]); (2) It may be an effect of social media and the visibility of secondary research outlets (e.g., newspapers, social media networks, and others), which feeds into the popularity of a paper among peers; and (3) It may be influenced by an author's network and affiliations, which may stress one's scientific prestige. We offer two additional explanations that also need to be taken into consideration: (1) The increasing number of publications on DCs, and the associated data availability, allow researchers to more selectively choose which publications to cite. For example, when selecting a sex assessment method, they may do so on the basis of population affinity (and not on the basis of publication availability). The highest number of publications and associated datasets comply with the justification that more DCs allow for a better assessment of the population variability; (2) In recent years, research networks have expanded (see Figure 2), with new academics and scientific clusters of research, new references being used, and new scholars seeking individual visibility. The known existence of more DCs and the associated data is an interesting trend to consider when assessing future publications, as it may inform on the impact that population-specific datasets (*senso lato*) have on scientific research and human variability assessments, and it may support a nonracialized paradigm in the assessment of humans, as suggested by Ross and co-authors [13,14].



OVERALL PUBLICATIONS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Frequency	5	6	6	8	11	4	11	12	19	6	25	25	138
Percent	3.6	4.3	4.3	5.8	8.0	2.9	8.0	8.7	13.8	4.3	18.1	18.1	100.0
Cumulative Percent	3.6	8.0	12.3	18.1	26.1	29.0	37.0	45.7	59.4	63.8	81.9	100.0	

Figure 6. The numbers of citations and numbers of publications of TOP4 journals between 2010 and 2021 (November).

Table 2. TOP5 papers of the TOP4 journals: the ranking was estimated via numbers of citations and altmetric scores.

Article Title	Authors	Journal Title	Year of Publication	Citation Number *	Altmetric Attention Score *
The effect of age, sex, and physical activity on entheseal morphology in a contemporary Italian skeletal collection	Milella et al. [43]	*American Journal of Physical Anthropology*	2012	95	3
Stature estimation from long bone lengths in a Thai population	Mahakkanukrauh et al. [44]	*Forensic Science International*	2011	83	
A new forensic collection housed at the University of Coimbra, Portugal: The 21st century identified skeletal collection	Ferreira et al. [42]	*Forensic Science International*	2014	68	1
The application of traditional and geometric morphometric analyses for forensic quantification of sexual dimorphism: preliminary investigations in a Western Australian population	Franklin et al. [45]	*International Journal of Legal Medicine*	2012	61	
Sex estimation from the tarsal bones in a Portuguese sample: a machine learning approach	Navega et al. [46]	*International Journal of Legal Medicine*	2014	47	
Article Title	**Authors**	**Journal Title (impact factor)**	**Year of Publication**	**Citation Number ***	**Altmetric Attention Score ***
The Ratón Pérez collection: Modern deciduous human teeth at the Centro Nacional de Investigación sobre la Evolución Humana (Burgos, Spain)	de Pinillos et al. [35]	*American Journal of Physical Anthropology*	2021	0	75
Distal Humerus Morphological Variation and Sex Estimation in Modern Thai Individuals	Tallman and Blanton [36]	*Journal of Forensic Sciences*	2019	5	44
Age estimation of immature human skeletal remains from mandibular and cranial bone dimensions in the postnatal period	Smith et al. [37]	*Forensic Science International*	2021	0	24
A geometric morphometric approach to the study of sexual dimorphism in the modern human frontal bone	Del Bove et al. [38]	*American Journal of Physical Anthropology*	2020	1	17
The utility of elliptical Fourier analysis for estimating ancestry and sex from lateral skull photographs	Caple et al. [47]	*Forensic Science International*	2018	8	13

* Citation and altmetric data were accessed via Dimensions, on 20 November 2021.

The TOP5 most cited papers, and those with the highest altmetric scores of the TOP4 journals, can be found in Table 2. When compared to the overall sample assessment of the TOP5 articles (Table 1), the overall profile is similar: the emphasis is placed on research-based papers on biological profiling that are based on sex, age at death, activity, and stature, with one paper introducing a new documented collection, The 21st Century Identified Skeletal Collection [42]. These are all papers relevant to forensic research, except for the paper by Milella et al. [43]. Although their research was based on a DC, the aim of this specific paper focuses on activity-related patterns of entheseal changes, and their correlations to sex, age, and occupation. Moreover, most of its citing papers are related to archaeology and past population studies and, hence, its relevance to forensic sciences may be seen as marginal. The high citation score is certainly related to the interest in activity-related research, which has found in DCs the perfect niche to test hypotheses linked to activity-related changes, such as entheseal changes [9]. Nevertheless, its contribution to the visibility of DCs is noteworthy. All of the TOP5 most cited papers have citation numbers high above the average (13.4), and they all have very-low-to-nonexistent, altmetric scores

(TOP4 average is 4.4), probably because of the low or absent involvement of social media at the time of publication. This observation is, to some extent, supported by the papers with the highest altmetric scores, all published between 2018 and 2021 (Table 2) [42–46]. The papers with the highest altmetric scores are almost coincident with those of the overall sample (see Table 1), except for the paper of Caple and colleagues [47]. Overall, the secondary research outlets are mainly tweets and newspaper outputs, with academic and nonacademic targeted audiences. This shows the importance of social media as a means of research dissemination.

Within the TOP4 journals, the most frequent words within the titles and abstracts concur with the pattern already highlighted in the overall sample assessment of the research terms (see Figure 4 for the overall sample). Most of the papers published on research are associated with the development of methods on the biological profile assessment of human remains, with age at death and sex as the main topics (Figure 7). The focus continues to be the measure of human variability, and it stresses sexual diagnosis and age estimation methods, and the associated methodological statistics approach. This can be inferred on the basis of the presence of words such as "regression", "function", and "equation". It is also interesting to observe the gained, although discrete, visibility of population variability via the presence of words such as "ancestry", "Africans", and "European".

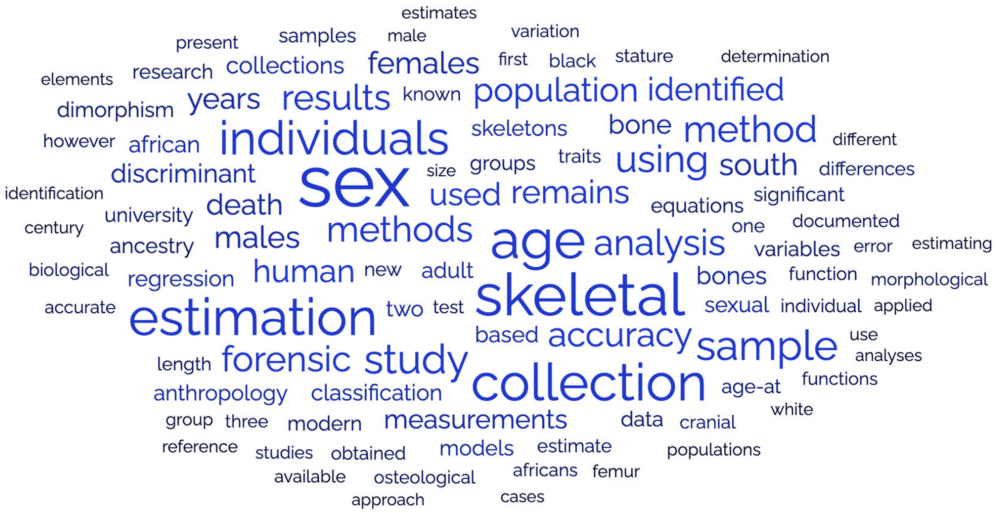


Figure 7. Word counts of the most frequent terms used in the titles and abstracts of the articles associated with TOP4 journals.

The analysis of the 376 papers identified in this research have shown an overall positive correlation between DC-related publications and forensic anthropology, not only in the topics assessed, but also in the most contributive journals. The major topics, in later years, stress the development of methodological approaches to sex and age-at-death estimations, as well as individual and population ancestry and variability profiling. In all, these topics have contributed significantly to the development of biological and forensic anthropology. Hence, the scientific rigor, and the outstanding contribution of DCs to science, is not under scrutiny. However, as the concerns related to ethical issues associated with the sourcing, handling, and storing of human remains increases, it is necessary to consider the impact it may have on past and present collections, as well as on future of collections that have yet to be built. Some of these concerns are already being considered in newer DCs, as we explore in the next section.

3.3. Profiling Documented Collections: Where, When, and How

From the overall sample of articles, 33 were selected because they introduced documented collections and/or because they updated information on the collections, testifying to their "living" natures as collections that are continuously being updated with new ac-

quisitions, e.g., [17,19]. These 33 papers were written between 1995 and 2021, and they profile 39 collections from 15 countries (Figure 8; see Supplementary Data, Table S2, for data details). The article published in 1995 portrays 5 of the 10 documented collections known to exist in Portugal, also known as the "Identified Collections", which are housed in Portuguese institutions, the universities, and associated museums [18,19,48–50]. Portugal is followed by Brazil, South Africa, and the United States. From 2016 onwards, the number of articles increased, addressing the new collections and the additional data from various countries.

Country	Nº Collections	%	Publication Reference
Argentina	2	5.1	Bosio et al. (2012) & Salceda et al. (2012)
Belgium	2	5.1	Boucherie et al. (2021)
Brazil	7	17.9	Cunha et al. (2018) & de Carvalho et al. (2020)
Colombia	1	2.6	Sanabria-Medina et al. (2016)
France	1	2.6	Luyer and Bayle (2021)
Greece	2	5.1	Eliopoulos et al. (2007) & Nikita (2020)
Hong Kong	1	2.6	Savoldi et al. (2021)
Italy	2	5.1	Belcastro et al. (2017) & Cattaneo et al. (2018)
Mexico	1	2.6	Chi-Keb et al. (2013)
Philipines	1	2.6	Go et al. (2017)
Portugal	10	25.6	Cardoso et al. (2020); Cardoso (2006); Cardoso and Marinho (2016); Ferreira et al. (2014); Ferreira et al. (2020); Lopes and Fernandes (2021) & Rocha (1995)
South Africa	4	10.3	Alblas et al. (2018); Beresheim et al. (2018); Dayal et al. (2009); L'Abbé et al. (2005) & Maass and Friedling (2019)
Spain	1	2.6	Aleman et al. (2012)
Thailand	1	2.6	Techataweewan et al. (2017a) & Techataweewan et al. (2017b)
USA	3	7.7	Hunt and Albanese (2015); Komar and Grivas (2008) & Mann et al. (2020)
Total	39	100	

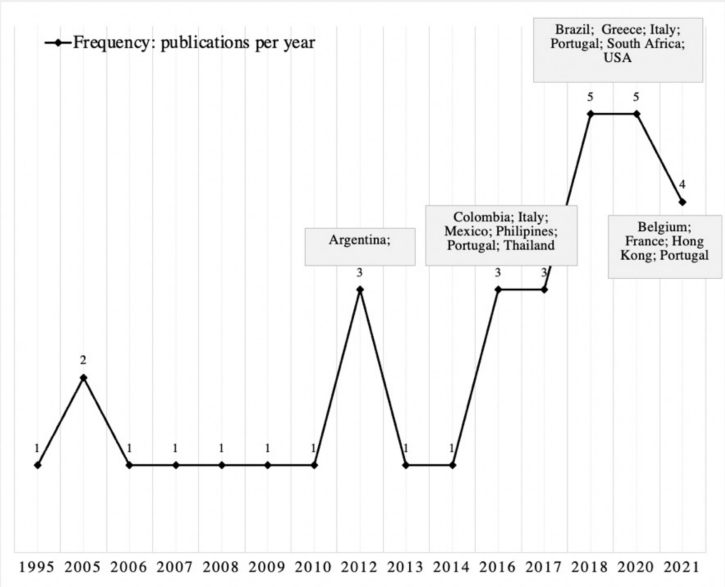


Figure 8. Numbers of publications introducing documented collections identified by country (**left table**), and according to year of publication (**right graph**).

These collections consist mostly of human remains from contemporary cemeteries and are classified as "unclaimed" (n = 25), and they are followed by collections with remains obtained via body donations (n = 5), dissection rooms (n = 3), and a mix of donated bodies and unclaimed human remains (n = 5). For example, the Kirsten Skeletal Collection is composed of consented donations and unclaimed cadavers of individuals who died from natural causes. Most of the unclaimed individuals were from the Western Cape hospitals and other government mortuaries [51,52]. On the other hand, the Maxwell Museum Documented Collection assembled human remains from body donations, from cadavers from the Department of Anatomy of the University of New Mexico, and from the Office of the Medical Investigator, although 15% of the collection contains individuals of unknown provenance [53]. It is worth highlighting the skeletal collection at the KKU Human Skeleton Research Centre, composed entirely of body donations [54,55]. The collection's origin is, therefore, diverse, and is in line with past medical and anatomical traditions. The 25 collections built with human remains from cemeteries have been steadily increasing over the past 50 years. The chronologies of these collections range from the mid-18th century to the 21st century and are composed of individuals that died between 1870 and 2012, and that were exhumed between 1908 and 2018 [17,56]. The 21st Century Identified Skeletal Collection (Coimbra) contains the individuals with the shortest time spans between the dates of death (1982–2012) and exhumation (1999–2016) [19,42].

The origin and acquisition of human remains for research and teaching, and the way many documented collections have been developed, has, in later years, been the focus of ethical discussion. Much of this discussion has been in line with the urgency of decolonizing museums, and with the act of restitution and repair towards past communities. This preoccupation is also addressed in some of the publications, specifically those published

after 2020. The ethical issues raised in these publications, for example, mostly address the need to guarantee the confidentiality of the personal information disposed of, and the anonymization of the data, or the data availability upon request (e.g., [57–59]). The issue of dignity and respect towards the dead and good research practices are also addressed (e.g., [20,60,61]). Some collections extend the concern for dignity and respect towards the dead towards the living relatives. For example, the skeletal collection at the KKU Human Skeleton Research Centre offers the family members of the donors a visit to the department and allows them to partake in formal ceremonies at the beginning of each semester to pay their respects to the donors. If they wish, family members may view the bodies or skeletons of their relatives [55]. This approach is highly inclusive and does not dissociate the family members from the process of building and curating a collection.

Many of the ethical considerations are entangled with legislative issues, as is also reported in some manuscripts. Overall, the access to many of the remains originated from cemeteries where those individuals were declared "unclaimed". This is a fairly common practice worldwide and is in line with the re-use of cemeterial grounds. The exhumation of skeletons takes place after the passage of a specific time (years), and if the skeletons are left unclaimed, these may be regulated for incineration or burial in a communal grave. Unclaimed skeletons can also be relocated to universities and/or research institutions for teaching, training, and research. Families are informed of the exhumation, but if they fail to reply, the skeletons are classified as "unclaimed" or "abandoned". The period between burial and exhumation varies per country and is usually from 3 to 6 years. For example:

> "According to the regulations of the Municipal Cemetery of La Plata (Cementerio Municipal de La Plata, Ordenanza Municipal 7638/90), and in order to reuse space, individuals that have been buried for 6 years are exhumed by the cemetery personnel. [...] In 2002, and in compliance with the current legislation, the Administration of the Municipal Cemetery of La Plata decided to cede bones to the Faculty of Medicine at the National University of La Plata to be used for research and teaching purposes (Ordenanza Municipal 9471/02)". (p. 276 of [62])

> "Thus, in 1981 [. . .] the HK Government entered into an informal collaboration with HKU to permit a long-term loan of exhumed skeletal remains of unclaimed individuals for teaching and research purposes [. . .] HK Government may direct exhumation of any human remains that have been buried in public cemeteries for at least 6 years (Power of Authority to direct removal and disposal of human remains (Paragraph 119A), 1988) (accessed to HK e-Legislation database on 18th Nov2019 [e-Legislation, Last revision date: 18/12/, 2019])". (p. 719 of [61])

> " . . . 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 27,590 (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". (p. 487 of [60])

In recent years, the growing awareness of a lack of specific legislation regarding the exhumation of human skeletons from modern cemeteries and their inclusion in institutional collections, and the need to act ethically, has led to the "borrowing" (used here very loosely) of existing laws, such as those related to body donation consent by default (as is the practice in countries with an opt-out system), corpse dissection, and the extraction of parts such as tissues or organs for teaching and scientific research [63]. This approach frames, within limits, the use of unclaimed human skeletons exhumed from cemeteries in order to build documented collections. This is described in some of the manuscripts here, analyzed as a process of skeleton acquisition (e.g., [17,18,49,56,64]). There is, however, the need for caution. For example, in countries with opt-out body and organ donation systems, the

inclusion of individuals that did not consent to be donors needs to be considered [18,49,63]. Moreover, the access to remains of autopsied individuals may require additional precautions, as is pointed out by Lopes and Fernandes [18]. Although this latter consideration is specific to the Portuguese context, one may find similar legal frameworks in other countries. Most importantly, it raises important issues related to the acquisition of human skeletons from cemeteries.

It is also interesting to note that, although there is a protocol to follow, and a need to comply with the (available) legislation, the classification of the skeletons as "unclaimed" or "abandoned" is never questioned. There is a tacit acknowledgement that, if a relative of the remains fails to respond to a notice of exhumation issued by a cemetery, it means that the relative has no interest in the skeleton [63]. However, a nonresponse may be due to several other unforeseeable events, such as a change of address. Moreover, depending on the cost of reburial, one may not be able to claim the remains back and pay the cemetery and secondary reburial fees. Hence, the access to human remains also needs to equate to socioeconomic factors. The issue of the socioeconomic inequalities associated with the access to human skeletons has been discussed in alignment with the notion of structural violence and the incorporation of the remains of vulnerable individuals in documented collections (for a detailed discussion, see [65–71]). Currently, many collections do not aggregate human remains alone (e.g., dried bones); there is also biographical information, imaging data, and aDNA and geochemical data. Hence, discussions on ethical issues and legislation will certainly be addressed in the near future, opening up new avenues of research, and new ways of thinking about and addressing DCs. Some of the past and newly built DCs may find themselves the focus in such discussions [72–81].

As Joyce stated, "The parallel demands made on anthropology–that it engage with perspectives of the people under study–have also opened up new avenues for the production of knowledge. The fact that some studies can no longer be carried out as they would have been in the past does not portend an end to science. It simply signals the maturation of anthropological research and its acceptance of social and ethical responsibilities that come with academic freedom" (p. 198 of [82]).

4. Concluding Remarks: Moving Forward

An exponential increase in the visibility of forensic anthropology occurred in the early years of the 21st century, driven, in part, by popular crime television shows. With the "CSI effect" came the demand to learn more about human remains in a forensic context, as shown by the rise in the number of students pursuing forensic anthropology courses within universities. However, there was also an increase in the publications within forensic anthropology, especially with analyses of documented collections (DCs). This paper quantified the research outputs and the impact on papers with, and about, DCs. Although it is not an exhaustive summary of all of the academic work conducted, the 376 papers analyzed provide an overall indicator of the amount of publications sampling DCs, research trends, and institutional networks. From the year 2008 onwards, an increase can be seen in the number of publications favoring three forensic journals and the *American Journal of Physical Anthropology*, revealing a growing interest in forensic anthropology, as well as the importance of DCs to the development of this field. The most cited DCs were from Portugal, making this country, and especially the University of Coimbra, one of the major networking clusters, alongside the United States, the United Kingdom, and Canada. However, since 2014, a higher number of publications have emerged in peripheral countries that were not considered mainstream in forensic anthropology, such as Argentina and Brazil, and that are associated with the creation of new DCs. Therefore, it will be noteworthy to explore (in the near future) whether the publication and institutional networking trends observed in this paper are maintained, or if they will fluctuate towards those peripheral countries or other countries that emerge, particularly if we continue to see a materialization of new collections worldwide. Overall, the majority of the publications mostly address topics on sex profiling and disease. However, when the year of publication is factored in, there is a

shift towards biological profiling. From the 376 papers, only 84 were cited over 20 times, which may reflect cumulative citations with time, or the visibility of the researchers and/or of the publications. A higher social media visibility was recorded for TOP5 articles published between 2019 and 2021, which, in turn, had absent or negligible citation scores, but which captured the interest of the members of the public. This is indicative of a changing relationship between academia and nonacademia, and is another interesting point to keep an eye on in the years to come.

This exercise of profiling DCs via publication data is an important contribution to the understanding of the growth of forensic anthropology as a discipline. Furthermore, the DCs not only brought visibility to the institutions that house them, but also to their affiliated researchers. Moreover, the growing ethical concerns related to human skeletons, and discussed within anthropology, biological anthropology, and bioarcheology, have found their way into forensic anthropology, adding new discussions. Alongside the ethical concerns, such as the origin of and the acquisition, storage, and handling of those collections, especially for unclaimed skeletons, the lack of specific legislation also adds to the discussion. Overall, and because many DCs are housed in museums, much of this debate centers on the calls to decolonize museums and higher education institutions, which are encouraging anthropologists to come to terms with the discipline's past, including the assembly of human skeletons, and which are aimed at future repairs. Each country will have its specific context and path. Importantly, and moving forward, there is also a need to take on a more inclusive approach to DCs, with the aggregation of, and collaboration with, the communities from which the individuals of the collections are derived.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/forensicsci2010004/s1: Supplementary Data, Table S1. Frequency of manuscripts related to Documented Collections per source title; Supplementary Data, Table S2. List of 33 publications profiling Documented Collections.

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References

1. Buikstra, J.E. Knowing your audience: Reactions to the human body, dead and undead. In *Bioarchaeologists Speak Out*; Bioarchaeology and Social Theory; Buisktra, J.E., Ed.; Springer: Cham, Switzerland, 2019; pp. 19–58.
2. Emery, K.M.; Killgrove, K. Bones, bodies, and blogs: Outreach and engagement in bioarchaeology. *Internet Archaeol.* 2015. [CrossRef]
3. Shelton, D.E.; Kim, Y.S.; Barak, G. A study of juror expectations and demands concerning scientific evidence: Does the "CSI Effect" exist? *Vanderbilt JETLaw* **2006**, *9*, 331–368.
4. Kim, Y.S.; Barak, G.; Shelton, D.E. Examining the "CSI-effect" in the cases of circumstantial evidence and eyewitness testimony: Multivariate and path analyses. *J. Crim. Justice* **2009**, *37*, 452–460. [CrossRef]
5. Black, S.M. Forensic anthropology–regulation in the United Kingdom. *Sci. Justice J. Forensic Sci. Soc.* **2003**, *43*, 187–192. [CrossRef]
6. Cunha, E. Réflexion à propos de la popularité de l'anthropologie médico-légale aujourd'hui. *Bull. Mem. Soc. Anthropol. Paris* **2010**, *22*, 190–193. [CrossRef]
7. Komar, D.A.; Buikstra, J.E. (Eds.) *Forensic Anthropology: Contemporary Theory and Practice*; Oxford University Press: Oxford, UK, 2008.
8. Blau, S. More than just bare bones: Ethical considerations for forensic anthropologists. In *Handbook of Forensic Anthropology and Archaeology*; Blau, S., Ubelaker, D., Eds.; Left Coast Press: Walnut Creek, CA, USA, 2009; pp. 457–467.
9. Henderson, C.; Alves-Cardoso, F. (Eds.) *Identified Skeletal Collections: The Testing Ground of Anthropology?* Archaeopress: Oxford, UK, 2018.
10. Petaros, A.; Caplova, Z.; Verna, E.; Adalian, P.; Baccino, E.; de Boer, H.H.; Cunha, E.; Ekizoglu, O.; Ferreira, M.T.; Fracasso, T.; et al. Technical note: The Forensic Anthropology Society of Europe (FASE) map of identified osteological collections. *Forensic Sci. Int.* **2021**, *328*, 1–6. [CrossRef]
11. Mann, R.W.; Koel-Abt, K.; Dhody, A.; Mahakkanukrauh, P.; Mann, V.J.; Techataweewan, N.; DeFreytas, J.R.; Ruengdit, S. The importance of human osteological collections: Our past, present, and future. *Forensic Sci. Int.* **2021**, *325*, 110895. [CrossRef]
12. Santos, A.L. A particular heritage: The importance of identified osteological collections. *Metode* **2020**, *10*, 91–97. [CrossRef]
13. Ross, A.H.; Pilloud, M. The need to incorporate human variation and evolutionary theory in forensic anthropology: A call for reform. *Am. J. Phys. Anthropol.* **2021**, *176*, 672–683. [CrossRef] [PubMed]
14. Ross, A.H.; aams, S.E. Ancestry studies in forensic anthropology: Back on the frontier of racism. *Biology* **2021**, *10*, 602. [CrossRef]
15. Obertová, Z.; Stewart, A.; Cattaneo, C. (Eds.) *Statistics and Probability in Forensic Anthropology*; Academic Press: London, UK, 2020.
16. Franklin, D.; Blau, S. Physical and virtual sources of biological data in forensic anthropology: Considerations relative to practitioner and/or judicial requirements. In *Statistics and Probability in Forensic Anthropology*; Obertová, Z., Stewart, A., Cattaneo, C., Eds.; Academic Press: London, UK, 2020.
17. De Carvalho, M.V.D.; Lira, V.F.; do Nascimento, E.A.; Torres Kobayashi, S.B.; de Araújo, L.F.; de Almeida, A.C.; Porto Petraki, G.G.; Cunha, E.; Soriano, E.P. New acquisitions of a contemporary Brazilian Identified Skeletal Collection. *Forensic Sci. Int. Rep.* **2020**, *2*, 100050. [CrossRef]
18. Lopes, C.; Fernandes, T. The identified skeleton collection of Évora: Importance for forensic science and bioarchaeology in the southern inland of Portugal. *Int. J. Leg. Med.* **2021**. [CrossRef]
19. Ferreira, M.T.; Coelho, C.; Makhoul, C.; Navega, D.; Gonçalves, D.; Cunha, E.; Curate, F. New data about the 21st Century Identified Skeletal Collection (University of Coimbra, Portugal). *Int. J. Leg. Med.* **2021**, *135*, 1087–1104. [CrossRef] [PubMed]
20. Mann, R.W.; Labrash, S.; Lozanoff, S. Medical school hotline: A new osteological resource at the John A. Burns School of Medicine. *Hawai'I J. Health Soc. Wel.* **2020**, *79*, 202–203.
21. Marquez-Grant, N.; Fibiger, L. (Eds.) *The Routledge Handbook of Archaeological Human Remains and Legislation: An International Guide to Laws and Practice in the Excavation and Treatment of Archaeological Human Remains*; Routledge: London, UK, 2011.
22. Squires, K.; Errickson, D.; Márquez-Grant, N. (Eds.) *Ethical Approaches to Human Remains*; Springer: Cham, Switzerland, 2019.
23. Van Eck, N.J.; Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* **2010**, *84*, 523–538. [CrossRef] [PubMed]
24. Pirsig, W.; Ulrich, R. Karl Wittmaack: His life, temporal bone collection, and publications. *Arch Oto-Rhino-Laryngol.* **1977**, *217*, 247–262. [CrossRef]
25. Giraudi, R.; Fissore, F.; Giacobini, G. The collection of human skulls and postcranial skeletons at the Department of Human Anatomy of the University of Torino (Italy). *Am. J. Phys. Anthropol.* **1984**, *65*, 105–107. [CrossRef]
26. Rother, P.; Krüger, G.; Schramek, G. Proportions of the femur and humerus in relation to bone length. *Anat. Anz.* **1985**, *160*, 65–76.
27. Smith, D.R. Historical development of the journal impact factor and its relevance for occupational health. *Ind. Health* **2007**, *45*, 730–742. [CrossRef] [PubMed]
28. Ugolini, D.; Bonassi, S.; Cristaudo, A.; Leoncini, G.; Ratto, G.B.; Neri, M. Temporal trend, geographic distribution, and publication quality in asbestos research. *Environ. Sci. Pollut. Res. Int.* **2015**, *22*, 6957–6967. [CrossRef]
29. Chiu, W.T.; Ho, Y.S. Bibliometric analysis of tsunami research. *Scientometrics* **2007**, *73*, 3–17. [CrossRef]
30. Brooks, S.; Suchey, J.M. Skeletal age determination based on the os pubis: A comparison of the Acsadi-Nemeskari and Suchey-Brooks methods. *Hum. Evol.* **1990**, *5*, 227–238. [CrossRef]
31. Schuknecht, H.F.; Gacek, M.R. Cochlear pathology in presbycusis. *Ann. Otol. Rhinol. Laryngol.* **1993**, *102*, 1–16. [CrossRef] [PubMed]

32. Fayad, J.N.; Linthicum, F.H. Multichannel cochlear implants: Relation of histopathology to performance. *Laryngoscope* **2006**, *116*, 1310–1320. [CrossRef] [PubMed]
33. Hunt, D.R.; Albanese, J. History and demographic composition of the Robert J. Terry anatomical collection. *Am. J. Phys. Anthropol.* **2005**, *127*, 406–417. [CrossRef]
34. Villotte, S.; Castex, D.; Couallier, V.; Dutour, O.; Knüsel, C.J.; Henry-Gambier, D. Enthesopathies as occupational stress markers: Evidence from the upper limb. *Am. J. Phys. Anthropol.* **2010**, *142*, 224–234. [CrossRef]
35. De Pinillos, M.; Pantoja-Pérez, A.; Fernández-Colón, P.; Martín-Francés, L.; García-Campos, C.; Modesto-Mata, M.; Moreno-Torres, C.; Bermúdez de Castro, J.M.; Martinón-Torres, M. The Ratón Pérez collection: Modern deciduous human teeth at the Centro Nacional de Investigación sobre la Evolución Humana (Burgos, Spain). *Am. J. Phys. Anthropol.* **2021**, *176*, 528–535. [CrossRef]
36. Tallman, S.D.; Blanton, A.I. Distal humerus morphological variation and sex estimation in modern Thai individuals. *J. Forensic Sci.* **2020**, *65*, 361–371. [CrossRef]
37. Smith, D.E.M.; Humphrey, L.T.; Cardoso, H.F.V. Age estimation of immature human skeletal remains from mandibular and cranial bone dimensions in the postnatal period. *Forensic Sci. Int.* **2021**, *327*, 110943. [CrossRef]
38. Del Bove, A.; Profico, A.; Riga, A.; Bucchi, A.; Lorenzo, C. A geometric morphometric approach to the study of sexual dimorphism in the modern human frontal bone. *Am. J. Phys. Anthropol.* **2020**, *173*, 643–654. [CrossRef]
39. Lans, A.M. Decolonize this collection: Integrating black feminism and art to re-examine human skeletal remains in museums. *Fem. Anthropol.* **2021**, *2*, 130–142. [CrossRef]
40. Squires, K.; Errickson, D.; Márquez-Grant, N. Introduction. In *Ethical Approaches to Human Remains: A Global Challenge in Bioarchaeology and Forensic Anthropology*; Squires, K., Errickson, D., Márquez-Grant, N., Eds.; Springer: Cham, Switzerland, 2019; pp. 1–18.
41. Williams, S.; Ross, A.H. Ethical dilemmas in skeletal collection utilization: Implications of the Black Lives Matter movement on the anatomical and anthropological sciences. *Anat. Rec.* **2021**. [CrossRef]
42. Ferreira, M.T.; Vicente, R.; Navega, D.; Gonçalves, D.; Curate, F.; Cunha, E. A new forensic collection housed at the University of Coimbra, Portugal: The 21st century identified skeletal collection. *Forensic Sci. Int.* **2014**, *245*, 202.e1–5. [CrossRef] [PubMed]
43. Milella, M.; Giovanna Belcastro, M.; Zollikofer, C.P.E.; Mariotti, V. The effect of age, sex, and physical activity on entheseal morphology in a contemporary Italian skeletal collection. *Am. J. Phys. Anthropol.* **2012**, *148*, 379–388. [CrossRef]
44. Mahakkanukrauh, P.; Khanpetch, P.; Prasitwattanseree, S.; Vichairat, K.; Troy Case, D. Stature estimation from long bone lengths in a Thai population. *Forensic Sci. Int.* **2011**, *210*, 279.e1–7. [CrossRef]
45. Franklin, D.; Cardini, A.; Flavel, A.; Kuliukas, A. The application of traditional and geometric morphometric analyses for forensic quantification of sexual dimorphism: Preliminary investigations in a Western Australian population. *Int. J. Leg. Med.* **2012**, *126*, 549–558. [CrossRef] [PubMed]
46. Navega, D.; Vicente, R.; Vieira, D.N.; Ross, A.H.; Cunha, E. Sex estimation from the tarsal bones in a Portuguese sample: A machine learning approach. *Int. J. Leg. Med.* **2015**, *129*, 651–659. [CrossRef]
47. Caple, J.M.; Byrd, J.E.; Stephan, C.N. The utility of elliptical Fourier analysis for estimating ancestry and sex from lateral skull photographs. *Forensic Sci. Int.* **2018**, *289*, 352–362. [CrossRef] [PubMed]
48. Cardoso, H.F. Brief communication: The collection of identified human skeletons housed at the Bocage Museum (National Museum of Natural History), Lisbon, Portugal. *Am. J. Phys. Anthropol.* **2006**, *129*, 173–176. [CrossRef]
49. Cardoso, H.F.V.; Marinho, L.; Caldas, I.M.; Puentes, K.; Andrade, M.; Toso, A.; Assis, S.; Magalhães, T. Historical, demographic, curatorial and legal aspects of the bonemedleg human skeletal reference collection (Porto, Portugal). *Anthr. Anz.* **2020**, *77*, 57–73. [CrossRef]
50. Cardoso, H.F.V.; Marinho, L. Lost and then found: The Mendes Correia collection of identified human skeletons curated at the University of Porto, Portugal. *Antropol. Port.* **2016**, *32–33*, 29–46. [CrossRef]
51. Alblas, A.; Greyling, L.M.; Geldenhuys, E.M. Composition of the Kirsten skeletal collection at Stellenbosch University. *S. Afr. J. Sci.* **2018**, *114*, 1–6. [CrossRef]
52. Beresheim, A.C.; Pfeiffer, S.K.; Grynpas, M.D.; Alblas, A. Sex-specific patterns in cortical and trabecular bone microstructure in the Kirsten Skeletal Collection, South Africa. *Am. J. Hum. Biol.* **2018**, *30*, e23108. [CrossRef]
53. Komar, D.A.; Grivas, C. Manufactured populations: What do contemporary reference skeletal collections represent? A comparative study using the Maxwell Museum documented collection. *Am. J. Phys. Anthropol.* **2008**, *137*, 224–233. [CrossRef] [PubMed]
54. Techataweewan, N.; Tuamsuk, P.; Toomsan, Y.; Woraputtaporn, W.; Prachaney, P.; Tayles, N. A large modern Southeast Asian human skeletal collection from Thailand. *Forensic Sci. Int.* **2017**, *278*, 406.e1–406.e6. [CrossRef]
55. Techataweewan, N.; Panthongviriyakul, C.; Toomsan, Y.; Mothong, W.; Kanla, P.; Chaichun, A.; Amarttayakong, P.; Tayles, N. Human body donation in Thailand: Donors at Khon Kaen University. *Ann. Anat.* **2018**, *216*, 142–151. [CrossRef]
56. Cunha, E.; Lopez-Capp, T.T.; Inojosa, R.; Marques, S.R.; Moraes, L.O.C.; Liberti, E.; Machado, C.E.P.; de Paiva, L.A.S.; Francesquini Júnior, L.; Daruge Junior, E.; et al. The Brazilian identified human osteological collections. *Forensic Sci. Int.* **2018**, *289*, 449.e1–449.e6. [CrossRef] [PubMed]
57. Alemán, I.; Irurita, J.; Valencia, A.R.; Martínez, A.; López-Lázaro, S.; Viciano, J.; Botella, M.C. Brief communication: The Granada osteological collection of identified infants and young children. *Am. J. Phys. Anthropol.* **2012**, *149*, 606–610. [CrossRef]

58. Cattaneo, C.; Mazzarelli, D.; Cappella, A.; Castoldi, E.; Mattia, M.; Poppa, P.; de Angelis, D.; Vitello, A.; Biehler-Gomez, L. A modern documented Italian identified skeletal collection of 2127 skeletons: The CAL Milano Cemetery Skeletal Collection. *Forensic Sci. Int.* **2018**, *287*, 219.e1–219.e5. [CrossRef] [PubMed]
59. Le Luyer, M.; Bayle, P. The Tooth Fairy collection *(la collection Petite Souris*), a sample of documented human deciduous teeth at the University of Bordeaux, France. *Am. J. Biol. Anthropol.* **2021**, *177*, 175–181. [CrossRef]
60. Bosio, L.A.; García Guraieb, S.; Luna, L.H.; Aranda, C. Chacarita Project: Conformation and analysis of a modern and documented human osteological collection from Buenos Aires City–theoretical, methodological and ethical aspects. *HOMO* **2012**, *63*, 481–492. [CrossRef] [PubMed]
61. Savoldi, F.; Montalvao, C.; Hui, L.; Leung, C.K.K.; Jablonski, N.G.; Tsoi, J.K.H.; Bornstein, M.M. The Human Bone Collection of the Faculty of Dentistry at the University of Hong Kong: History and description of cranial and postcranial skeletal remains. *Am. J. Phys. Anthropol.* **2021**, *175*, 718–730. [CrossRef] [PubMed]
62. Salceda, S.A.; Desántolo, B.; Mancuso, R.G.; Plischuk, M.; Inda, A.M. The "Prof. Dr. Rómulo Lambre" Collection: An Argentinian sample of modern skeletons. *HOMO* **2012**, *63*, 275–281. [CrossRef]
63. Alves Cardoso, F. "Not of one's body": The creation of identified skeletal collections with Portuguese human remains. In *Ethical Approaches to Human Remains: A Global Challenge in Bioarchaeology and Forensic Anthropology*; Squires, K., Errickson, D., Márquez-Grant, N., Eds.; Springer: Cham, Switzerland, 2019; pp. 503–518.
64. Maass, P.; Friedling, L.J. Documented composition of cadaveric skeletal remains in the University of Cape Town Human Skeletal Collection, South Africa. *Forensic Sci. Int.* **2019**, *294*, 219.e1–219.e7. [CrossRef] [PubMed]
65. Muller, J.L.; Pearlstein, K.E.; de la Cova, C. Dissection and documented skeletal collections: Embodiments of legalized inequality. In *The Bioarchaeology of Dissection and Autopsy in the United States*; Bioarchaeology and Social Theory; Nystrom, K., Ed.; Springer: Cham, Switzerland, 2017; pp. 185–201.
66. Bright, L.N. Structural violence: Epistemological considerations for bioarchaeology. In *Theoretical Approaches in Bioarchaeology*; Cheverko, C.M., Prince-Buitenhuys, J.R., Hubbe, M., Eds.; Routledge: New York, NY, USA, 2020; pp. 130–131. [CrossRef]
67. Nystrom, K.C. The bioarchaeology of structural violence and dissection in the 19th-century United States. *Am. Anthropol.* **2016**, *116*, 765–779. [CrossRef]
68. Watkins, R.J. The fate of anatomical collections in the US: Bioanthropological investigations of structural violence. In *Identified Skeletal Collections: The Testing Ground of Anthropology?* Henderson, C., Alves-Cardoso, F., Eds.; Archaeopress: Oxford, UK, 2018; pp. 169–186.
69. Zuckerman, M.K.; Austin, R.M.; Hofman, C.A. Historical anatomical collections of human remains: Exploring their reinterpretation as representations of racial violence. *Ann. Am. Acad. Polit. Soc.* **2021**, *694*, 39–47. [CrossRef]
70. De La Cova, C. Processing the destitute and deviant dead: Inequality, dissection, politics, and the structurally violent legalization of social marginalization in American anatomical collections. In *The Poetics of Processing: Memory Formation, Identity, and the Handling of the Dead*; Osterholtz, A.J., Ed.; University Press of Colorado: Boulder, CO, USA, 2020; pp. 212–234.
71. De la Cova, C. Making silenced voices speak: Restoring neglected and ignored identities in anatomical collections. In *Theoretical Approaches in Bioarchaeology*; Cheverko, C.M., Prince-Buitenhuys, J.R., Hubbe, M., Eds.; Routledge: New York, NY, USA, 2020; pp. 150–170.
72. Boucherie, A.; Polet, C.; Lefèvre, P.; Vercauteren, M. Sexing the bony labyrinth: A morphometric investigation in a subadult and adult Belgian identified sample. *J. Forensic Sci.* **2021**, *66*, 808–820. [CrossRef]
73. Chi-Keb, J.R.; Albertos-González, V.M.; Ortega-Muñoz, A.; Tiesler, V.G. A new reference collection of documented human skeletons from Mérida, Yucatan, Mexico. *HOMO* **2013**, *64*, 366–376. [CrossRef]
74. Dayal, M.R.; Kegley, A.D.; Štrkalj, G.; Bidmos, M.A.; Kuykendall, K.L. The history and composition of the Raymond A. Dart Collection of human skeletons at the University of the Witwatersrand, Johannesburg, South Africa. *Am. J. Phys. Anthropol.* **2009**, *140*, 324–335. [CrossRef]
75. Eliopoulos, C.; Lagia, A.; Manolis, S. A modern, documented human skeletal collection from Greece. *HOMO* **2007**, *58*, 221–228. [CrossRef]
76. Belcastro, M.G.; Bonfiglioli, B.; Pedrosi, M.E.; Zuppello, M.; Tanganelli, V.; Mariotti, V. The History and Composition of the identified human skeletal collection of the Certosa cemetery (Bologna, Italy, 19th–20th Century). *Int. J. Osteoarchaeol.* **2007**, *27*, 912–925. [CrossRef]
77. Go, M.C.; Lee, A.B.; Santos, J.A.D.; Vesagas, N.M.C.; Crozier, R. A newly assembled human skeletal reference collection of modern and identified Filipinos. *Forensic Sci. Int.* **2017**, *271*, 128-e1. [CrossRef]
78. L'Abbé, E.N.; Loots, M.; Meiring, J.H. The Pretoria bone collection: A modern South African skeletal sample. *HOMO* **2005**, *56*, 197–205. [CrossRef] [PubMed]
79. Nikita, E. Documented skeletal collections in Greece: Composition, research, and future prospects. *Am. J. Phys. Anthropol.* **2020**, *174*, 140–143. [CrossRef]
80. Sanabria-Medina, C.; Gonzalez-Colmenares, G.; Restrepo, H.O.; Rodríguez, J.M.G. A contemporary Colombian skeletal reference collection: A resource for the development of population specific standards. *Forensic Sci. Int.* **2016**, *266*, 577-e1. [CrossRef]
81. Rocha, M.A. Les collections ostéologiques humaines identifiées du Musée Anthropologique de l'Université de Coimbra. *Antropol. Port.* **1995**, *13*, 7–38.
82. Joyce, R.A. Science, objectivity, and academic freedom in the twenty-first century. *Int. J. Cult. Prop.* **2021**, *28*, 193–199. [CrossRef]

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