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Essay

Speaking of Sex: Critical Reflections for Forensic Anthropologists

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Abstract: Forensic anthropologists have a responsibility to appropriately relay information about a decedent in medicolegal reports and when communicating with the public. The terms 'sex' and 'sex estimation' have been applied with numerous, inconsistent definitions under the guise that sex—a broad, complex concept—can be reduced to a female/male binary. This binary does not reflect biocultural realities and harms those whose bodies do not meet social expectations of maleness or femaleness. The University of Nevada, Las Vegas' Forensic Anthropology and Bioarchaeology Laboratory (UNLV FAB Lab) advocates for the use of the term 'assigned sex at birth' (ASAB) to highlight that binary sex is not biologically inherent to the body, but rather, assigned by society. Additionally, we call for the use of disclaimers in case reports to denote the limitations of ASAB estimation methods, the differentiation between those with mixed trait expression (i.e., indeterminate) and those on whom an ASAB analysis cannot be performed (i.e., unknown), and the included consideration of gender in forensic anthropology research and case reports. Such applications challenge biological normalcy, allowing forensic anthropologists to actively advocate for those whose bodies do not meet biocultural expectations.

Keywords: sex estimation; assigned sex at birth estimation; forensic anthropology; terminology; advocacy

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1. Introduction

Law enforcement agencies and Coroner/Medical Examiners' (CME) offices often request that forensic anthropologists analyze an unidentified set of skeletal remains and create a biological assessment—typically including an estimation of sex, age at death, population affinity (the NIST Forensic Anthropology Subcommittee uses "population affinity" in their American National Standards Institute/AAFS Standards Board [ANSI/ASB] Standard 132 Standard for Population Affinity Estimation in Forensic Anthropology, which was just recently published [1]; this term is also widely used in recent publications [2–5]. We acknowledge that "population affinity" has replaced outdated terms in anthropological discourse, including "race" and "ancestry," without radical change in anthropological practice. Although this paper does not focus on population affinity specifically, we advocate for a field where racialized practices and typological classifications are obsolete), and stature—to aid in the identification process. Though methods for each area of the biological assessment have evolved over time, many have roots in Westernized ideas about the human body and identity [6]. This is particularly true for estimating sex, henceforth referred to as estimating "assigned sex at birth" (ASAB). When discussing forensic anthropological estimates, we advocate for the field to transition from using the term "sex" to "ASAB" because the latter highlights that reports and research classify individuals based on socially constructed understandings of assigned sex, gender, and their embodiment [7]. Sometimes referred to as "sex assigned at birth" or simply "assigned sex," ASAB reminds the reader that female and male are culturally defined descriptors, rather than biologically inherent identities, and

that enforcing this binary subjugates all bodies and identities that do not conform to social understandings of masculinity and femininity.

Sex is often used to discuss an individual's biology; however, definitions used socially and amongst researchers lack uniformity (for varying definitions of sex, see [8–14]). Sex is a broad concept that often entangles an individual's anatomy (including genes, chromosomes, and internal and external organs) with their personal environment, experience, and history [15–21]. Defining sex in a way that accounts for all variation is difficult. Often, specific disciplines operate under a working definition that changes with time and research. Current forensic anthropology standards define sex as "[the] biological differences between males and females" [22] (p. 1). However, this definition confines sexual identities to only female or male, ignoring that sex is not binary, but rather exists on a spectrum [15–17]. While we acknowledge that there is a relative binary for some biological characteristics in the human body (see: "3G sex" [20,23]), we echo DuBois and Shattuck-Heidorn [20] (p. 4) in that "the blanket assumption of a deep, thoroughgoing binary frequently works to mask variation in physiology, as well as sociocultural contributions to human biology." Additionally, the definition offered in the ANSI/ASB Standard 090 Standard for Sex Estimation in Forensic Anthropology [22] does not specify which biological differences should be referred to (e.g., chromosomes, skeletal expression), and integrates biological normalcy in forensic casework. Biological normalcy (i.e., bionormalcy) limits social perspectives and describes the presentation of "normal" bodies, therefore suggesting that bodies that do not conform to binary expectations lie outside this realm of normalcy [19,20].

Here, ASAB will refer to the assigned classification that an individual is given by a medical doctor at birth, most often assigned based on the visual appearance of the external genitalia [7], which typically align with anthropological "sex estimates." Sex, and ASAB, cannot be discussed without considering gender. Gender is the social performance of masculinity, femininity, and/or androgyny as ascribed by one's sociocultural and political surroundings. Currently, the ANSI/ASB Standard 090 Standard for Sex Estimation in Forensic Anthropology provides that "gender cannot be determined from skeletal remains" [22] (p. 3). Although we agree that the skeleton cannot determine gender, research has shown that surgical-based indicators of gender expression can be observed on the skeleton, e.g., in [24], providing key contextual evidence about the decedent's medical history and potentially their identity. Sex and gender are inextricably linked [20] because neither exist without influence from social bias, and both are categorized within historical and environmental context. We certainly are not the first to discuss the intricacies of sex and gender in forensic anthropology [7,25,26]; in fact, nearly all respondents (95.8%) to Tallman and colleagues' survey [25] expressed support for gendered research in the field. Additionally, many have proposed carrying out anthropological praxis without adhering to cis-heteronormative standards, though this has primarily been disseminated through conference presentations, e.g., [27–61], and theses e.g., [62–65]. We would like to further such conversations by recommending the standardization of the term ASAB in forensic anthropology casework and research.

Historically, and still today, forensic anthropology methods have been developed following culturally defined binary categories of ASAB, suggesting that most individuals can be correctly classified as either female or male, with a degree of certainty, e.g., in [66–70]. However, using only binary categories for identification risks impeding forensic investigations if the anthropologist's ASAB estimate does not match the individual's lived identity (see the case of "Julie Doe" [71–73]). Due to the wide spectrum of human skeletal variation, it is also likely that many individuals do not fit anthropological definitions of female or male, again risking the potential that these individuals remain unidentified.

Forensic anthropologists must aim to accurately represent decedents not only because accurate representation aids in identification, but also because medicolegal practitioners have a duty to respectfully care for deceased individuals and act as liaisons between the living and the dead. Additionally, forensic anthropologists are positioned to critically evaluate the intersection of biology and culture, meaning we can share knowledge regard-

ing the embodiment of social identities and the nonbinary (note that there is a difference between nonbinary sex/sexual expression and nonbinary gender identities [74]. Unless we specifically state that we are referring to nonbinary genders, we use nonbinary in the literal etymological sense to simply mean not consisting of only two) nature of human bodies with others. This field is, therefore, in a place to advocate for more accurate representations of decedents while also showing the public that the female/male binary is a social construct, not a biological fact. If forensic and medicolegal stakeholders do not directly advocate for a deconstruction of the sex and gender binary, members of the public may misuse scientific discourse to perpetuate harm toward individuals who do not conform (for examples, see X [formerly Twitter]; Reddit; independent online platforms such as Spiked, City Journal, and UnHerd; and other social media sites). Similar arguments have been made concerning hate groups' misappropriation of population affinity to further their own agendas of white supremacy [75].

Forensic anthropologists influence historical records and public perceptions relating to identity and embodiment and, therefore, bear a responsibility to strive for the most accurate representation of an unidentified decedent possible. One way to meet this goal is to ensure that forensic anthropologists use terminology that more accurately correlates with lived identities and variation in skeletal expression [76]. There are no consistent social or scientific definitions for terms such as 'sex', 'female', or 'male', meaning forensic anthropologists must rectify this shortcoming of ASAB estimation through inclusivity in terminology and research. As we discuss the importance of introducing standardized language, this paper will explore, and challenge, current understandings of sex and ASAB in forensic anthropology. We do this to highlight the socially constructed nature of ASAB and the subsequent identifiers that forensic anthropologists ascribe to skeletal remains. Other aspects of the biological assessment may also benefit from critical reflection; however, that is beyond the scope of this paper. Without broadening our terminology and methods to better include lived identities, forensic anthropologists risk exacerbating linguistic necroviolence—the mistreatment of human remains after death—or delaying identification, potentially indefinitely [73,77,78]. The extent to which identification may be delayed is currently unknown due to missing data on sex- and gender-diverse deaths and their prevalence in forensic casework.

2. A Moment of Self-Reflection

This paper was developed by members of the University of Nevada, Las Vegas (UNLV) Forensic Anthropology and Bioarchaeology Laboratory (FAB Lab). During our time as students, we have witnessed the negative impacts that cis-heteronormative ideologies have had on sex- and gender-diverse communities. In 2023 alone, state legislatures have codified and enforced sex and gender binarism in legislation and restricted educational topics regarding sex and gender more than in the past five years combined, e.g., see [79–84]. As queer scholars and allies, we are passionate about expanding normative preconceptions of ASAB to other forensic anthropologists and medicolegal practitioners. We would like to take this opportunity to facilitate future discussions amongst our colleagues.

Knowledge and logic are historically contingent [85]. We therefore acknowledge that our predecessors did not have the current understanding of sex, assigned sex, and gender that anthropologists have today. We also recognize that our own knowledge will continue to evolve and that our successors will likely correct some of the statements that we are making here. With this article, we are not attempting to be the arbiters of all discussions relating to sex, assigned sex, and gender in forensic anthropology. Rather, we aim to critically evaluate aspects of our field's practice. We understand that some may disagree with the recommendations in this article, and we look forward to future discussions and consensus within the field. The beauty of language is that it is fluid and can change with our evolving knowledge and social norms. As such, our shift in language regarding assigned sex in forensic anthropology should not be viewed as a conclusion to the discussion, but rather, a shift that will help the field challenge the sex, assigned sex, and gender binaries.

The current effort is one that aims to better reflect the biological realities of our bodies, while also acknowledging existing cultural influences.

Furthermore, we cannot ignore our responsibility in contributing to potential negative impacts through the use of existing methodology and language regarding ASAB estimations within our own forensic casework. Since the UNLV FAB Lab was established in 2019, we have consulted for the Clark County Office of the Coroner/Medical Examiner (CCOCME). Like many other forensic laboratories, we use the most applicable existing "sex estimation" methods in forensic anthropology in support of our casework. Despite recognizing that our ASAB estimations may not be reflective of an individual's lived identity, we continue to provide ASAB estimations when requested by the CCOCME. We also include a summary table on the first page of our reports that provides a basic list of findings, including a final estimation of ASAB. While "Assigned Sex at Birth" is a header with a dedicated section of the document, the disclaimer (i.e., footnote) is not available until later in the report. This could potentially limit the reach of the disclaimer if the report's summary table at the beginning of the document is primarily referenced. Nonetheless, and as will be discussed in more detail throughout the paper, we have adopted the above change in language in favor of a more representative term as a first step in acknowledging the limitations of our own practice.

3. Assigned Sex in Forensic Anthropology

Language and methods in modern forensic anthropological practice fail to accurately capture the variation observed in human skeletons [86], influenced not only by one's ASAB, but also individual genetics, environment, and cultural experiences. To move forward, it is imperative that we understand how the field has progressed regarding assigned sex. The following is intended to be a brief discussion of assigned-sex estimation in forensic anthropology, including a discussion on recent statistical findings. For more comprehensive reviews, see Klales et al. [87] and Klales [88].

Westernized concepts of sex that support patriarchal hierarchy have long shaped the sciences, from the Classic period of Greece well through the Renaissance [87,89]. Social status and representation within the sciences depended on proximity to maleness, meaning that the further one's body and identity deviated from what was perceived as naturally male, the less they were deemed worthy of care, consideration, and study. Those with any nonbinary form of sex or gender expression have been viewed as social or medical anomalies in need of correction in Western society [89–91]. Although a minority of feminist researchers began to challenge these assumptions [90,92], often, the most partisan conclusions have shaped public consciousness regarding sex and gender. For example, cranial and pelvic measurements had social ramifications for sex, assigned sex, and gender in that medicalists pointed to seemingly incontrovertible physical evidence (e.g., smaller skulls and wider pelvises in those classified as females) to suggest that some were "naturally destined for motherhood" [89] (p. 43) and that those individuals were intellectually and physically inferior [89]. These presumptions constructed foundational principles for anatomical knowledge and the differentiation of female and male skeletons into the eighteenth century, and often still do so today.

Both anatomists and biological anthropologists began developing methods for ASAB estimation in earnest in the early 1900s [93–95]. Visual assessments of the skull and pelvis were predominantly used, with researchers suggesting that all individuals possessed morphological characteristics that aligned with the socially constructed categories of female or male [96]. In the 1950s, methods, e.g., in [97,98], employing measurements and gross examinations of the ilium, ischium, and pubis, as well as the morphology of the greater sciatic notch, were developed and received wide acceptance throughout the forensic community [87,96] due to observed sexual dimorphism in the pelvic bones despite phenotypic variation in trait expression. These concepts of human variation remained influential through the end of the twentieth century and into the new millennium, with the development and widespread acceptance of nonmetric methods, such as those recommended by

Phenice [66], Acsadi and Nemeskeri [99], Buikstra and Ubelaker [67], Walker [100], and Klales and colleagues [68]. While nonmetric methods are generally easy to use, quick to record, and can be used in instances when remains are too fragmentary for metric assessment, it has been recognized that they are inherently subjective, largely limited by user experience and bias, and have the potential to reduce overall accuracy in estimations where individuals cannot be confidently categorized as female/male due to a variety of reasons (e.g., postmortem or taphonomic changes, missing skeletal elements, mixed trait expression, limitations in software data samples, etc.) [101].

Currently, standards in forensic anthropology suggest that individuals with mixed trait expression should be classified as "undetermined," alongside individuals for whom ASAB could not be accurately assessed due to preservation or a lack of available skeletal material. We suggest that forensic anthropologists might better capture the full range of human variation if we were to instead classify individuals with mixed trait expression as "indeterminate" in statistical and biocultural analyses. In doing so, we could better differentiate between individuals who do not fit into existing binary categories (i.e., indeterminate) and those for whom ASAB could not be accurately estimated due to taphonomic damage and/or missing skeletal elements (i.e., unknown). Standardizing and explaining this differentiation, when appropriate, would add necessary context for all medicolegal practitioners and other anthropologists.

Identification methods are also rooted in a legacy of typological classification that is not unique to forensic anthropology, as those in bioarchaeology and paleopathology have discussed [102,103]. However, typological classifications represent only a small part of one's identity and may unintentionally contribute to the marginalization of groups in the social system. Consider the estimation of population affinity as a clear example. Anthropometric methods for estimating population affinity were developed by early anthropologists, such as Earnest Hooton and Aleš Hrdlička, who conducted research with the intention of defining social categories of race within human anatomy to differentiate and distinguish white individuals. Many early methods shaped modern anthropological praxis and remain in use by various stakeholders in the medicolegal community despite the shared recognition that race is not biologically defined [104–107]. Additionally, stigma deriving from these methods is used socially and politically to oppress others, namely those who are Black, Indigenous, and People of Color (BIPOC). Early anthropometric studies, such as those using craniometrics, also used data largely collected from non-white, non-consenting, and/or incarcerated individuals in an attempt to find biological determinants of crime within the skeleton [108–110]. These studies further exemplify how anthropological methods were created to reinforce social ideas of human variation and behavior and how studies may ostracize groups who are already at risk.

Due to the unavoidable subjectivity in forensic anthropology identification methods, and the statistical rigor required by the Supreme Court's ruling in Daubert [111,112], the field began largely using statistical probabilities to support observations beginning in the early 2000s. However, quantitative methods cannot be completely objective as assessments remain subject to human error and bias, which include how the user chooses to apply the assessments [113,114]. For example, FORDISC [70] uses osteometrics and discriminant function analysis, a statistical process that uses measurements from an unknown individual to provide a probability that they belong to a certain group, to estimate an individual's ASAB. However, FORDISC only offers two potential categories for ASAB identification: female or male. Additionally, the Forensic Anthropology Databank, which houses all modern comparative samples for FORDISC, does not include any known sex- or gender-diverse samples. Using FORDISC versions 3.0 and 3.1, Albanese and colleagues [107] elaborated on how the forced linkage between assigned-sex and race estimations with a typological approach to human variation provides information that could compromise an investigation in 60 and 61% of cases, respectively. Some have suggested that forensic anthropologists should prioritize logistic regression analysis (e.g., with associated probabilities) over discriminant function analysis [115]. Most logistic regressions, however, use independent

factors to predict the likelihood of binary outcomes. Binary logistic regression provides no spectrum for identification, unlike multinomial logistic regression, which allows the user to predict more than two outcomes. To date, we do not know of any methods that use logistic regression with nonbinary outcomes. The program MorphoPASSE [116], which allows forensic anthropologists to score nonmetric traits and calculate the degree to which the remains match a previously identified reference group, also uses binary logistic regression analysis. More recent versions of MorphoPASSE recommend random forest modeling, which predicts outcomes based on random subsets of data represented in decision trees. However, random forest modeling has higher sensitivity and lower specificity than logistic regressions [117]. For ASAB estimation, this means that random forest models will produce fewer false negatives but more false positives, exacerbating the risk of ASAB misclassification for all individuals. Results from random forest models do not necessarily have to be binary; yet, MorphoPASSE produces binary outcomes, likely as a result of binary sex classification in reference samples. This is an inherent limitation to all ASAB methodology due to the biomedical, and subsequently medicolegal, classification of all individuals as either female or male, often excluding those with mixed trait expression or lived identities that are different from their ASAB. It is worth noting, though, that Klales and colleagues [68] expanded pelvic nonmetric scoring, originally developed by Phenice [66], from a three-point scale to a five-point scale to express a wider range of human variation within the skeleton, a progressive step toward the accurate representation of lived individuals.

Until recently [118], there were no published thresholds for qualifying the statistical confidence of ASAB analyses in forensic anthropology. In their study on cranial nonmetric traits of ASAB, Avent and colleagues [118] used discriminant function analysis, finding that posterior probabilities of at least 0.85 produced higher confidence in result accuracy when only assigning female or male. They further advise that a posterior probability in the range 0.75–0.84 offers a female or male classification that is better than chance, but with lower confidence than >0.85, thus qualifying that the reported ASAB would warrant adding "probable." It was recommended that posterior probabilities below 0.75 be reported as "indeterminate" due to accuracy rates that were not significantly different from chance (e.g., 50%). To date, no recommendations for confidence threshold cutoffs exist for pelvic nonmetric traits, and MorphoPASSE guidelines do not indicate posterior probability thresholds to use for qualifying confidence when interpreting results.

Recent works by Lane and Adams [27,28] called for the statistical deconstruction of binary assigned-sex estimation in forensic anthropology using fuzzy statistics. Fuzzy data clustering models, such as adaptive neuro-fuzzy-based inference systems (ANFIS), or fuzzy c-means, have the potential to assess how individual data points overlap rather than neatly fit into hardline categories [119,120]. These approaches show promise as they may be able to better classify individuals of overlapping group memberships/identities, rather than a set of mutually exclusive groups, though more research is necessary to better understand these methods. This is not to say that intersex or nonbinary individuals may fall only into a third, intermediate group. Rather, all individuals have the potential to fall anywhere on the spectrum of human skeletal variation, and anthropological interpretations should reflect this variation. It has been argued, however, that statistical methods for assessing human variation require better application, not more advancement [106]. Statistical methods for ASAB estimation are employed under the assumption that socially ascribed groups are static and biologically homogenous. Yet, social groups are fluid and shaped by time and space and are thus embodied in various ways that cannot be easily split into dichotomous phenotypic categories. Much like population affinity classification, methods for estimating ASAB are also influenced by socio-political concepts of inclusion and exclusion within social groups, which can result in marginalizing some and not others [106].

Ultimately it is not that forensic anthropologists are searching for the perfect statistical analysis for estimating ASAB. Rather, the field should consider testing that is not binary to begin with (e.g., ANFIS and multinomial logistic regression) and use reference groups with more comprehensive antemortem data to better represent the spectrum of skeletal

variation. Current methods apply statistics to fit the assumption that there is a definitive female/male binary, excluding individuals that do not have "normal" skeletal expression for either group. Statistical approaches may accurately classify many individuals; yet this does not prevent individuals' potential misclassification or exclusion. In other words, binary statistical frameworks may identify ASAB correctly for most, but ultimately fail to reflect the full continuum of variation observable in the human skeleton.

Skeletal traits are expressed on a continuum that should not be dichotomized because of social scripts. Traits used for ASAB estimations in forensic anthropology display considerable overlap between and within individuals, as well as populations, including those assigned female and male at birth [115,121]. Methods that do not consider variation of skeletal size and morphology, or age- or environment-related changes over the life course, potentially risk making the binary classification of a decedent uncertain and/or inaccurate [121]. For example, Walker's study [100] examining the use of the greater sciatic notch to estimate assigned sex found that younger adults typically had wider sciatic notches than older adults; wider sciatic notches are likely to be interpreted as more "feminine" by forensic anthropologists. Additionally, although Garvin and colleagues [122] stated that knowing the decedent's age at death was not necessary to estimate ASAB from the cranium, a recent study examining how senescence impacted cranial ASAB estimation found that the accuracy of ASAB estimations decreased in older adults [123]; see also [124]. However, these examples of variation are not perceived to deviate from the "norm" [125]. Current methods and language for categorizing ASAB are antiquated with the misconception that sex is an absolute binary, limiting space for the full spectrum of skeletal variation and biosocial identities.

An anthropologist's biological assessment is intended to aid in the identification of unknown individuals. This includes whether the individual was biologically and socially classified as female or male because these are core aspects of identity in Western culture. Early nonmetric methods, such as those created by Acsadi and Nemeskeri [99] for the skull and Phenice [66] for the pelvis, provided foundational starting points for narrowing down potential putative matches within missing and unidentified person investigations. Recognizing the need for less subjective results, metric and nonmetric assessments via programs such as FORDISC [70], MorphoPASSE [116], and (hu)MANid [126] were developed with the goal of strengthening ASAB estimates. These have been crucial for research, forensic investigations, and the field's technological advancement. However, linguistic and analytical standards that are widely employed in forensic investigations have limitations as to how they mirror or reflect dynamic human identities, such as ASAB, potentially hampering the resolution of forensic anthropological casework.

4. Critical Reflections on Sex

We propose the standardization of language used in forensic anthropology when discussing assigned sex at birth. However, our efforts would be remiss if we neglected to provide some reasoning as to why we feel that this change is necessary. While many within the field of forensic anthropology recognize the intricacies of human biology and anatomy, arguments for binary sex linger even within scientific disciplines, e.g., see [127–129]. Arguments for assigning binary sex have the potential to perpetuate harm onto those who do not fall within binary boundaries. This may lead to poor identification rates, deadnaming, misclassification in forensic databases, and decreased investigative efforts [78,130]. Here, we make an effort to galvanize critical conversations regarding traditional ideology relating to sex. Binary sex has certainly been challenged by other anthropologists. For example, the American Anthropological Association (AAA) and Canadian Anthropology Society (CASCA) have recently challenged harmful rhetoric regarding sex, ASAB, and gender by canceling a proposed panel for their 2023 annual meeting titled "Let's Talk About Sex, Baby: Why biological sex remains a necessary analytic category in anthropology" [131]. In taking this action, the AAA and CASCA directly advocated for the sex- and gender-diverse community, encouraging other anthropologists and the general community to follow suit.

Western society has constructed social norms around a series of reductive Cartesian dualisms (e.g., nature or nurture, gracile or robust, female or male), embracing bionormalcy in casework and research [19,20]. However, Western notions of sex ignore that binary sex as a concept, and an identity, is culturally constructed. The hegemonic culture instills binary gender norms, which humans subsequently embody, often to reflect the two sexes that are assigned at birth [132]. Individuals who transgress these social norms become vulnerable to violence and victimization [133,134]. There are several examples of individuals who subverted the Westernized sex and gender binary throughout history and across cultures, such as those who are intersex or part of the hijra community [135–137]. This is because sex has not been categorized independently of culture, historical contingency, and social schemas such as class, race, and sexuality [138,139].

While much research has shown that other species exhibit higher degrees of sexual dimorphism [140,141], the human body and experience are far more complex. Humans experience unique cultural stressors that impact their skeletal morphology, creating a feedback loop between human biology, culture, and embodiment [96,142,143]. Although cultural stress is not isolated to humans, e.g., see [144,145], the degree of reliance on cultural adaptations to buffer environmental stressors is uniquely human. Despite the phenotypic variation in trait expressions across the human body, anthropologists continuing to use dimorphic classifications may unintentionally create biases in their results. Harmful assumptions are rooted in biological anthropology theory and method, largely pertaining to which bodies are and are not "normal" (i.e., overtly female or male). Those viewed as abnormal were long considered deviants within Western society [146]. We stress the need to restructure forensic anthropology's language and open a dialogue on how our language and methods can better represent those who are sex- and gender-diverse. Western social norms have historically propagated viewing ASAB and primary sex characteristics/reproductive organs as intrinsically linked rather than framing human sex variation as it naturally exists on a spectrum. These social norms influence the biomedical and forensic sciences, often leading to conflations between sex and gender, implying that both are binary and interchangeable [20].

By default, individuals who do not fit the binary at birth are often categorized as either female or male socially and medically. These individuals are typically referred to colloquially as being intersex and may be referred to as having Disorders (or Differences) of Sex Development [147]. Nonbinary sexes have been recorded in the medical literature for many years, with Anne Fausto-Sterling [148] being among the first to advocate for an expansion of sex categories throughout the sciences. Fausto-Sterling [148] suggested that there were at least five "sex" categories within the human species: females, males, and three intersex categories. Noting that even five categories would be too few to capture all sexual variation, and though this publication has since received rightful critique and revision [149], Fausto-Sterling [148] advocated for the expansion of ASAB categories as a direct challenge to the Western social norms that have infiltrated scientific research. Research has shown that there are substantially more than just two ways individuals may express sexual variation [15]. Thus, categorizing all individuals within the female/male binary is a social decision based on Western patriarchal norms regarding gender, ASAB, and sexuality [15,17].

The intersex body is often pathologized medically as a result of social norms encouraging the female/male binary [142,150]. However, this misclassification may result in intersex individuals having to endure "corrective" genital surgery, hormone therapy, and misinformation regarding their medical history and identity [151–154]. This dramatically impacts intersex individuals' lives and their embodiment of sex, gender, and sexuality [138]. Intersex people make up 1–2% of the population, the same as people with red hair, and at least one in one-hundred individuals are born with bodies that lie beyond the biological binary in some way [15,155]. Some have suggested that the 1–2% statistic is inflated. For example, Sax [127] argued against the definition of intersex used by Blackless and colleagues [15], suggesting that those who exhibit "typical" genitalia yet "atypical" gonadal,

hormonal, or chromosomal differences should not be considered intersex [127]. Excluding those who are cisgender and/or have unambiguous genitalia would result in less than one percent of individuals being classified as intersex, constituting a dichotomy in Sax's opinion. However, we argue that language surrounding intersex individuals should be all-encompassing rather than exclusionary, should not reduce individuals to ambiguous or unambiguous genitalia, and should not exclude those with the most common forms of nonbinary biological expression (i.e., Klinefelter syndrome, Turner syndrome) to conform biology to social norms. Additionally, intersex conditions that do not express phenotypic overt variation have a history of being underreported, suggesting that the 1–2% statistic may be an underestimate [156–159]. Though the number of intersex people continues to be debated, it is imperative that forensic practitioners account for these individuals regardless of their frequency in a population, as their existence will continue to matter.

Although it may seem counterintuitive, "neutrality, in th[ese] context[s], is itself a subjective stance" that reveals unaddressed bias [160] (p. 2). Additionally, those who have the social and academic power to shift the methodology are often not the ones who suffer systemic oppression [160]. It is, therefore, the modern anthropologist's duty to actively challenge outdated assumptions regarding sex, assigned sex, and gender. We encourage our peers to critique and reflect upon attempts to accurately estimate "sex" from the human skeleton in forensic settings. Without this critical reflection, we risk misidentifying individuals whose bodies do not conform to the current binary standards.

5. Language Use in Forensic Anthropology

Language regarding sex, assigned sex, and gender used amongst forensic practitioners remains inconsistent. Inconsistent language can lead to data misinterpretation or a lack of clarity in meaning amongst researchers, further hindering identification efforts, e.g., see [25,78,161]. In addition to the National Institute of Standards and Technology (NIST) standards, the National Institute of Justice (NIJ) Forensic Science Research and Development Technology Working Group (TWG) is an established group of forensic science practitioners working to identify operational needs and requirements across forensic science disciplines. Of the eight disciplines represented, including "Forensic Anthropology and Odontology", only "Impression/Pattern Evidence" and "Seized Drugs" list standardizing language use in reports and shared information with non-scientific stakeholders as an important operational requirement [162]. These suggestions for operational requirements highlighted by the TWG serve to reiterate the need for standardized language across disciplines. However, this begs the question as to why forensic anthropology (and other forensic fields) have also not formally recognized these as potential areas of improvement.

Some practitioners have brought attention to forensic anthropologists' unintentional insensitivity in using certain biological descriptors for identification purposes [73,163,164]. For example, there is a growing concern that forensic anthropologists' language to discuss population affinity has the potential to hinder the identification process [77,165]. Population affinity has been critiqued for being ethically, methodologically, and theoretically typological. The linguistic changes that occurred following Sauer's [104] recommendation to no longer use the word "race" in forensic anthropology displayed the field's attempt to alter language. However, current methods will remain typological so long as they ignore the variation of phenotypic expression in humans [107,166].

Appropriately, the NIST Forensic Anthropology Subcommittee distinguishes sex from gender in the ANSI/ASB Standard 090 Standard for Sex Estimation in Forensic Anthropology [22]. Gender is defined by this NIST subcommittee as "an individual's culturally mediated social expression along the feminine-masculine continuum", and sex is defined as the "biological differences between females and males" [22] (p. 1). Unfortunately, this definition of sex reinforces the female/male binary and does not elaborate on what exactly the biological differences are, thus oversimplifying a complex and nuanced phenomenon. Additionally, while the standard includes a section for "Considerations," sex/gender fluidity and lived identities are not listed as potential "confounding factors" that should

be considered in the estimation of assigned sex [22]. This consideration is crucial as it includes intersectional identities that may more accurately reflect the lived experiences of a decedent. To their credit, however, the standard states "Contextual indicators inconsistent with the estimated sex may also be noted" [22] (p. 3). For the sake of clarification and inclusivity, this statement could be updated to include more specific instructions, such as "...that may be suggestive of gender or lived identities," rather than remaining so broad. As such, it is the authors' recommendation that the above standard, as a whole, be revised for clarification to provide reporting guidelines that incorporate inclusive language reflective of how individuals may have self-identified [77].

6. Advocating for Sex- and Gender-Diverse People

At present, the standards established for ASAB estimation specify the use of morphological traits and cranial and postcranial metrics. Yet, as a field, we have not come to an agreement regarding consistent or standardized language to use when estimating and reporting a decedent's ASAB [25]. Through the continued use of inconsistent language, we fail to challenge cis-heteronormative ideologies [76]. Many contributing to recent discourse in forensic anthropology call for commitments to diversity, inclusion, and equity in our research, the classroom, published works, and communications with the public [167,168]. We further urge a re-evaluation of the language used in forensic anthropology case reports and stress the importance of standardization that considers the lived identities of all sex- and gender-diverse individuals.

In the UNLV FAB Lab, all forensic anthropology case reports with biological assessments include a brief disclaimer in the form of a footnote denoting the challenges with estimating assigned sex. It states:

> *Methods for estimating assigned sex at birth are rooted in antiquated assumptions about a male/female binary. Modern science has shown that neither assigned sex nor gender are binary; rather they exist on a spectrum [15]. Unfortunately, standardized anthropological methods do not offer the range of sex and gender identities which exist in modern society. As such, we acknowledge that these results may only indicate how sexually dichotomous the individual's skeleton is and not their lived identity.*

The UNLV FAB Lab also denotes an individual's "sex" as "assigned sex at birth." Terminologically, ASAB indicates the exogenous conditions of the biological assessment, not the individual's lived experience or identity. It would be disingenuous to suggest that this paper is the first or only to suggest the inclusion of supplementary disclaimers in case reports in the form of statements, cover letters, or footnotes; it is possible that this practice is already commonplace (see Ross and Pilloud's recommendation for a cautionary statement [5], p. 679). However, without documenting standards of praxis, such knowledge exists only by word of mouth, which is both inherently exclusionary as well as an inefficient means to disseminate information. We wish to extend this conversation to the broader field by recommending that all forensic anthropologists adopt similar language (if not already doing so) and provide disclaimers in their final case reports to deter the misrepresentation of individuals' assigned sex and gender identities and to combat linguistic forms of necroviolence [73]. This should be replicated routinely across the field as case reports are a matter of historical record and should reflect the scientific nuances of the time. For this reason, the UNLV FAB Lab follows previous recommendations by providing a similar disclaimer for population affinity estimation.

Although these amendments may seem inconsequential to ASAB estimations in forensic anthropology, their importance extends far beyond a disclaimer. By building upon this foundation, forensic anthropologists can better serve sex- and gender-diverse individuals whose remains are entrusted to us by critically assessing and dismantling unconscious biases pertaining to ASAB estimation. Disclaimers, including our own, may vary by institution and will likely evolve over time as new research, identities, and paradigms emerge. Including graduate and advanced undergraduate students in the process of developing

ASAB disclaimers has both pedagogical and professional implications that may better promote belonging and engagement [169].

This issue extends far beyond forensic anthropologists. In addition to the use of disclaimers and standardized, inclusive linguistic practices, forensic anthropologists can better inform their stakeholders (e.g., CME offices) of relevant literature, methods, and limitations, as well as how to interpret reports. Additionally, we recommend that qualifiers of assigned-sex estimations in forensic anthropology reports (e.g., probable) be added as an option to the National Missing and Unidentified Persons System (NamUs) and similar databases that house assigned-sex estimations of unidentified persons. Operationalizing these changes may be difficult, particularly if coroners, medical examiners, and others who sign death certificates are limited by local policies, funding, and politics; however, rules and regulations can evolve. Stewart and Delgado [73] outlined how advocates in California successfully lobbied to change how a decedent's ASAB is recorded, resulting in expanded options for "sex" on death certificates and guidelines that legally protect those completing death certificates from potential associated damages or costs [170,171]. This example highlights how medicolegal practitioners can work together with community stakeholders to shape policy that better includes and represents affected communities. Herbert Marcuse once asked, "Can we say that the intelligentsia is the agent of historical change?" We echo their response in that alone we are not, but together can be, a catalyst with a decisive preparatory function [172] (p. 272). If we fail to act on these issues, then we perpetuate the violence, stigma, and discrimination that sex- and gender-diverse individuals often experience(d) not only in life, but also in death [173]. If no action is taken, we may also hamper our scientific goals of striving for accurate results.

Forensic anthropologists also routinely exclude a critical aspect of representation in their reports: gender. Evidence of gendered surgery may be visible on skeletal remains, e.g., see [24], and a recent study indicated that 39.5% of surveyed forensic anthropologists support including gender in forensic casework [25]. With nearly 40% of surveyed forensic anthropologists supporting supplementing case reports with indicators of gender expression at a time where no operational framework to do so exists, this could be a call to action to develop ways to provide ethically and scientifically rigorous professional observations. It is also critical that forensic anthropologists begin to routinely assess available material context and scene evidence following a blind analysis of skeletal remains, a shift in practice that we are not the first to advocate for, e.g., see [25,26,174–178]. This additional evidence may provide key insight into the life and death experiences of individuals, contextualize skeletal findings, and promote the use of biocultural assessments and frameworks [78,174–178] in forensic anthropology, rather than the medicalized biological assessment. Contextual evidence may include indicators of gender-affirming care for any decedent, including those who are transgender and gender-diverse (TGD), highlighting that this is mutually beneficial for those belonging to TGD and non-TGD communities [25,179–181]. If the American Board of Forensic Anthropology incorporated relevant publications on biocultural indicators of gender-affirming care into the required reading to pass the board examination(s), then they could contribute to a shift in leveraging this type of evidence into the repertoire of forensic anthropology casework and reports.

Several bioarchaeologists and forensic anthropologists recently released a new publication [26] that outlines the paradigmatic shift that forensic anthropology is experiencing in regard to gender. This publication advocates for gender equity in forensic anthropology casework, research, and education, while also providing an extensive review of literature and offering practices that can be operationalized. Recognizing and reconciling with social factors that may be embodied may aid in case resolution and limit necroviolence impacting marginalized communities. A number of these authors also worked to create the Contextual Observations in Support of all Gender Expressions (COSAGE) document that was recently introduced at the 2023 American Association of Biological Anthropologists Meeting in Reno, NV [182] and is currently available for public review and comment [183]. This form is composed of three sections—the estimation of ASAB, evidence of medical interventions,

and personal effects—that use biocultural data to explore indicators of gender identity and expression on, and associated with, skeletal remains. Implementing this document into forensic casework has the potential to supplement a medicolegal team's insight into an individual's gender expression and allows for more holistic data collection. When inductive evidence presents itself, forensic anthropologists should consider both the assigned sex and gender of decedents, with the parallel recognition that these categorizations may differ from an individual's lived reality. This nuanced approach has the potential to help anthropologists challenge harmful typological identifiers and dismantle the perpetuation of a rigid binary categorization in casework and research [25,182]. To ensure that language regarding sex and gender does not also change without methodological advancement, Stewart and Delgado [73] offered recommendations for forensic practitioners to alter their language and practice related to TGD decedents to limit necroviolence. These authors recommend actionable items for individuals and institutions, including the following: using a decedent's preferred name, pronouns, and identity indicators that reflect their lived experiences or other gender-neutral terminology when identity is unknown; becoming familiar with LGBTQ+-inclusive language and concepts; connecting with living communities and advocating for their needs; supporting policies for TGD inclusion in medicolegal settings, documentation, databases, and records; both understanding the differences between ASAB and gender, as well as considering both when analyzing remains; and aiding in monitoring TGD deaths in public health data [73]. Incorporating these suggestions may help forensic practitioners challenge current typological classification methods and include those who have been excluded (e.g., sex- and gender-diverse people) in identification efforts and research.

7. Conclusions and Future Directions

Forensic anthropologists play an integral role in identifying decedents and ensuring they are accurately represented and respected throughout the identification process. To date, no uniform guidelines exist among forensic anthropologists for optimal methods or language to use when estimating a decedent's ASAB. Nor are there methods to address nonbinary ASAB. Forensic anthropologists and other medicolegal practitioners can utilize the suggested language in research, reports, and pedagogical practices to more accurately describe decedents and their identities. We advocate for forensic anthropologists to transition from using the term 'sex' to 'ASAB' to indicate that the "sex estimation" practitioners ascribe to decedents is socially constructed and differentially embodied. Additionally, we recommend that all forensic laboratories include a disclaimer in case reports denoting the limitations of ASAB estimates and differentiate between those with mixed trait expression (i.e., indeterminate) and those on whom an ASAB analysis cannot be performed (i.e., unknown). In applying these changes, forensic anthropologists actively challenge antiquated Westernized concepts and advocate for those that have been and continue to be marginalized.

The future of anthropological praxis relating to sex, ASAB, and gender exhibits much room for growth, not only linguistically but also methodologically. We encourage others in the field to consider future research and identification efforts that do not rely on the a priori binary classification of decedents. Using more than two categories may allow for a better understanding of how skeletal presentation intersects with social identity. Additionally, it may be beneficial for forensic anthropologists engaged with CME offices to pursue efforts similar to those of the New Mexico Decedent Image Database (NMDID) [184], which collects routine computed tomography images and biocultural antemortem data from decedents to be used for public health and forensic research. These efforts may also aid in achieving the NIJ Forensic Science Strategic Research Plan's (2022–2026) strategic priority of "[creating] databases that are accessible, searchable, interoperable, diverse, and curated" [185] (p. 11). The NIJ TWG may also consider adding an operational requirement for forensic agencies to routinely collect medical imaging and biocultural data from decedents as this will help build representative databases and assist the NIJ in developing new protocols and opportunities

that aid the needs of forensic scientists [162]. We recognize that there are operational, economic, and bioethical challenges in achieving this goal, though these discussions are outside of the paper's scope. Finally, we urge our colleagues to remain critical about the language and practices used in forensic casework and research. Through critical analysis and formative discussions, the field of forensic anthropology may enhance the care of sex- and gender-diverse individuals.

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