Forensic Anthropology Vol. 5, No. 2: 161–180
DOI: 10.5744/fa.2020.0030

RESEARCH ARTICLE

Centering Transgender Individuals in Forensic Anthropology and Expanding Binary Sex Estimation in Casework and Research

Sean D. Tallman[a,b]*† • Caroline D. Kincer[a]† • Eric D. Plemons[c]

ABSTRACT: Due to disproportionate violence impacting the transgender community, forensic anthropologists may encounter the remains of trans individuals; however, it is unknown how often trans individuals are represented in casework and if practitioners have sufficient knowledge about trans bodies. After contextualizing forensically relevant demographics for the trans community, this study uses survey data of forensic anthropologists to critically explore the collective knowledge of and experience working with trans individuals; practitioners' perceptions of sex and gender; and potential opportunities for trans-oriented research. The results indicate that 28.9% of respondents have worked with trans individuals in casework, but most forensic anthropologists were unfamiliar with forms and evidence of gender affirming procedures. Additionally, the survey indicates that forensic anthropologists struggle with the binary nature of forensic sex estimation, with 42.4% agreeing that sex is binary and 56.2% disagreeing. Similar opposition was found with reporting gender: 39.5% indicated that gender should be reported in casework and 31.0% disagreed. Moreover, current sex estimation methods are: rigidly binary; not reflective of human biological variation; and inadequate for trans individuals as they are based on assigned sex. To dismantle rigidly binary sex categorization, we propose the adoption of a biocultural and queer theoretical approach to forensic sex estimation and in sexual dimorphism research that challenges heteronormative assumptions, questions typological two-sex categorization, and combats the presumptions that gender and sex are stable, independent entities that convey universal meaning. Relatedly, the expansion of trans-oriented research, which is supported by 95.8% of respondents, will further improve methodological accuracies.

KEYWORDS: Forensic anthropology, transgender and gender-diverse individuals, binary and assigned sex, survey data, biocultural queer theory, transgender studies

Introduction

Presently, it is unknown how frequently transgender individuals are represented in forensic anthropological casework due to the near-complete dearth of transgender-related research and published case reports in the forensic anthropological literature. Consequently, it is likely that forensic anthropology researchers and practitioners have yet to fully consider the forensically relevant issues related to transgender demographics, violence, and medical interventions, or the efficacy of current binary sex estimation practices when applied to transgender decedents. Therefore, this study uses survey data to explore the field of forensic anthropology's current knowledge of—and experience working with—transgender bodies; perspectives regarding gender and sex in forensic anthropological casework; and important avenues of transgender-related research in order to recontextualize sex estimation practices and sexual dimorphism research to better reflect human biocultural variation.

The appropriate consideration of transgender individuals first requires the understanding of proper terminology. Transgender or trans (abbreviation) broadly refers to individuals whose gender identity does not align with the sex that was assigned to them at birth (GLAAD 2020). As such, gender represents the collective behaviors, activities, roles, and attributes that societies deem appropriate for different genders—namely girls/women and boys/men—which may interact with but is distinct from biological sex (World Health Organization 2020). Gender, which is fluid and limitless, can be considered an invention or idea that both oppresses and expresses identities (Bornstein 1994). Biological sex refers to an individual's classification at birth, usually as female or male on a birth certificate, which is largely based on the visual assessment of external anatomy, but more broadly includes chromosomes, hormones, internal and external reproductive organs, and secondary sex characteristics (GLAAD 2020). The psychological condition whereby gender and assigned sex do not align is referred to as gender dysphoria, which is a diagnostic category that represents an individual's overall

[a]Department of Anatomy & Neurobiology, Boston University School of Medicine, 72 East Concord Street (L 1004), Boston, MA 02118
[b]Department of Anthropology, Boston University, Boston, MA 02215, USA
[c]School of Anthropology, University of Arizona, Tucson, AZ 85721, USA
*Correspondence to: Sean D. Tallman, Department of Anatomy & Neurobiology, Boston University School of Medicine, 72 East Concord Street (L 1004), Boston, MA 02118
Email: sean.tallman@gmail.com
†Shared first authorship

Received 25 September 2020; Revised 05 December 2020; Accepted 10 December 2020

cognitive disconnect with their assigned sex and the accompanying emotional distress (American Psychiatric Association 2013). Conversely, non-transgender individuals, or cisgender individuals, are those whose gender identity correlates with their assigned sex (GLAAD 2020). To treat gender dysphoria, individuals may pursue psychological, social, legal, and/or medical transition (Glynn et al. 2016); however, not all trans individuals transition, as indicated by a recent survey demonstrating that approximately 38% of trans individuals had not undergone transition-related interventions (James et al. 2016). Moreover, the transition process is not limited to hormonal or surgical interventions, but can also include alterations in clothing and appearance, counseling, name change, and/or official identification documentation change (James et al. 2016). Thus, transgender self-identity is not necessarily dependent on an individual's outward appearance or whether they receive medical care to transition (GLAAD 2020), but it is related to interpersonal, social processes that recognize and support one's identity through gender affirmation (Glynn et al. 2016; Nuttbrock et al. 2009; Sevelius 2013). More specifically, transgender women are women who were assigned male at birth, while transgender men are men who were assigned female at birth. Additionally, non-binary often describes those whose gender identity is outside of the categories of man and woman, and gender non-conforming may describe individuals whose gender expression is not conventionally feminine or masculine (GLAAD 2020). While for some, the terms non-binary and gender non-conforming (collectively referred to as gender diverse) may fall under the umbrella of transgender or trans, they are not synonymous with transgender/trans.

Currently, there are estimated to be more than 1.4 million trans adults in the United States, with the trans community comprising approximately 0.6% of the U.S. population (Flores et al. 2016). Additionally, a Human Rights Campaign (2020a) survey of more than 10,000 LGBTQIA+ youth found that 10% of respondents self-identified as trans or broadly gender non-binary. However, legal recognition of transgender individuals varies by state and favors letters from medical authorities over letters from psychologists/therapists, evidence of hormone therapy, or full-time lived experiences as the transitioned sex (Lambda Legal 2020; van Anders et al. 2014). At present, 26 states allow for sex to be changed on birth certificates without surgery, 22 states require surgery, and two states (Ohio and Tennessee) do not allow birth certificates to be altered regardless of surgery (Lambda Legal 2020). For drivers' licenses, all states allow gender to be changed; however, the documentation needed varies by state (National Center for Transgender Equality 2020). Additionally, several states now allow individuals to use "X" as a non-binary gender option on drivers' licenses and other government issued identification (Harmon 2019; National Center for Transgender Equality 2020). While equality and acceptance for trans and gender-diverse individuals have not been achieved universally across the U.S., the growing use of non-binary "X" demonstrates that societal beliefs about the rigidly assigned and categorical sex binary are changing.

Violence against Trans Individuals

While trans and gender-diverse individuals have historically been disproportionately susceptible to violence and homicides (Human Rights Campaign 2020b; Meyer 2015), the recent rise in visibility of ongoing trans-focused violence has highlighted how the medico-legal community, in general, and forensic anthropology, in particular, have largely neglected trans and gender-diverse people. Further, as highlighted by Spade (2015), myriad cultural norms, practices, sites of knowledge production, and politics intersect to uphold the continued subjugation and, by extension, elimination of trans individuals. Increased visibility has importantly demonstrated that trans Black and Indigenous individuals and other people of color (BIPOC) are under the highest levels of risk of violence due to a confluence of transphobia, racism, and misogyny (Human Rights Campaign 2020c; Waldron & Schwencke 2018). Between 2017 and 2019, there were at least 26–30 documented violent trans deaths per year in the U.S. (Human Rights Campaign 2020b; Trans Respect 2020). Worldwide, at least 350 trans and gender-diverse individuals—mostly BIPOC—have been killed in 2020 with the majority of murders having occurred in Brazil and Mexico (Wareham 2020), which increased from 331 trans deaths in 2019 (Wareham 2019). As of December, 2020, at least 40 violent deaths of trans people have been reported in the U.S. (Human Rights Campaign 2020b). Because these statistics include only deaths of confirmed (i.e., "out") trans individuals, statistics about violence against the trans and gender-diverse communities are inherently underestimated.

The inaccuracies and underestimation regarding reported violence against the trans and gender-diverse communities are further compounded by the fact that state laws inconsistently recognize hate crimes. Currently, only 22 states recognize both sexual orientation and gender identity in hate crime laws (Human Rights Campaign 2020c). While numerous societal systems do not support trans and gender-diverse communities (Spade 2015), present legal infrastructure is particularly problematic due, in part, to the upholding of the LGBTQIA+ panic defense (i.e., "gay panic") that allows perpetrators to defend their violent actions, including murder, as a loss of control in response to the victim's LGBTQIA+ identity (LGBT Bar 2021). Only 11 states and Washington, D.C. have banned the panic defense, while several states have pending legislation to ban the defense. The lack of consensus regarding the classification of hate crimes impacts how jurisdictions report violence against trans individuals, along with other LGBTQIA+ individuals, and

further skews crime statistics. Moreover, as argued by Spade (2015), the implementation of hate crime laws and anti-discrimination measures alone are insufficient in combatting negative societal perceptions of trans and gender-diverse individuals and in protecting them. This is because large-scale and insidious federal- and state-level administrative governances actively define societal norms, classify people, and continually create vulnerable groups and their subjugation through those definitions and classifications. Accordingly, active resistance to the maintenance of societal and legal infrastructure that produces vulnerable groups should be (re) framed with critical race theory, as it allows us to question how state-created systems promote marginalization, subjugation, racism, and criminalization (Spade 2015).

In addition to the present, ongoing violence disproportionately experienced by the trans community, it is likely that there are hundreds of cold cases involving trans individuals across the country (Trans Doe Task Force 2020). The Trans Doe Task Force is a volunteer group that works with Medical Examiner (ME)/Coroner offices, law enforcement agencies, and forensic anthropologists to research missing and unidentified trans individuals through news media and NamUs (https://www.namus.gov) (Michael et al. 2020; Trans Doe Task Force 2020). At present, the Trans Doe Task Force lists more than 70 active cold cases involving trans individuals across the U.S. that date from the 1970s to the present; however, this is not an exhaustive list.

Gender Affirming Medical Transition

Because medical interventions to treat the distress associated with gender dysphoria have the potential to indirectly or directly impact skeletal structures, it is important for forensic anthropologists to be familiar with these alterations. Medical transition may begin with cross-sex gender-affirming hormone therapies (GAHT) as they are less risky and more accessible than surgery, and GAHT may be required prior to surgery (Berli et al. 2017; Rothman & Iwamoto 2019; Schall et al. 2020). Nationwide survey data demonstrate that approximately 49% of trans individuals have undergone GAHT (James et al. 2016). While estrogen plays a significant role in bone metabolism and attaining peak bone density in females and males (Khosa et al. 2012; Rothman & Iwamoto 2019), studies on its inhibition or administration during GAHT have produced variable results. Some studies have demonstrated that trans women may have lower bone mass (Fighera et al. 2018; T'Sjoen et al. 2009; Wierckx et al. 2012), while others report increased bone mineral density in both trans women and men (Fighera et al. 2019; Singh-Ospina et al. 2017; Wiepjes et al. 2017). While the goal of GAHT is to reduce the prevalence of innate secondary sex characteristics and increase those of the transitioned sex (Berli et al. 2017), the long-term effects of GAHT on the skeleton and the landmarks used to estimate sex remain largely unknown (Mackenzie & Wilkinson 2017). Further, approximately 25% of trans individuals report having some form of gender affirming surgery (James et al. 2016). While the majority of surgeries alter breasts/chests or sexual organs in the form of genital-gender confirmation surgeries, facial feminization surgeries (FFS) alter the bone and cartilage of the facial skeleton and are likely more evident in forensic anthropological casework (Altman 2012; Schall et al. 2020). In the U.S., approximately 7% of trans women have received FFS and an additional 43% report wanting FFS in the future (James et al. 2016). Additionally, a facial masculinization surgery (FMS) for trans men was recently developed that augments the thyroid cartilage (i.e., Adam's apple) with rib cartilage (Deschamps-Braly et al. 2017).

The field of FFS was pioneered in the 1980s by Dr. Douglas Ousterhout, who developed two procedures focused on the glabellar region. The first surgical intervention is employed if the patient's anterior frontal sinus wall is thick enough to undergo burring, which shaves down the frontal bone to the desired shape and thickness (Ousterhout 1984; Salgado et al. 2018). If the patient's anterior frontal sinus wall is too thin to undergo burring, the glabella can be removed, shaved down, moved posteriorly, and reattached using metal anchors (Altman 2018; Dempf & Eckert 2010; Ousterhout 1984). A third, less invasive approach in altering the glabellar region involves the addition of hydroxyapatite cements to the frontal bone and subsequent remodeling to achieve the desired shape, which mitigates the risk of disrupting cranial nerves (Hoenig 2011). Other surgical procedures involve the mandible. One process involves the burring of the mental eminence or surrounding bone to reduce the height and width of the chin (Altman 2012; Schall et al. 2020). Additionally, genioplasties push back (shorten) or advance (lengthen) the mandible depending on pre-operative anatomy and desired outcome (Altman 2012; Gray et al. 2019). In another genioplasty procedure, the mental eminence can be removed, shaved down, and repositioned posteriorly with plates and screws. A similar procedure is performed laterally to the mental foramina in order to shorten the height of the chin (Abadi & Pour 2015). Surgeries on the gonial angles use burrs to shave down the sharper, more pronounced muscle attachments on masculine-appearing mandibles to make the overall jawline less angular (Altman 2012; Schall et al. 2020). Other common areas targeted for surgery include the hairline, cheekbone, and cartilage and/or bone of the nose (i.e., rhinoplasty) (Altman 2012; Ainsworth & Spiegel 2010; Hoenig 2011; Schall et al. 2020); however, these interventions may not leave skeletal indicators (Plemons 2014).

Skeletal Sex Estimation and FFS

Sex estimation has been highlighted as a crucial component of establishing the biological profile of an unidentified individual, while gender estimation has been considered outside of

forensic anthropological practice (Bertsatos et al. 2018; Kimmerle et al. 2008; Klales 2020a; Klales et al. 2012; Lestrel et al. 2011; Nikita & Michopoulou 2017; Perlaza 2014; Petaros et al. 2017; Sairam et al. 2016; Small et al. 2018). Importantly, the expression of sexual dimorphism differs between populations, and therefore ancestry and sex are inexorably linked. Sex is most confidently estimated from pelvic morphology (Buikstra & Ubelaker 1994; Klales et al. 2012; Phenice 1969; Walker 2005); however, long bones and the cranium can be used for sex estimation, especially if the pelvis is missing or damaged (Buikstra & Ubelaker 1994; Garvin et al. 2014; Garvin & Klales 2018; Patterson & Tallman 2019; Spradley & Jantz 2011; Tallman 2019; Walker 2008). Numerous craniofacial morphological features exist that can be used to differentiate between females and males (Williams & Rogers 2006), and research has repeatedly validated the glabella, nuchal crest, supraorbital margin, mastoid process, and mental eminence (Buikstra & Ubelaker 1994; Garvin et al. 2014; Tallman 2019; Tallman & Go 2018; Walker 2008). Traditionally, each of these traits is scored on an ordinal scale from 1 (most gracile) to 5 (most robust) and collectively considered to estimate where the skull, as a whole, falls on a simplified spectrum of female to male (Buikstra & Ubelaker 1994). Moreover, the ordinal scores can be entered into binary regression equations wherein probabilities can be calculated (Garvin et al. 2014; Klales 2020b; Tallman 2019; Walker 2008), or into other robust statistical programs that utilize Random Forest Modeling (Klales 2018, 2020b; Klales & Cole 2018). Metrically, sex can be estimated with cranial and postcranial remains in FORDISC 3.1 that produces probabilities (Jantz & Ousley 2005) or other discriminant functions that lack probabilities (France 1998; Patterson & Tallman 2019; Spradley & Jantz 2011). Regardless of method selection, which is based on skeletal completeness, analyst preference, and the estimated ancestry of the decedent, methodology is couched within a problematic two-sex system (Geller 2005), despite the categories of "probable female," "probable male," or "indeterminate" when uncertainty arises. Thus, current forensic anthropological perspectives and methods fail to accommodate variable sex and gender identities and are therefore inadequate at predicting sex beyond the rigid and assigned binary categorization.

The glabella, mental eminence, and gonial angles may be impacted by FFS; however, it unknown if their alterations will be significant enough to influence morphological or metric sex estimation using extant methods. While FFS has been researched extensively in medical and psychological contexts (Ainsworth & Spiegel 2010; Altman 2012; Dempf & Eckert 2010; Ousterhout 1984; Plemons 2014, 2017a, 2017b, 2019; Salgado et al. 2018; Spiegel 2010), there is a near-complete lack of research that examines how the skeleton is altered with FFS or FMS from a forensic anthropological perspective (Buchanan 2014; Cirillo et al. 2020; Schall et al. 2020). A noteworthy exception to this paucity is a recent study by Schall et al. (2020), who examined how FFS impact standard craniometric measurements by comparing those obtained from pre- and post-operative computed tomography (CT) scans of 11 trans women. Pre- and post-operative measurements were entered into FORDISC 3.1 (Jantz & Ousley 2005) discriminant functions to see how the individuals classified before and after FFS. Schall et al. (2020) found that all individuals were classified as male in the pre-operative discriminant functions and that all but one individual were classified as male in the post-operative discriminant functions. The results of Schall et al.'s (2020) study suggest that cranial dimensions may not be altered significantly enough from FFS to produce sex estimations that identify the correct/transitioned sex of trans females; however, surgical indicators may assist in identifying a trans individual. Thus, the historical lack of forensic anthropological engagement with trans individuals and associated research on the skeletal impacts of gender affirming procedures—and the disproportionate levels of violence experienced by the trans community—necessitate an examination of current trans-related knowledge and experience in forensic anthropology, along with a critical reevaluation of sex estimation practices.

Methods

To explore the current knowledge of trans bodies and perceptions regarding sex and gender in forensic anthropology, an anonymous survey consisting of 42 questions was developed using the Qualtrics Research Suite (https://www.qualtrics.com). The survey was submitted to Boston University's Institutional Review Board (IRB) for approval and due to the anonymous nature of the survey, it fell under the exempt category (IRB #H-38324). The survey primarily targeted the Anthropology Section of the American Academy of Forensic Sciences (AAFS), which had over 500 members at the time of the survey, via an unofficial email listserv for forensic anthropologists maintained by Phoebe Stubblefield. The survey remained active from November 30, 2019 until March 1, 2020 and included questions covering respondent demographics and employment contexts; casework experience involving transgender individuals; sex estimation practices and reporting; and transgender-related research opportunities (Table 1). After the conclusion of the survey period, the results were qualitatively and quantitatively analyzed using Qualtrics Research Suite and Microsoft Excel.

Results

A total of 158 responses (~26% of the AAFS Anthropology Section) were recorded; however, this included incomplete

TABLE 1—*IRB-approved questions included in the Qualtrics survey distributed to the AAFS Anthropology Section members.*

Question	Response options
Respondent Demographics	
Age (years):	Select one: 18–24; 25–34; 35–44; 45–54; 55–64; 65–74; 75–84; 85+
Gender:	Open Text Entry
Sex:	Open Text Entry
Level of education (highest degree):	Select one: Current Undergraduate; BA/BS; MA/MS; PhD; MD; PhD and MD; PhD and D-ABFA
Degree concentration:	Select all that apply: General anthropology; Biological/physical anthropology; Forensic anthropology; Skeletal biology/osteology; Anatomy; Archaeology; Bioarchaeology; Forensic sciences; Biology; Medical anthropology; Other, with open text entry
Experience working in the field of forensic anthropology, post-education:	Select one: N/A (student); 0–5 years; 6–10 years; 11–15 years; 16–20 years; 21–25 years; 26–30 years; 31+ years
In which contexts do you work? (select all that apply)	Select all that apply: N/A (student); Academia (college or university); post-doctoral research/practice; Medical Examiner/Coroner's Office; Government agency/laboratory; Non-profit human rights or humanitarian organization; Museum; Archaeology (state archaeology office, CRM); Unemployed; Other with open text entry
Casework Experience	
Are you actively engaged in forensic anthropology casework presently?	Select one: Yes; No
Total number of forensic anthropology cases that you have worked on, either as lead analyst or collaborator:	Select one: 1–10; 11–20; 21–30; 31–40; 41–50; 51–60; 61–70; 71–80; 81–90; 91–100; 101–110; 111–120; 121+
In forensic anthropological casework, how important is sex estimation in potentially identifying individuals? (0 = not important; 5 = moderately important; 10 = very important)	Select one: 0 (not important); 1; 2; 3; 4; 5 (moderately important); 6; 7; 8; 9; 10 (very important)
How strongly do you agree with the following statement? "Human biological sex is binary."	Select one: Strongly agree; Somewhat agree; Unsure; Somewhat disagree; Strongly disagree
Which of these shape your current practice of reporting sex as either female or male? (select all that apply)	Select all that apply: Existing practices delimit female/male as the only sex options; It is important to maintain reporting consistency that has always been female/male; In training and experience, female/male are the most accurate descriptors of human sex; N/A; Other, with open text entry
In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context in addition to anatomical evidence? (if yes or no, please explain why)	Select one: Yes, with open text entry; No, with open text entry; Unsure
In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context when lacking anatomical evidence? (If yes or no, please explain why)	Select one: Yes, with open text entry; No, with open text entry; Unsure
How strongly do you agree with the following statement? "Forensic anthropologists have the ability to identify intersex individuals through skeletal analyses."	Select one: Strongly agree; Somewhat agree; Unsure; Somewhat disagree; Strongly disagree
Do you believe that forensic anthropologists should report on the gender of an individual in forensic anthropological casework?	Select one: Yes, forensic anthropologists should always report on the gender of an individual, regardless of contextual evidence; Yes, forensic anthropologists should report on the gender of an individual, but only if there is overwhelming contextual evidence to support this claim; No, forensic anthropologists should never report on the gender of an individual, regardless of contextual evidence; Unsure; Other with open text entry
Have you participated in casework that potentially involved a transgender individual?	Select one: Yes; No; Unsure
If you have participated in casework that involved a transgender decedent, why do you believe they were transgender?	Select one: Scene context (e.g., clothing, other material articles associated with gender roles); Signs of surgery (e.g., facial feminization surgery); Information presented by an investigative agency (e.g., law enforcement, Medical Examiner/Coroner's Office); Other
In past casework, if you suspected an individual was transgender, did you officially report this information? (If yes, how? To whom? If no, why was this not reported?)	Select one: Yes, with open text entry; No, with open text entry; Unsure or N/A
In future casework, upon suspecting an individual is transgender, would you always include that suspicion in your notes and/or report?	Select one: Yes, I would report it in my notes and report; Yes, I would report it in my notes only (leave out of report); No, I would not report it in either notes or report; Other, with open text entry
If you would or would not report the evidence that a decedent is transgender in your notes or report, please explain why.	Open Text Entry

(*continued*)

TABLE 1—(*Continued*)

Question	Response options
Upon identifying a transgender individual in forensic casework, how would you report the individual's sex?	Select one: I would report this biological sex only (derived from pelvis and/or skull morphology/metrics; long bone metrics/morphology); I would report the transitional/preferred sex only (derived from evidence of surgery, material evidence, clothing, and/or scene context); I would report both the biological sex and the transitional/preferred sex; Other, with open text entry
Knowledge of Gender Affirming Surgical Procedures	
How familiar are you with transgender surgeries that could potentially affect forensic casework? (0 = very unfamiliar; 5 = moderately familiar; 10 = very familiar)	Select one: 1; 2; 3; 4; 5; 6; 7; 8; 9; 10
How familiar are you with Facial Feminization Surgery (FFS)? (0 = very unfamiliar; 5 = moderately familiar; 10 = very familiar)	Select one: 1; 2; 3; 4; 5; 6; 7; 8; 9; 10
Have you encountered any cases with signs of FFS? (If yes, what made you come to this conclusion?)	Select one: Yes, with open text entry; No; Unsure or N/A
Have you ever consulted any type of surgeon or medical professional when working on a forensic case?	Select one: No, never; yes, but rarely (1–5 times); Yes (5+ times)
Would you consider consulting a plastic surgeon, or other medical professional, if you suspected an individual had undergone FFS or another form of gender transition surgery? (If no, please explain why)	Select one: Yes; No, with open text entry
Have you consulted a plastic surgeon, or other medical professional, upon suspecting a decedent had undergone FFS or another form of surgery?	Select one: Yes; No
If you have consulted a plastic surgeon or other medical professional, do you have a specific contact established for such instances?	Select one: Yes; No
Do you think that Medical Examiner's/Coroner's Offices should specifically collect data on LGBTQIA+ deaths from suicides, homicides, and hate crimes?	Select one: No, no specific information is needed for this population; Yes, Medical Examiners/Coroners should record information about sexual orientation if it is known; Yes, Medical Examiners/Coroners should record information about gender if it is known; Yes, Medical Examiners/Coroners should record both sexual orientation and gender if they are known; Unsure; Other, with open text entry
Trans-Oriented Research	
Should forensic anthropologists conduct research that will actively improve the identification of transgender individuals?	Select one: Yes, No, Unsure
If you believe that forensic anthropologists should not conduct research that will actively improve the identification of transgender individuals, why do you believe this?	Open-ended field
When considering admissions into a graduate program, do you and your department consider diversity?	Select one: Research in this area should be left to the medical field; Research in this area should be left to the cultural field (i.e., cultural anthropologists, psychologists, sociologists); Other with open text entry
If you could envision research on one topic regarding the forensic identification of transgender individuals, what would you most want to see?	Open Text Entry
In your opinion, would involving the transgender community directly improve research/casework regarding transgender individuals? (If yes, how? If no, please explain why)	Select one: Yes, with open text entry; No, with open text entry
There is little existing research to support forensic anthropologists with the identification of transgender individuals. Why do you think such research has not been extensively pursued? (select all that apply	Select all that apply: Lack of appropriate study samples; Lack of research interest in exploring this area; The number of transgender individuals is so small, there is no need for it; Topic is too political; Topic is too sensitive; Topic is out of the realm of forensic anthropological research; Lack of funding opportunities; Concerns about where to present and/or publish findings; Other with open text entry
Academia Considerations	
Do you teach a course/s in forensic anthropology?	Select one: Yes; No; N/A
Do you discuss issues regarding the identification of transgender individuals in forensic casework with your students? (If no, please explain why)	Select one: Yes; No, with open text entry
If you discuss issues regarding the identification of transgender individuals in forensic casework with your students, please briefly explain how you approach this topic/conversation.	Open Text Entry

(*continued*)

TABLE 1—(*Continued*)

Question	Response options
Do you discuss issues regarding transgender individuals in forensic research with your students? (If no, please explain why)	Select one: Yes; No, with open text entry
If you discuss issues regarding transgender individuals in forensic research with your students, please briefly explain how you approach this topic/conversation.	Open Text Entry
Is there anything you wish to add regarding casework and/or research involving transgender individuals?	Open Text Entry

responses. Each question had a different response rate due to the fact that no questions required an answer for the respondent to advance, and certain questions were only displayed to some respondents (e.g., questions only displayed if a respondent worked in academia).

Demographics of Survey Respondents

Out of 140 respondents, 38.6% had obtained a doctorate degree only, and an additional 19.3% had also received Diplomate-American Board of Forensic Anthropology (D-ABFA) certification. Another 25.7% of respondents had received a master's degree only and 12.9% had received a bachelor's degree only. Additionally, 2.9% were current undergraduate students, and the remaining 0.6% possessed both a PhD and MD. The most common degree concentration held by respondents was in forensic anthropology (31.2%), followed by biological/physical anthropology (25.1%), skeletal biology/osteology (11.6%), archaeology (4.8%), anatomy (4.2%), forensic sciences (3.9%), general anthropology (1.6%), medical anthropology (1.3%), and biology (0.6%). An additional 1.0% of participants responded "Other," including degree concentrations in human biology, genetics, and human rights. Respondents mainly worked in academic settings (34.2%) and ME's/Coroner's Offices (20.5%). Other occupational contexts included government agency/laboratory (11.7%), non-profit human rights or humanitarian organizations (5.9%), archaeology (5.4%), museums (2.4%), and post-doctoral research/practice (0.98%). An additional 2.9% of respondents selected "Other" and reported their occupational contexts as private practice; Disaster Mortuary Operational Response Team (DMORT); consultant to coroner's offices, police, pathologists, or fire marshal; National Institute of Legal Medicine; and bioarchaeology. Additionally, 16.1% were students.

When asked about years of experience, many of the respondents were active students who had no experience working in forensic anthropology post-education (26.4%). Additionally, 22.1% had between zero and five years of experience; 15.7% had between six and 10 years of experience; 10.7% had between 11 and 15 years of experience; 8.6% had between 16 and 20 years of experience; 7.9% had between 21 and 25 years of experience; 3.6% had between 26 and 30 years of experience; and 5.0% had 31 or more years of experience. Out of 140 respondents, 69.3% were actively engaged in forensic casework and have participated in a considerable number of cases. In particular, regarding the number of forensic cases worked either as lead analyst or collaborator, 30.9% had worked 121 or more cases (Table 2).

Casework Involving Transgender Individuals

Out of 128 respondents, 28.9% reported that they had participated in casework that involved a trans individual, indicating that this demographic is presently represented in forensic anthropological casework. Of those who had participated in casework involving a trans individual, 31.4% reported that they based this finding on scene context; 20.0% reported that they based this finding on signs of surgery; 17.1% based this finding on information presented by an investigative agency; and 31.4% reported "Other" and commented that they based this finding on more than one of the aforementioned criteria (Table 3).

When asked, "In past casework, if you suspected an individual was transgender, did you officially report this information?", 41.7% of the 36 respondents selected "Yes"; 38.9% selected "Unsure"; and 19.4% selected "No." Many respondents indicated that they reported this information in a forensic anthropology case report, in NamUs, or to the ME/Coroner. A survey respondent took the opportunity with this question to offer the following example: **"There was a**

TABLE 2—*Number of cases worked by survey respondents either as lead analyst or collaborator.*

Number of cases worked	n (%)
1–10	37 (27.2)
11–20	12 (8.8)
21–30	9 (6.6)
31–40	5 (3.7)
41–50	4 (2.9)
51–60	5 (3.7)
61–70	4 (2.9)
71–80	5 (3.7)
81–90	1 (0.7)
91–100	5 (3.7)
101–110	3 (2.2)
111–120	4 (2.9)
121+	42 (30.9)

TABLE 3—*Number of survey respondents who have participated in casework that involved a transgender individual and how they arrived at that conclusion. Those in italics represent self-reported answers.*

Indicator	n (%)
Scene context	11 (31.4)
Signs of surgery	7 (20.0)
Information presented by investigative agency	6 (17.1)
Other	11 (31.4)
Two of the above	5 (14.3)
All of the above	3 (8.6)
DNA	1 (2.9)
ID already known	2 (5.7)

TABLE 4—*Survey respondents' familiarity with FFS.*

Familiarity level	n (%)
0 (very unfamiliar)	14 (12.2)
1	8 (7.0)
2	11 (9.6)
3	9 (7.8)
4	13 (11.3)
5 (moderately familiar)	15 (13.0)
6	7 (6.1)
7	11 (9.6)
8	12 (10.4)
9	3 (2.6)
10 (very familiar)	12 (10.4)

discordance between the anatomical evidence and material evidence and this was presented to law enforcement and the medical examiner. The individual was unidentified, and we feared ignoring the possibility that the individual was transgender would prevent identification in the future; it also provides investigators potential leads on the case." When asked, "In future casework, if you suspect an individual is transgender, would you report this information?", 72.0% of 118 respondents selected "Yes" and commented that this information would be pertinent when trying to make an identification. Conversely, 11.0% selected "No" and commented that it was not within their job to report on this information. In a specific trans case, one respondent noted that they, **"did not report [a decedent] as transgender, only as sex [*sic*] could be estimated,"** which underscores the limitations of current sex estimation practices. The remaining 17.0% selected "Unsure." However, when asked, "In forensic casework, upon suspecting an individual is transgender, would you always include that suspicion in your notes and/or report?", 44.4% of 115 respondents selected, "Yes, I would report it in my notes and report"; 25.2% selected, "Yes, I would report it in my notes only (leave out of report)"; 7.0% selected, "No, I would not report it in either notes or report"; and 23.5% selected "Other." Of the respondents who selected "Other," most commented that they would report this finding on a case-by-case basis depending on the specific evidence presented. Further, some of those who were reluctant to report on a trans individual mentioned the fear of outing a closeted individual, while others remarked on the lack of appropriate methods and research to employ and cite.

When asked, "Upon identifying a transgender individual in forensic casework, how would you report the individual's sex?", 75.2% of 117 respondents indicated that they would report both the biological sex and the transitioned sex; and 7.7% indicated that they would report the biological sex only (derived from pelvis and/or skull morphology/metrics; long bone metrics). An additional 1.7% responded that they would report the transitioned sex only (derived from evidence of surgery, material evidence, clothing, and/or scene context). The remaining 15.4% answered "Other." When asked to expand upon their answers, many of those who selected "Other" commented that their decision would be dependent on the scenario at hand. However, most would either report the transitioned sex or *both* transitioned and biological sex, but never the biological sex only.

When asked how they would rate their familiarity with gender affirming surgeries, 41.5% of 118 respondents indicated that they were largely unfamiliar with these surgeries, as represented by one respondent who admitted, **"In all honesty, I have no idea what transgender looks like, skeletally . . ."** Additionally, 36.5% indicated they were largely familiar with transgender surgeries, and the remaining 22.0% indicated that they were moderately familiar with transgender surgeries. When asked specifically about their familiarity with FFS, 47.8% of 115 respondents indicated that they were largely unfamiliar with these procedures; 39.1% indicated that they were largely familiar with FFS; and 13.0% indicated that they were moderately familiar with FFS (Table 4). While 47.8% of respondents were unfamiliar with FFS procedures, 71.2% out of 118 respondents reported that they have never encountered signs of FFS when working on a forensic case. Therefore, it is possible that forensic anthropologists have missed signs of FFS due to unfamiliarity with the procedures. Only 7.6% had encountered signs of FFS during forensic casework. The remaining 21.2% were unsure whether or not they had encountered signs of FFS in casework.

Out of 118 responses, 50.9% reported that they had never consulted with a surgeon or medical professional when working on a case where they suspected a trans individual, and 31.4% had consulted a surgeon or medical professional, but rarely (1–5 times). The remaining 17.8% had consulted a surgeon or medical professional more than five times. However, 96.6% of 114 respondents reported that they would consult a surgeon or medical professional in the future if they suspected a decedent had undergone some sort of gender affirmation surgery. The remaining 3.4% selected, "No," they would not contact a surgeon or medical professional for assistance if they saw signs that an individual might be trans.

When asked, "Do you think that Medical Examiner's/Coroner's Offices should specifically collect data on LGBTQIA+ deaths from suicides, homicides, and hate

crimes?", 70.3% of 118 respondents selected, "Yes, Medical Examiners/Coroners should record both sexual orientation and gender if they are known." An additional 16.1% selected, "Yes, Medical Examiners/Coroners should record information about gender if it is known"; and 3.4% selected, "Yes, Medical Examiners/Coroners should record information about sexual orientation if it is known." Another 5.1% of respondents answered "Unsure" and 5.1% answered "Other." None of the respondents selected, "No, no specific information is needed for this population." Some respondents commented that the collecting of this data at the ME/Coroner level might be difficult due to inconsistencies in collecting and reporting terminology between investigators and agencies. Other respondents commented that information that does not pertain to the cause and manner of death are unimportant and therefore should not be collected. However, it is critical to consider that gender and sexual orientation identities may, in fact, directly pertain to the cause and manner of death.

Sex and Gender Estimation in Forensic Anthropology

When asked to rate how strongly survey participants agreed with the statement, "Human biological sex is binary," 9.5% of the 137 respondents strongly agreed; 32.9% somewhat agreed; 1.5% were unsure; 24.1% somewhat disagreed; and 32.1% strongly disagreed. Moreover, 39.5% of 81 respondents reported that in training and experience, "female/male" are the most accurate descriptors of human sex; 39.5% reported that existing practices delimit "female/male" as the only sex options; and 9.9% indicated that it is important to maintain reporting consistency and "female/male" are the categories that have always been used. An additional 1.2% responded "N/A," and 9.9% selected "Other." Those who answered "Other" wrote in responses that included sex estimations with "likely," "probable," and "possible" female/male as well as options such as "undetermined," "indeterminate," and "unsure" for sex estimation. The importance of binary sex classification in forensic anthropology is further demonstrated with practitioners' perceived inability to identify intersex individuals (i.e., those born with sexual or reproductive anatomy that does not match definitions of female or male). When asked to rate how strongly they agreed with the statement, "Forensic anthropologists have the ability to identify intersex individuals through skeletal analyses," 40.3% of 129 respondents strongly disagreed; 24.8% somewhat disagreed; 27.1% were unsure; 7.8% somewhat agreed; and no respondents strongly agreed. The adherence to the idea that sex is binary by some forensic anthropologists and the finding that most practitioners do not think that forensic anthropologists can identify intersex individuals demonstrates that extant sex estimation methods are inadequate for trans, intersex, and gender-diverse individuals.

TABLE 5—*Breakdown of individuals who answered "Yes" and "No" when asked, "In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context in addition to anatomical evidence?"*

Reported answers	n (%)
Yes	
It is important to consider the entire context of a scene and person	21 (63.6)
The items indicate gender, and gender correlates with sex	5 (15.2)
Provides information about how a person self-identified	4 (12.1)
Other	3 (9.1)
No	
Materials are not sex-specific	24 (36.9)
Gender does not equal sex	20 (30.8)
Sex should only be based on skeletal material	13 (20.0)
Other	8 (12.3)

TABLE 6—*Breakdown of individuals who answered "Yes" and "No" when asked, "In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context when lacking anatomical evidence?"*

Reported answers	n (%)
Yes	
Any information about context is useful	4 (50.0)
Other	4 (50.0)
No	
Only skeletal evidence should be considered	27 (32.9)
Gender does not equal sex	15 (18.3)
Scene materials do not dictate sex	13 (15.9)
Too inaccurate	6 (7.3)
Other	21 (25.6)

When asked, "In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context *in addition* to anatomical evidence?", 62.8% of 129 respondents selected "No" and 31.0% selected "Yes." When asked to explain their answer, many respondents who selected "No" reported that they: limited their analyses to skeletal evidence only; left analysis of scene materials to investigators; or made a distinction between sex and gender (Table 5). For example, one respondent noted, **"Context means very little."** Conversely, respondents who selected "Yes" reported that scene context was an important part of anthropological analysis, as one respondent affirmed that, **"those materials reflect gender, and gender is correlated with biological sex."** Other respondents commented that they might use scene context/materials to infer gender, but that this did not necessarily correlate with biological sex. The remaining 6.2% responded "Unsure." Additionally, when asked, "In forensic anthropological casework, would you base a sex estimation on clothing, material evidence, and/or scene context *when lacking* anatomical evidence?", 79.8% of 129 respondents selected "No," 8.5% selected "Yes," and 11.6% selected "Unsure." When asked to extrapolate on their responses, many respondents reported that they would not base a sex estimation on material evidence but would possibly use it to discuss gender identity (Table 6).

Many respondents reported that scene materials were not a reliable source of information due to the high cultural variability surrounding clothing.

While the vast majority of respondents would not use scene context to infer biological sex, many reported that scene context may be useful for inferring gender. When asked if they believed that forensic anthropologists should report on the gender of an individual during forensic casework, 36.4% of 129 respondents selected, "Yes, forensic anthropologists should report on the gender of an individual, but only if there is overwhelming contextual evidence to support this claim," while 3.1% selected, "Yes, forensic anthropologists should *always* report on the gender of an individual, regardless of contextual evidence." One respondent noted, **"SWGANTH [Scientific Working Group for Forensic Anthropology] guidelines list gender as an unacceptable practice; however, the increased likelihood that a nonbinary person will be the victim of violence indicates we should develop better procedures that incorporate gender into sex reporting."** Another 31.0% of respondents selected, "No, forensic anthropologists should *never* report on the gender of an individual, regardless of contextual evidence." This opposition is reflected in one respondent's perspective**: "The gender of a person is not prudent to the construction of the biological profile."** Additionally, 23.3% of respondents selected "Other" and commented that the use of scene context should be considered on a case-by-case basis to infer gender with great discretion. The remaining 6.2% selected "Unsure."

Trans-Oriented Research in Forensic Anthropology

Out of 119 responses, 95.8% reported that forensic anthropologists should conduct research that will improve the identification of transgender individuals. The remaining 4.2% answered "Unsure." None of the respondents indicated that forensic anthropologists *should not* conduct research involving trans individuals; however, one respondent contextualized their response: **"It's not that I don't think FAs [forensic anthropologists] should study transgender individuals. It's just that this is a very hot topic right now so there is a lot of interest, yet the population of interest is fairly small. There appear to be far more students interested in studying transgender forensic cases than there are such cases. While I think it is reasonable, perhaps there are larger groups that forensic anthropology could benefit from further study on, such as Native Americans, African Americans, etc."** However, despite the perceived popularity among students, few published studies that include trans individuals exist in forensic anthropology (although see the following AAFS conference abstracts: Bouderdaben 2019; Cirillo et al. 2020; Michael et al. 2020). Further, this comment demonstrates that there are numerous groups in need of more in-depth study, and that some forensic anthropologists view the deficits in research involving larger populations as more essential than deficits representing smaller populations.

When asked, "If you could envision research on one topic regarding the forensic identification of transgender individuals, what would you most want to see?", the responses were highly varied (Table 7). These included answers such as skeletal alterations during surgery and indications thereof; pelvic characteristics; effects of GAHT on skeletal morphology and ways to recognize their presence; the reevaluation of cold cases; better understanding of the range of gender expressions; and demographic information and statistics on violence against trans individuals. When asked why they thought research on transgender individuals has been historically lacking in forensic anthropology, 31.2% of respondents indicated this was due to the lack of appropriate study samples; 19.3% indicated it was due to the lack of researcher interest in exploring this topic; 12.3% indicated "Other"; 11.6% indicated it was due to the lack of funding opportunities; 9.5% claimed this topic is too political; 8.1% indicated the topic is too sensitive; 2.1% indicated the number of transgender individuals is so small, there is no need for this research; and 2.1% indicated this topic is too far out of the realm of forensic anthropological research. Those who responded "Other" were asked to share their thoughts, and 10 out of the 35 respondents indicated the lack of diversity in forensic anthropology as a hindrance to research involving trans individuals. Moreover, out of 110 respondents, 97.3% indicated that involving the trans community would improve research/casework relating to trans individuals. Respondents generally agreed that involving the trans community would be beneficial because they have the best

TABLE 7—*Desired trans-oriented research topics in forensic anthropology.*

Topics	n (%)
Surgeries and resulting skeletal alterations	27 (31.7)
GAHT	21 (24.7)
GAHT and surgeries	9 (10.6)
Demographics	4 (4.7)
Biological markers of a trans individual	4 (4.7)
Cold case resolution	3 (3.5)
Range of gender expressions	2 (2.3)
Inter- and intra-observer error/statistics	2 (2.3)
Stigmatization of trans individuals	1 (1.2)
Genome surveys	1 (1.2)
Studies of living individuals	1 (1.2)
Database of descendants	1 (1.2)
Standardization in reporting	1 (1.2)
Non-skeletal material identifiers	1 (1.2)
Collaboration with theoretical researchers	1 (1.2)
Inclusion of trans researchers	1 (1.2)
Cross-references of cultural and biological factors	1 (1.2)
Data to support conclusions	1 (1.2)
Other	1 (1.2)
Unsure	1 (1.2)
Already conducting research	1 (1.2)

knowledge about their community and would provide invaluable insight. The remaining 2.7% of participants indicated that involving the trans community would not be beneficial.

Academia

The final section of the survey was oriented toward forensic anthropologists who worked in academia. Out of 115 respondents, 49.6% taught courses in forensic anthropology; 43.5% did not; and 7.0% responded "N/A." Out of the 56 respondents who taught forensic anthropology courses, 82.1% reported that they discussed issues regarding the identification of transgender individuals in forensic casework with their students and the remaining 17.9% did not. Further, 60.0% of 55 of respondents reported that they discussed issues regarding transgender individuals in forensic research with their students and 40.0% did not. One respondent commented that they had many students interested in pursuing research projects relating to trans issues, but there are no appropriate skeletal collections, highlighting the increasing importance of CT data in forensic anthropological research.

Discussion

The results of this survey, which capture a robust range of experience levels and employment contexts, indicate that forensic anthropologists occasionally engage with the remains of trans individuals in casework (28.9%) despite their low representation in the U.S. population; however, the majority of forensic anthropologists are unfamiliar with gender affirming surgeries and FFS in particular. The frequency of trans individuals in forensic anthropological casework highlights the concerning fact that this community is disproportionately the target of violence and that practitioners should familiarize themselves with forensically relevant information for this at-risk demographic. The importance of recognizing trans individuals in casework is further supported by the finding that 41.7% of those who have worked with trans individuals in casework reported the individual as transgender, and that 72.0% would report individuals as transgender in future casework. Additionally, issues related to trans identification and research are clearly important to the forensic anthropological community, as indicated, in part, by educators reporting that they discuss both trans identification (82.1%) and trans-related research (60.0%) with their students. Likewise, the demographics of the survey respondents (e.g., many students and those with bachelors or master's degrees only) underscores the importance of trans-related topics to younger forensic anthropologists. Further, 70.3% of survey respondents think that ME/Coroner offices should record both sexual orientation and gender of decedents in order to better track LGBTQIA+-related violent crime; however, at present, numerous states and jurisdictions do not collect these data (Human Rights Campaign 2020c). Thus, trans individuals represent an important and neglected group for forensic anthropologists to thoughtfully consider, yet we largely lack the necessary information and research findings to sufficiently recognize this demographic or estimate their transitioned sex, thereby leading to error in sex estimations.

The neglect of trans individuals and inadequacies of sex estimation methods in forensic anthropology can be attributed to the fact that the field has yet to dismantle binary and assigned conceptions of sex, which are taxonomically rooted and not reflective of human biological variation. For example, the survey indicates that the forensic anthropological community struggles with the binary nature of forensic sex estimation, with 42.4% agreeing that sex is binary and 56.2% disagreeing. This is further illustrated by the finding that the majority of respondents (65.1%) believe that forensic anthropologists are unable to identify intersex individuals utilizing extant methods. Likewise, the field struggles with whether reporting gender falls under the purview of forensic anthropologists, with 39.5% indicating that gender should be reported and 31.0% opposed to reporting gender. These opposing perspectives mean that for some forensic anthropologists, sex and gender meaningfully intersect and factor into identity.

Sex and Gender Estimation in Forensic Anthropology

One issue commonly highlighted in the present research was how the distinction between sex and gender creates discrepancies when reporting sex, particularly for trans and gender-diverse decedents. Some respondents commented that only biological sex should be reported, never gender, as forensic anthropologists do not have the ability to comment on gender. However, other respondents reported that gender was an important aspect to consider when trying to identify an individual. Opposing perspectives such as these illustrate forensic anthropologists' uncertainty with the role of gender and the fact that there is no codified way to interpret and communicate information about trans or gender-diverse individuals in casework. As one respondent noted, **"A standardized system needs to be put in place to assess and report on potential transgender individuals."** Additionally, the dearth of research including trans individuals further contributes to a lack of understanding about trans bodies and propagates inaccurate methods that are not reflective of human biological variation or lived experiences.

The existence of trans and gender-diverse individuals challenges the traditional sex estimation procedures that have been highly ingrained in forensic anthropological teaching, research, and practice, as these individuals may not, anatomically speaking, fall squarely into preexisting sex categories.

Yet, it is critical that forensic anthropologists use the appropriate sex in forensic anthropological casework to ensure that decedents' humanity and self-identity are upheld. However, this requires that forensic anthropologists recognize potential signs of gender affirming surgeries, though most practitioners are unfamiliar with surgical manifestations, and the vast majority of trans individuals do not undergo surgical procedures. A recent survey found that in 74 out of 85 trans deaths investigated by 65 law enforcement agencies from 2015 to 2018 across the U.S., the abandoned gender and/or name was used to refer to victims (Waldron and Schwencke 2018). As highlighted by Waldron and Schwencke (2018), using the abandoned name and misgendering by investigators can slow an investigation, hinder identification, and breed mistrust between the trans community and law enforcement. While forensic anthropologists are not at the forefront of homicide investigations, information about decedents is generated and relayed to investigators by forensic anthropologists. Thus, we play a role in manufacturing identities and need to be cognizant about the implications in using only biological/assigned sex for trans cases and in the ways that we report sex estimations. This is illustrated in the following survey respondent's experience: **"In the case I worked on that involved a transgender person, she was misgendered and ridiculed by law enforcement and her body was denied release to her friends (her biological family had abandoned her and refused to care for her remains). Transphobia is endemic in law enforcement, and I am embarrassed to say that this extends to forensic anthropology. We tend to think that anthropology is 'better' somehow, since we acknowledge that gender is a social construct, but it is my experience that most anthropologists do not fully understand trans individuals and even actively argue against their validity through reinforcing the concept of binary sex (which, biologists would argue against)."** This exemplifies how trans individuals can be treated disrespectfully in death, as in life, and that forensic anthropology can be considered complicit in trans mistreatment through the ongoing invalidation of their lived experiences by reinforcing rigid, binary, and assigned sex estimations that fail to reflect human biological diversity.

As sex and gender identities variably intersect and are biocultural, performative processes (*sensu* Butler 1993), we advocate that forensic anthropologists apply a biocultural approach when estimating the sex of a decedent, and that gender and associated evidentiary material *may* need to be cautiously considered by forensic anthropologists and other investigators. While several survey respondents shared the sentiment that, **"clothing, material evidence, and/or scene context are unrelated to biology,"** as noted by one individual, this argument becomes significantly murkier with trans and gender-diverse individuals. For trans individuals who are seeking gender affirmation by living and presenting as their transitioned sex, regardless of hormone or surgical interventions, clothing and outward appearance may represent important expressions of both self-identified sex and gender. Furthermore, not all trans individuals undergo surgical procedures to transition. Therefore, in cases lacking surgical evidence of gender affirming procedures, the consideration of scene context, personal effects, and clothing may be critical in identifying the correct (i.e., transitioned) self-identified sex and, possibly, gender. As noted by one survey respondent, **"When trying to determine who someone was it is important to take into consideration how they chose to identify in life and considering their material possessions may aid in identification."** The biocultural approach is not new to forensic anthropology and has proved useful in ancestry/population affiliation estimation, particularly in identifying Latinx individuals and displaced foreign-born nationals found along the U.S./Mexico border through the incorporation of biological, cultural, and contextual evidence—namely with skeletal stress markers and their relation to structural violence (Beatrice & Soler 2016; Birkby et al. 2008; Soler and Beatrice 2018; Soler et al. 2019). However, the biocultural approach has been slow to gain traction across the discipline outside of deciphering Latinx population affiliation because many practitioners concern themselves with, or are given access only to, the skeletal remains and many advocate for "blinded" analyses so as to reduce bias. This perspective is illustrated by one respondent: **"Considering material evidence may introduce bias into sex estimation for skeletons that are ambiguous."** In fact, 62.8% of survey respondents reported that they would not base a sex estimation on material evidence or scene context in addition to anatomy, largely because practitioners contend that forensic anthropological analyses should be limited to skeletal remains. However, nearly 40% of respondents indicated that gender—based on contextual information—should be reported in forensic anthropological cases, and that contextual information was the most frequently cited line of evidence for forensic anthropologists who have worked with trans remains (31.4%). Thus, the material evidence may rightfully feature prominently in sex and/or gender estimations for some cases where skeletons are sexually ambiguous, as it provides another line of evidence for the expression of self-identity.

While forensic anthropologists understand that sexual dimorphism is population-specific and significant ambiguity exists on a "spectrum" of female to male (e.g., probable female/male and indeterminate), at present we operate within two-sex (Geller 2005) and two gender (Bornstein 1994) models, which reify the rigid and typological binary sex and gender perspectives that are being destabilized by LGBTQIA+ individuals, queer theory, and third-wave feminism. Additionally, this population-specificity underscores the inexorable link between race/ethnicity/ancestry and sex in both forensic skeletal analyses (Gere 1999) and in the scientific

definitions of "female" and "male" articulated by surgeons who perform trans surgeries, which are often couched in terms of desirable ethnic traits (Plemons 2019). Analysts are forced to place the decedent into one of the rigidly defined sex estimation categories, yet no guidance or consensus exists regarding how one should select categorization. For example, sex estimation could be accomplished numerous ways, including overall morphological gestalt analysis based largely on experience (e.g., Bass 2005; Buikstra & Ubelaker 1994; Phenice 1969; Rogers 1999; Rogers et al. 2000); morphological logistic regression equations (e.g., Garvin et al. 2014; Klales et al. 2012; Tallman 2019; Tallman & Blanton 2020; Walker 2008); metric thresholds (e.g., France 1998; Patterson & Tallman 2019; Spradley & Jantz 2011; Stewart 1979); and metric discriminant function analyses (e.g., Jantz & Ousley 2005; Spradley & Jantz 2011; Patterson & Tallman 2019), among other methods (e.g., Tallman & Go 2018; Vance et al. 2011). Regardless of method(s) selection, which is at the discretion of the analyst and is limited by taphonomic alterations, the final sex categorization is based on the confidence and informed, yet subjective opinion of the analyst. However, the sex category selected and associated confidence level is framed in terms of the *skeleton's* manifestation of femininity (gracility) or masculinity (robusticity) rather than the *analyst's* cultural biases or social constructs about the biological and anatomical expression of sex (Geller 2005). Only the methods that provide probabilities allow for the analyst to ascribe a degree of confidence to their estimation (Bartholdy et al. 2020). However, even if using a method that has associated probabilities (e.g., Jantz & Ousley 2005; Klales et al. 2012; Tallman 2019; Tallman & Blanton 2020; Rogers et al. 2000), there is no real delimited or biological threshold whereby a probability transitions from "probable female" to "female." Even if we arbitrarily select a probability of 0.80 as the transition from "probable" (*sensu* Bartholdy et al. 2020), how do we factor in multiple probabilities derived from different body regions? Thus, much like medical practitioners ascribing female or male at birth, ascribing female or male to the skeleton is, in itself, a cultural process that has been largely ignored by biological and forensic anthropologists (Geller 2005; Gere 1999).

Moreover, estimating the sex of a skeleton as either female or male does not mean that the decedent lived, presented, or identified as either sex, akin to the fact that labeling a skeleton as "African American" or "Black" does not mean that they identified similarly. As identities are not simply the result of biological processes and bodies exist in social worlds, it is important that forensic anthropologists consider how individuals lived and self-identified; otherwise, the field reduces identity to biology/anatomy, considers bodies in biological isolation, and constrains our relevance in the manufacturing of accurate and meaningful identities. Additionally, concluding that the sex is indeterminate/ambiguous for a skeleton can signify that: the methods lack resolution; there is conflicting anatomical evidence (e.g., female and male indicators); there is not enough skeletal data; or the analyst lacks confidence in the assessments. However, skeletal ambiguity could also signify that the remains represent a trans or gender-diverse individual, though this is generally not considered by most forensic anthropologists. While beyond the scope of this research, intersex individuals may manifest as skeletally subtle as highlighted by Geller (2005). This is likewise not considered by most forensic anthropologists despite the finding that intersex individuals may comprise 2% of births (Backless et al. 2000). Moreover, we largely assume, either consciously or subconsciously, that people, whether living or deceased, are cisgender (and heterosexual) and that sex and gender are stable, unchanging phenomena. This binary and static rhetoric pervades the field, such as when we collectively note that we are often correct in our sex estimations because, after all, it is a "50:50 chance." This simplistic perspective is further highlighted by Klales (2020d:xxxi) in a recent volume dedicated to sex estimation: "Sex estimation lacks some of the inherent difficulties found with the other profile parameters because the outcome is limited to only two options: male or female." In reality, sex and sex estimation have not, and likely never have been, a 50:50 chance or simply female *or* male; rather, this dichotomized perspective was borne from heteronormative assumptions about sex and gender that have been repeatedly created and propagated through educational, training, and research processes.

These heteronormative perspectives may bias our interpretation of skeletal remains even if we employ mitigated objectivity (*sensu* Winburn 2018). Therefore, much like the allied fields of archaeology and bioarchaeology, forensic anthropology would greatly benefit from the incorporation of queer theoretical perspectives that engage with transgender studies in its approach to conceptualizing sex and gender in casework and in the flourishing body of sexual dimorphism research (Bornstein 1994; Boyce et al. 2018; Butler 1993; Marinucci 2010; Spade 2015; Stryker 2006, 2004; Walks 2014). Though difficult to define, queer theory challenges sex and gender binaries, essentialism, and dominant heteronormative frameworks that underscore academic scholarship (Marinucci 2010). Following Geller (2017:68), a queer perspective explores the production of knowledge and power; generates novel research inquiries; presents different ways of knowing; combats erasure of marginalized individuals; and "voices discontent with regulatory mechanisms and disciplinary norms," among other actions. Closely aligned with queer theory is transgender studies, which, according to Stryker (2006:3), "is the academic field that claims as its purview transsexuality and cross-dressing, some aspects of intersexuality and homosexuality, cross-cultural and historical investigations of human gender diversity, myriad specific

subcultural expressions of 'gender atypicality,' theories of sex embodiment and subjective gender identity development, law and public policy related to the regulation of gender expression, and may other similar issues." In particular, bioarchaeologists have made considerable progress in understanding that socio-sexual diversity has existed since time immemorial (e.g., Blackmore 2011; Cobb 2005; Croucher 2005; Dowson 2000; Geller 2005, 2008, 2009a, 2009b, 2017, 2019; Joyce 2000; Meskell 2002), yet forensic anthropology's perspectives and methodologies have not allowed for similar disciplinary and theoretical growth. As highlighted by Bornstein (1994), binary conceptualizations of gender and sex result in one group (e.g., men/males) having more power over the other (e.g., women/females), but queer theory allows for and encourages different and fluid ways of thinking. Advocacy for a queer theoretical perspective in forensic anthropological research and praxis is not meant to imply that analysts should be queer or that we should actively look to label bodies as "queer" in the forensic record, but that we should collectively challenge heteronormative assumptions, question typological assigned/two-sex categorization, and combat the presumptions that gender and sex are stable entities that convey universal meaning. Inherent in this process is interrogating who has had narrative control and power in establishing definitions for the expression of sex and gender (e.g., cisgender straight white males) (*sensu* Heath-Stout 2020), which is particularly prescient for a field like forensic anthropology that struggles with diversity and inclusion (Tallman 2020; Tallman & Bird 2020). Following Geller (2009a), our field should self-reflect as to why we claim that the determination of a skeleton as either female *or* male is one of the *most important* aspects of the biological profile beyond utilitarian reasons, and question our discomfort with conflicting skeletal data and our inability to categorize. Further, because individuals do not necessarily self-identify with their biological sex—and can have sex legally changed in many jurisdictions—this begs the question: should we remain preoccupied with researching and estimating only binary biological/assigned sex in blinded isolation without considering how sex intersects with gender and other identities that we ascribe skeletons? Of course, the correct sex estimation can help to limit the pool of missing persons in some forensic contexts, but sex also serves as an identity marker that variably intersects with gender, in addition to age, social race, socioeconomic status, (dis)ability, and sexual orientation among other identities. Moreover, queer theory and transgender studies enable us to self-reflect about how our own perceptions of sex and gender—and relatedly, race and ancestry—influence the way we conduct casework and research. The failure to acknowledge that other sex and gender identities exist and that forensic anthropologists play an active role in trans and gender-diverse invisibility is something that the field can confront with queer theoretical perspectives.

Toward a Biocultural and Queer Theoretical Perspective in Forensic Anthropology

The suggestions presented in this section may serve as a starting point to better assess and report sex and gender estimations; however, expanded research and ongoing discussions in the field will further contribute to nuanced approaches. Forensic anthropologists should take a more holistic, humanistic, and critical approach to sex estimation and research that allows for different ways of existing beyond the two-sex/assigned system that has been propagated and reinforced since the field's inception. Importantly, this may include considering the gender of a decedent through analyses of material evidence and scene context since, for many trans individuals, their outward presentation may reflect their sex and gender. Accordingly, forensic anthropologists—when possible and relevant—could cautiously incorporate contextual evidence such as personal effects, material evidence, recovery scene information, and signs of surgery, especially when they encounter an individual with conflicting anatomical evidence (*sensu* Beatrice & Soler 2016; Birkby et al. 2008; Soler and Beatrice 2018; Soler et al. 2019; Winburn et al. 2017; Winburn et al. 2016). Increasingly, forensic anthropologists are involved in the recovery of human remains in ME/Coroner contexts; however, it may also be possible to view the associated material evidence or scene photographs if only presented with human remains. While for some this may belie the "blind" analysis that has been a cornerstone of forensic casework, an anthropologist deploying an un-blinded biocultural and queer perspective may be more attuned at detecting contextual nuances that suggest a trans or gender-diverse individual compared to other, less holistically trained investigators. On the skeletal sex estimation notes forms, a question can direct the analyst to consider non-skeletal evidence, such as: "Is there clothing, personal effects, or other contextual evidence that possibly expresses gender or sex self-identity?" The analyst can choose to list and describe the non-skeletal evidence found with the remains and, if warranted, consider a range of gender expressions that may align with the evidence.

Further, analysts should consider multiple sex indicators across the skeleton and understand that prioritizing pelvic indicators will likely misclassify trans individuals. This underscores the problem of relying exclusively on anatomical evidence for sex estimation in forensic anthropology and in prioritizing the pelvis as is apropos for most practitioners (Klales 2020c). Therefore, the cranium should be included in all sex estimations, as this may be the only region of the body where surgical intervention has impacted bone. While Schall et al. (2020) found relatively minor changes in cranial measurements in 11 pre- and post-operative trans women, the study's sample size was understandably small, and at this point we lack a comprehensive understanding regarding the

range of variation in the effects of GAHT and FFS/FMS on the skeleton. In addition to analyzing the cranium for sex estimation, analysts should look for surgical alterations to the mental eminence and glabellar regions (including signs of hydroxyapatite cements) and subtle signs of burring on the glabella, mental eminence, and gonial angles, and these should be differentially diagnosed from surgical intervention resulting from trauma or pathology. On the skeletal sex estimation notes forms, we suggest adding: "Are there signs of possible gender affirming surgical interventions (e.g., burring, plates, screws, pins, hydroxyapatite cement) on the skull (e.g., glabella, mental eminence, gonial angles)?" This question explicitly directs the analyst to consider surgical alterations and the malleable nature of sex. Moreover, if an individual is found with conflicting skeletal and contextual evidence (e.g., clothing or personal effects), the anthropologist should not necessarily limit their sex estimation to the skeletal evidence and default to anatomy. Conflicting evidence should be clearly articulated in the report and this could be factored into the final sex or gender estimation.

Concerning sex estimation methods, analysts should prioritize those that have associated probabilities, such as logistic regressions, over discriminant function analyses that often have cutoff/sectioning points and contribute to rigid dichotomization (Bartholdy et al. 2020). Bartholdy et al. (2020) contend that probabilities allow for uncertainty and therefore various categories in the sex estimation (e.g., probable and indeterminate); however, probabilities are established on the assumption that sex is binary. Moreover, probabilities can be easily calculated on an individual (i.e., forensic) basis (Klales et al. 2012; Tallman 2019; Walker 2008). Conversely, discriminant function analyses, apart from FORDISC 3.1 (Jantz & Ousley 2005), often do not have associated probabilities and always place the individual into one of only two sex categories (Bartholdy et al. 2020), thereby reinforcing the typological system that is not reflective of human skeletal variation. However, Bartholdy et al. (2020) provide examples of how to calculate posterior probabilities from discriminant function analyses and suggest that a probability of 0.80 mark the transition from "probable."

Perhaps, most importantly, forensic anthropologists should not unjustifiably assume that individuals are cisgender and avoid assumptions that all individuals share the analyst's perspectives on sex and gender and associated expressions. Currently, no option exists if the analyst opines that a decedent is trans, gender diverse, or in the process of transitioning. Additionally, current forensic sex categorization does not reflect the fact that, increasingly, individuals are living as non-binary and this can be indicated in official, government-issued identifications for many states in the U.S. (Harmon 2019; National Center for Transgender Equality 2020). In short, current sex estimation practices and the reporting of sex in forensic anthropology have not evolved at the same pace as societal perceptions of sex, gender, and identity, and a positive change for greater inclusion and variability in lived experiences is long overdue in order for forensic anthropology to remain relevant in sex, gender, and identity production, wherein we play an active role. Accordingly, sex and gender estimation categories should be expanded to include (probable) trans female, (probable) trans male, non-binary/gender diverse, and multiple gender options (where applicable, feasible, and warranted), while considering that the decedent may not have identified, presented, or were known as the selected sex and gender categories. Further, if only including skeletal evidence in sex estimations (as most forensic anthropologists currently do), we recommend amending the final, reported estimation to indicate that the findings are solely based on skeletal analyses that predict how the individual would have been assigned, as opposed to how they would have self-identified. For example, rather than simply stating "female" or "male," a sex estimation of "biologically female/male (likely assigned female/male at birth)" indicates that skeletally, the decedent is consistent with having been assigned "female" or "male" at birth (based on anatomy), but they may not have self-identified as such in life. Secondary skeletal sex characteristics are correlated with primary sex characteristics (i.e., anatomy), and therefore current sex estimation methods predict assigned sex, which for most individuals is aligned with their self-identified sex. Thus, this rather simple alteration in reporting indicates to the consumers of our reports that sex is not fixed and that forensic anthropologists predict how a decedent would have been assigned using the extant two-sex model, while allowing for the possibility that a decedent may have self-identified differently. Additionally, if contextual evidence suggesting a trans or gender-diverse individual is present and factored into analyses (as some forensic anthropologists may choose to include), the analyst could also state: "The decedent may have self-identified as trans female/trans male/gender non-binary/gender diverse [or multiple gender options]." These more nuanced sex and gender estimations avoid the simplified binary sex categorizations inherently propagated in concluding that a decedent is "female" or "male."

Thus, the inclusion of these expanded sex and gender categories requires forensic anthropologists to holistically consider the body and the associated contextual evidence while taking into account that there are numerous ways of existing and self-identifying beyond the analyst's worldview. Additionally, as highlighted by Garofalo and Garvin (2020), NamUs (https://www.namus.gov) includes only "female," "male," and "unsure" sex categories for entering decedent information. While individuals inputting cases can make a note of trans or gender-diverse statuses in the information fields, the forensic anthropological community should work with the National Institute of Justice, administrators of

NamUs, in expanding sex categories to better reflect the demographics that the forensic community serves. Moreover, much like issues surrounding race and ancestry, forensic anthropologists should communicate the complexities and inherent assumptions involved in sex estimation with the general public and within the contexts where they perform forensic casework, including in case reports.

Trans-Oriented Research in Forensic Anthropology

In addition to the heteronormative two-sex system, forensic anthropology's collective lack of knowledge regarding the expression of transness can also be attributed to the paucity of trans-related research and publications in forensic anthropology. While 96.6% of respondents indicated that they would consult a surgeon or medical professional if they suspected trans representation in casework, the onus is also on practitioners to be familiar with the surgical indicators of transition. Importantly, this will require developing new avenues of in-depth research regarding the variation in surgical procedures and how such procedures impact sex estimation, along with integrating knowledge from the medical and trans communities. Moreover, it is important to acknowledge that the majority of trans individuals do not undergo surgical procedures (James et al. 2016), and research should also be centered on the effects of GAHT on the skeleton and other contextual indicators of transition.

The lack of trans-related research in forensic anthropology was largely attributed by survey respondents to the paucity of appropriate skeletal collections and a perceived overall lack of interest from the field. Concurrently, the survey results contradict a disinterest in trans-related research by clearly demonstrating that an overwhelming majority of survey respondents (95.8%) think that forensic anthropologists should conduct trans-related research. However, a more insidious issue emerged from this survey in regard to a lack of trans-related research. Ten individuals wrote in an open text field that the lack of diversity in the field of forensic anthropology presented a palpable hindrance to trans-related research. One respondent wrote, **"FA community lacks diversity; does not recognize disproportionate victimization of transgender individuals as a serious problem."** This is further exemplified by another respondent who noted, **". . . I honestly would not trust most cis[gender] anthropologists to treat transgender individuals with the compassion and understanding required to conduct living person studies, which would be the best way to increase sample sizes. This is tragic, as I (as a nonbinary anthropologist) have often thought that trans identities are a wasted opportunity for anthropologists to study the interaction of biology and culture . . . Forensic anthropologists, in my experience, tend to focus on the majority rather than the minority."** In echoing the problematic two-sex system, another respondent remarked, **"It [trans-oriented research] is simply a daunting task given the reliance on biological sex in creating a biological profile."** Given that forensic anthropology was founded primarily by cisgender straight white males and presently struggles with diversity and inclusion (Tallman 2020; Tallman & Bird 2020; Winburn et al. 2020b), it is not surprising that the field's homogeneity constrains research and is, arguably, heir to a legacy of research that has sought to constrain variables rather than allow for data (i.e., human biological variation) to guide analyses. However, as reported by Pilloud and Passalacqua (2020) and Tallman and Bird (2020), present-day demographics indicate a shift toward overwhelming female/woman representation (well over 70%) in forensic anthropology, which will no doubt help in diversifying perspectives in research and lived experiences. Thus, the finding that our lack of diversity limits research further supports the adoption of queer theoretical perspectives in forensic anthropology, which not only allow for but encourages a multiplicity of ways of existing and in the associated research that examines those multiplicities.

This survey demonstrates considerable interest in forensic anthropological trans-related research, and highlights important topics to address, including longitudinal effects of GAHT on the skeleton; quantifying the changes from gender affirming procedures; exploring the demographics of the trans and gender-diverse communities; cold case resolution; and exploring the range of gender expressions, among many others. Notably, these topics extend beyond traditional, skeletally focused studies, which is critical for the growth and relevance of forensic anthropological research. The limitations of extant skeletal collections for conducting important aspects of skeletal biology research—namely concerning ancestral diversity—are not new, as highlighted by Winburn et al. (2020a), and can be remedied, in part, by conducting research that utilizes CT scans (e.g., NMDID 2020; Schall et al. 2020) and qualitative/quantitative surveys of the trans community similar to the present study and those of Tallman and Bird (2020) and Winburn et al. (2020b). In fact, moving forward, it will be critical to engage with and include the trans community in research, which is supported by 97.3% of survey respondents.

Conducting research relating to trans individuals that extends beyond simple binary categorizations is critical to the trans, gender-diverse, and forensic anthropological communities as it has the potential to improve investigations and sex/gender estimations, while lowering error rates, which can assist in identifications for this at-risk demographic. Further, it is possible that the incompatibility between current sex estimation methods and trans bodies, in addition to the lack of trans inclusion in forensic anthropological research, has contributed, in part, to the numerous unidentified trans individuals across the country. Lastly, through developing and

expanding research relevant to trans and gender-diverse individuals that employs a biocultural and queer theoretical perspective, forensic anthropologists have the ability to cultivate a more biologically accurate discipline that goes beyond rigid binaries that constrain casework, identification, and research.

Conclusion

Violence against the trans and gender-diverse communities has been disproportionately high; however, knowledge amongst forensic anthropology practitioners of the processes that affect transgender individuals has not kept up with current events. This is exemplified by the finding that nearly 30% of all survey respondents had participated in a case involving a transgender individual, yet the majority were unfamiliar with gender affirming surgeries. However, issues related to trans and gender-diverse individuals are of interest to relatively younger forensic anthropologists, who will likely play a vital role in advancing our methods, practice, research, and field to be more inclusive. Moving forward, it is crucial that the field as a whole gain a comprehensive understanding of transgender bodies and how to recognize and document the changes, in addition to understanding how gender affirmation procedures impact the biological profile and subsequent identifications. Additionally, the results of this study demonstrate that the field of forensic anthropology struggles with the role of gender in our analyses, with near-equal representation for and against the inclusion of gender in forensic casework. However, the cautious inclusion of material evidence suggesting self-identified sex or gender may potentially help to identify trans and gender-diverse individuals.

Additionally, it is important to understand how the current processes to estimate the sex of skeletonized remains, which are rigidly categorical and based on cultural constructs of sex, are largely inadequate for the trans and gender-diverse communities and do not fully reflect human skeletal variation. Therefore, we advocate for a biocultural and queer theoretical perspective in forensic sex estimation and in sexual dimorphism research, which allows for the field to challenge heteronormative assumptions, question typological two-sex categorization, and combat the presumptions that gender and sex are stable entities that convey universal meaning. This holistic and humanistic approach includes, but is not limited to: incorporating contextual evidence (e.g., material evidence, clothing, scene information, signs of surgery); utilizing multiple indicators of sex, including the cranium, and not prioritizing pelvic data; employing sex estimation methods that have probabilities (e.g., logistic regressions over discriminant functions); using more nuanced reporting terminology for sex estimations; and expanding forensic sex estimation categories to include trans female, trans male, gender diverse, and multiple gender options (where appropriate). Moreover, it is critical that forensic anthropologists understand that there are different ways of existing beyond female and male. Relatedly, trans-oriented research in forensic anthropology that inherently engages with biocultural queer theory will no doubt play a vital role in educating practitioners, advancing the field, and ensuring that forensic anthropology has broader and more accurate applicability.

Acknowledgements

The authors would like to thank all individuals who participated in the survey. Additionally, the authors appreciate the valuable comments and suggestions made by the anonymous peer reviewers. Lastly, thank you to Allysha P. Winburn for including our research and perspective in this important special issue.

References

Abadi M, Pour OB. Genioplasty. *Facial Plastic Surgery* 2015; 31(5):513–522.

Ainsworth TA, Spiegel JH. Quality of life of individuals with and without facial feminization surgery or gender reassignment surgery. *Quality of Life Research* 2010;19(7):1019–1024.

Altman K. Facial feminization surgery: Current state of the art. *International Journal of Oral and Maxillofacial Surgery* 2012;41(8):885–894.

Altman K. Forehead reduction and orbital contouring in facial feminisation surgery for transgender female. *British Journal of Oral and Maxillofacial Surgery* 2018;56(3):192–197.

American Psychiatric Association. Gender dysphoria. In: *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Washington, D.C.: American Psychiatric Association; 2013. https://doi.org/10.1176/appi.books.9780890425596.dsm14.

Backless M, Charuvastra A, Derryck A, Fausto-Sterling A, Lauzanne K, Lee E. How sexually dimorphic are we? Review and synthesis. *American Journal of Human Biology* 2000;12(2): 151–166.

Bartholdy BP, Sandoval E, Hoogland MLP, Schrader SA. Getting rid of dichotomous sex estimations: Why logistic regression should be preferred over discriminant function analysis. *Journal of Forensic Sciences* 2020;65(5):1685–1691.

Bass WM. *Human Osteology: A Laboratory and Field Manual*. 5th ed. Columbia: Missouri Arcaeological Society, Inc.; 2005.

Beatrice JS, Soler A. Skeletal indicators of stress: A component of the biocultural profile of undocumented migrants in southern Arizona. *Journal of Forensic Sciences* 2016;61(5): 1164–1172.

Berli JU, Knudson G, Fraser L. What surgeons need to know about gender confirmation surgery when providing care for transgender individuals. *JAMA Surgery* 2017;152(4):394–400.

Bertsatos A, Papageorgopoulou C, Valakos E, Chovalopoulou M-E. Investigating the sex-related geometric variation of the human cranium. *International Journal of Legal Medicine* 2018;132: 1505–1514.

Birkby WH, Fenton TW, Anderson BE. Identifying Southwest Hispanics using nonmetric traits and the cultural profile. *Journal of Forensic Sciences* 2008;53(1):29–33.

Blackmore C. How to queer the past without sex: Queer theory, feminisms and the archaeology of identity. *Archaeologies* 2011;7:75–96.

Bornstein K. *Gender Outlaw: On Men, Women, and the Rest of Us*. New York: Routledge; 1994.

Bouderdaben FA. A push for trans-inclusive language in forensic sciences. In: Proceedings of the 88th Annual Meeting of the American Academy of Forensic Sciences, February 18–23, 2019, Baltimore, MD.

Boyce P, Engebretsen EL, Posocco S. Introduction: Anthropology's queer sensibilities. *Sexualities* 2018;21:843–852.

Buchanan S. Bone *Modification in Male to Female Transgender Surgeries: Considerations for the Forensic Anthropologist* [MA thesis]. Baton Rouge: Louisiana State University; 2014.

Buikstra JE, Ubelaker DH. Standards for data collection from human skeletal remains. Arkansas Archeological Survey Research Series No. 44. Fayetteville; 1994.

Butler J. *Bodies that Matter: On the Discursive Limits of "Sex."* New York: Routledge; 1993.

Cirillo LA, Deschamps-Braly JC, Stull KE, Pilloud MA. Cranial feminization surgery methods and osteological identification of post-operative individuals. In: Proceedings of the 72nd Annual Meeting of the American Academy of Forensic Sciences, February 17–22 2020, Anaheim, CA.

Cobb H. Straight down the line? A queer consideration of hunter-gatherer studies in north-west Europe. *World Archaeology* 2005;37(4):630–636.

Croucher K. Queering near eastern archaeology. *World Archaeology* 2005;37(4):610–620.

Dempf R, Eckert AW. Contouring the forehead and rhinoplasty in the feminization of the face in male-to-female transsexuals. *Journal of Cranio-Maxillo-Facial Surgery* 2010;38(6):416–422.

Deschamps-Braly JC, Sacher CL, Fick JL, Ousterhout DK. First female-to-male facial confirmation surgery with description of a new procedure for masculinization of the thyroid cartilage (Adam's apple). *Plastic Reconstructive Surgery* 2017; 139(4):883e–887e.

Dowson TA. Why queer archaeology? An introduction. *World Archaeology* 2000;32(2):161–165.

Fighera TM, da Silva E, Lindenau JD, Spritzer PM. Impact of cross-sex hormone therapy on bone mineral density and body composition in trans women. *Clinical Endocrinology* 2018;88(6): 856–862.

Fighera TM, Ziegelmann PK, da Silva TR, Spritzer PM. Bone mass effects of cross-sex hormone therapy in transgender people: Updated systematic review and meta-analysis. *Journal of the Endocrine Society* 2019;3(5):943–964.

Flores AR, Herman JL, Gates GJ, Brown TNT. How many adults identify as transgender in the United States? The Williams Institute, Los Angeles. June 2016. https://williamsinstitute.law.ucla.edu/publications/trans-adults-united-states/.

France DL. Observational and metric analysis of sex in the skeleton. In: Reichs K, ed. *Forensic Osteology*. 2nd ed. Springfield: Charles C Thomas; 1998;163–186.

Garofalo EM, Garvin HM. The confusion between biological sex and gender and potential implications of misinterpretations. In: Klales AR, ed. *Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques*. San Diego, CA: Elsevier; 2020:35–52.

Garvin HM, Klales AR. A validation study of the Langley et al. (2017) decision tree model for sex estimation. *Journal of Forensic Sciences* 2018;63(4):1243–1251.

Garvin HM, Sholts SB, Mosca LA. 2014. Sexual dimorphism in human cranial trait scores: effects of population, age, and body size. *American Journal of Physical Anthropology* 2014;154(2): 259–269.

Geller PL. *The Bioarchaeology of Socio-Sexual Lives: Queering Common Sense about Sex, Gender, and Sexuality*. Cham, Switzerland: Springer; 2017.

Geller PL. Bodyscapes, biology, and heteronormativity. *American Anthropologist* 2009a;111(4):504–516.

Geller PL. The fallacy of the transgender skeleton. In: Buikstra JE, ed. *Bioarchaeologists Speak Out: Deep Time Perspectives on Contemporary Issues*. Cham, Switzerland: Springer; 2019: 231–242.

Geller PL. Fomenting a feminist bioarchaeology. *Journal of Social Archaeology* 2008;8(1):113–138.

Geller PL. Identity and difference: Complicating gender in archaeology. *Annual Review of Anthropology* 2009b;38:65–81.

Geller PL. Skeletal analysis and theoretical complications. *World Archaeology* 2005;37(4):597–609.

Gere C. Bones that matter: Sex determination in paleodemography 1948–1995. *Studies in History and Philosophy of Biological and Biomedical Sciences* 1999;30(4):455–471.

GLAAD. https://www.glaad.org/reference/transgender. Accessed August 28, 2020.

Glynn TR, Gamarel KE, Kahler CW, Iwamoto M, Operario D, Nemoto T. The role of gender affirmation in psychological well-being among transgender women. *Psychology of Sexual Orientation and Gender Diversity* 2016;3(3):336–344.

Gray R, Nguyen K, Lee JC, Deschamps-Braly J, Bastidas N, Tanna N, Bradley JP. Osseous transformation with facial feminization surgery: Improved anatomical accuracy with virtual planning. *Plastic and Reconstructive Surgery* 2019;144(5): 1159–1168.

Harmon A. States are offering a nonbinary option. *The New York Times*. May 29, 2019. https://www.nytimes.com/2019/05/29/us/nonbinary-drivers-licenses.html. Accessed June 14, 2020.

Heath-Stout LE. Who writes about archaeology? An intersectional study of authorship in archaeological journals. *American Antiquity* 2020;85(3):407–426.

Hoenig JF. Frontal bone remodeling for gender reassignment of the male forehead: A gender reassignment surgery. *Aesthetic Plastic Surgery* 2011;35:1043–1049.

Human Rights Campaign. https://www.hrc.org/supporting-and-caring-for-our-gender-expansive-youth. Accessed June 14, 2020a.

Human Rights Campaign. Supporting and Caring for our Gender-Expansive Youth. https://www.hrc.org/resources/violence-against-the-trans-and-gender-non-conforming-community-in-2020. Updated June 30, 2020. Accessed December 4, 2020b.

Human Rights Campaign. Hate Crimes. https://www.hrc.org/resources/state-maps/hate-crimes. Accessed June 14, 2020c.

James SE, Herman JL, Rankin S, Keisling M, Mottet L, Anafi M. The report of the 2015 U.S. transgender survey. National Center for Transgender Equality. Washington D.C.; 2016.

Jantz RL, Ousley SD. FORDISC 3.1: Personal computer forensic discriminant functions. University of Tennessee, Knoxville; 2005.

Joyce RA. Girling the girl and boying the boy: The production of adulthood in ancient Mesoamerica. *World Archaeology* 2000;31(3):473-483.

Khosla S, Oursler MJ, Monroe DG. Estrogen and the skeleton. *Trends in Endocrinology and Metabolism* 2012;23(11):576-581.

Kimmerle E, Ross A, Slice D. Sexual dimorphism in America: Geometric morphometric analysis of the craniofacial region. *Journal of Forensic Sciences* 2008;53(1):54–57.

Klales AR. Introduction to sex estimation and this volume. In: Klales AR, ed. *Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques*. San Diego, CA: Elsevier; 2020d:xxxi–xli.

Klales AR. MorphoPASSE: The morphological pelvis and sex estimation database. Version 1.0. Washburn University, Topeka; 2018.

Klales AR. MorphoPASSE: Morphological pelvis and skull sex estimation program. In: Klales AR, ed. *Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques*. San Diego, CA: Elsevier; 2020b:271–278.

Klales AR. Practitioner preferences for sex estimation from human skeletal remains. In: Klales AR, ed. *Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques*. San Diego, CA: Elsevier; 2020c:11–23.

Klales AR, ed. *Sex Estimation of the Human Skeleton: History, Methods, and Emerging Techniques*. San Diego, CA: Elsevier; 2020a.

Klales AR, Cole SJ. MorphoPASSE: The morphological pelvis and skull sex estimation database manual. Version 1.0. Washburn University, Topeka; 2018.

Klales AR, Ousley SD, Vollner JM. A revised method of sexing the human innominate using Phenice's nonmetric traits and statistical methods. *American Journal of Physical Anthropology* 2012;149(1):104–114.

Lambda Legal. Changing Birth Certificate Sex Designations: State-by-State Guidelines. https://www.lambdalegal.org/know-your-rights/article/trans-changing-birth-certificate-sex-designations. Updated September 17, 2018. Accessed June 14, 2020.

Lestrel P, Kanazawa E, Wolfe CA. Sexual dimorphism using elliptical Fourier analysis: Shape differences in the craniofacial complex. *Anthropological Science* 2011;119(3):213–229.

LGBT Bar. LGBTQ+ "Panic" Defense. https://lgbtbar.org/programs/advocacy/gay-trans-panic-defense/. March 10, 2021.

Mackenzie S, Wilkinson C. Morphological and morphometric changes in the faces of female-to-male (FtM) transsexual people. *International Journal of Transgenderism* 2017;18(2):172–181.

Marinucci M. *Feminism is Queer: The Intimate Connection between Queer and Feminist Theory*. New York: Zed Books; 2010.

Meskell L. The intersections of identity and politics in archaeology. *Annual Review of Anthropology* 2002;31:279–301.

Meyer D. *Violence Against Queer People: Race, Class, Gender, and the Persistence of Anti-LGBT Discrimination*. New Brunswick: Rutgers University Press; 2015.

Michael A, Isa MI, Redgrave L, Redgrave A. Collaborative approaches in the identification of transgender and gender variant decedents. In: Proceedings of the 72nd Annual Meeting of the American Academy of Forensic Sciences, February 17–22 2020, Anaheim, CA.

National Center for Transgender Equality. ID Documents Center. https://transequality.org/documents. Updated May 2020. Accessed June 14, 2020.

New Mexico Decedent Image Database (NMDID). https://nmdid.unm.edu. Accessed June 16, 2020.

Nikita E, Michopoulou E. A quantitative approach for sex estimation based on cranial morphology. *American Journal of Physical Anthropology* 2017;165(3):507–517.

Nuttbrock LA, Bockting WO, Hwahng S, Rosenblum A, Mason M, Macri M, Becker J. Gender identity affirmation among male-to-female transgender persons: A life course analysis across types of relationships and cultural lifestyle factors. *Sexuality and Relationship Therapy* 2009;24(2):108–125.

Ousterhout DK. Feminization of the forehead: Contour changing to improve female aesthetics. *Aesthetic Plastic Surgery* 1984;79(5):701–722.

Patterson MM, Tallman SD. Cranial and postcranial metric sex estimation in modern Thai and archaeological Native American individuals. *Forensic Anthropology* 2019;2(4):233–252.

Perlaza N. Sex determination from the frontal bone: A geometric morphometric study. *Journal of Forensic Sciences* 2014;59(5):1330–1332.

Petaros A, Garvin HM, Sholts SB, Schlager S, Warmlander SKTS. Sexual dimorphism and regional variation in human frontal bone inclination measured via digital 3D models. *Legal Medicine* 2017;29:53–61.

Phenice TW. A newly developed visual method of sexing the os pubis. *American Journal of Physical Anthropology* 1969;30(2):297–302.

Pilloud MA, Passalacqua NV. Why are there so many women in forensic anthropology? An evaluation of gender experiences in forensic anthropology. *Forensic Anthropology* 2020; doi: 10.5744/fa.2020.3002.

Plemons E. Descriptions of sex difference as prescription for sex change: On the origins of facial feminization surgery. *Social Studies of Science* 2014;44:657–679.

Plemons E. Formations of femininity: Science and aesthetics in facial feminization surgery. *Medical Anthropology* 2017a;36(7):629–641.

Plemons E. Gender, ethnicity, and transgender embodiment: Interrogating classification in facial feminization surgery. *Body & Society* 2019;25(1):3–28.

Plemons E. *The Look of a Woman: Facial Feminization Surgery and the Aims of Trans-Medicine*. Durham: Duke University Press; 2017b.

Rogers TL. A visual method for determining the sex of skeletal remains using the distal humerus. *Journal of Forensic Sciences* 1999;44:57–60.

Rogers NL, Flourney LE, McCormick WF. The rhomboid fossa of the clavicle as a sex and age estimator. *Journal of Forensic Sciences* 2000;45(1):61–67.

Rothman MS, Iwamoto SJ. Bone health in the transgender population. *Clinical Reviews in Bone and Mineral Metabolism* 2019;17:77–85.

Sairam V, Geethamalika MV, Kumar PB, Naresh G, Raju GP. Determination of sexual dimorphism in humans by measurements of mandible on digital panoramic radiograph. *Contemporary Clinical Dentistry* 2016;7(4):434–439.

Salgado CJ, AlQattan H, Nugent A, Gerth D, Kassira W, McGee C, Wo L. Feminizing the face: Combination of frontal bone reduction and reduction rhinoplasty. *Case Reports in Surgery* 2018; 2018:1–8.

Schall JL, Rogers TL, Deschamps-Braly JC. Breaking the binary: The identification of trans women in forensic anthropology. *Forensic Science International* 2020; doi: 10.1016/j.forsciint.2020.110220.

Sevelius JM. Gender affirmation: A framework for conceptualizing risk behavior among transgender women of color. *Sex Roles* 2013;68:675–689.

Singh-Ospina N, Maraka S, Rodriguez-Gutierrez R, Davidge-Pitts C, Nippoldt TB, Prokop LJ, Murad MH. Effects of steroids on the bone health of transgender individuals: A systematic review and meta-analysis. *The Journal of Clinical Endocrinology and Metabolism* 2017;102(11):3904–3913.

Small C, Schepartz L, Hemingway J, Brits D. Three-dimensionally derived interlandmark distances for sex estimation in intact and fragmentary crania. *Forensic Science International* 2018;287:127–135.

Soler A, Beatrice JS. Expanding the role of forensic anthropology in humanitarian crisis: An example from the U.S.-Mexico border. In: Latham KE, O'Daniel AJ, eds. *Sociopolitics of Migrant Death and Repatriation: Perspectives from Forensic Science*. New York: Springer; 2018:115–128.

Soler A, Reineke R, Beatrice JS, Anderson BE. Etched in bone: Embodied suffering in the remains of undocumented migrants.

In: Sheridan TE, McGuire, eds. *The Border and its Bodies: The Embodiment of Risk along the U.S.-Mexico Line*. Tucson: University of Arizona Press; 2019:173–207.

Spade D. *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of the Law*. Durham, NC: Duke University Press; 2015.

Spiegel JH. Facial determinants of female gender and feminizing forehead cranioplasty. *The Laryngoscope* 2010;121(2):250–261.

Spradley MK, Jantz RL. Sex estimation in forensic anthropology: Skull versus postcranial elements. *Journal of Forensic Sciences* 2011;56(2):289–296.

Stewart TD. *Essentials of Forensic Anthropology, Especially as Developed in the United States*. Springfield: Charles C Thomas; 1979.

Stryker S. (De)subjugated knowledges: An introduction to transgender studies. In: Stryker S, Whittle S., eds. *The Transgender Studies Reader*. New York: Routledge; 2006:1–15.

Stryker S. Transgender studies: Queer theory's evil twin. *GLQ: A Journal of Lesbian and Gay Studies* 2004;10(2):212–215.

Tallman SD. Opinion: The forensic sciences have a diversity, inclusion problem. *Forensic*. November 6, 2020. https://www.forensicmag.com/569912-Opinion-The-Forensic-Sciences-Have-a-Diversity-Inclusion-Problem/. Accessed November 7, 2020.

Tallman SD. Cranial nonmetric sexual dimorphism and sex estimation in East and Southeast Asian individuals. *Forensic Anthropology* 2019;2(4):204–221.

Tallman SD, Bird CE. Diversity and inclusion in forensic anthropology: Where we stand and prospects for the future. *Forensic Anthropology* 2020; doi: 10.5744/fa.2020.3001.

Tallman SD, Blanton AI. Distal humerus morphological variation and sex estimation in modern Thai individuals. *Journal of Forensic Sciences* 2020;65(2):361–371.

Tallman SD, Go MC. Applications of the optimized summed scored attributes method to sex estimation in Asian crania. *Journal of Forensic Sciences* 2018;63(3):809–814.

Trans Doe Task Force. http://transdoetaskforce.org. Accessed June 14, 2020.

Trans Respect. TMM Update Trans Day of Remembrance 2019. https://transrespect.org/en/tmm-update-trans-day-of-remembrance-2019/. Accessed June 15, 2020.

T'Sjoen G, Weyers S, Taes Y, Lapauw B, Toye K, Goemaere S, Kaufman JM. Prevalence of low bone mass in relation to estrogen treatment and body composition in male-to-female transsexual persons. *Journal of Clinical Densitometry* 2009; 12(3):306–313.

van Anders SM, Caverly NL, Johns MM. Newborn bio/logics and US legal requirements for changing gender/sex designations on state identity documents. *Feminism and Psychology* 2014; 24(2):172–192.

Vance VL, Steyn M, L'Abbe EN. Nonmetric sex determination from the distal and posterior humerus in Black and White South Africans. *Journal of Forensic Sciences* 2011;56(3):710–714.

Waldron L, Schwencke K. Deadnamed. *ProPublica*. August 10, 2018. https://www.propublica.org/article/deadnamed-transgender-black-women-murders-jacksonville-police-investigation/amp?__twitter_impression=true. Accessed June 17, 2020.

Walker P. Greater sciatic notch morphology: Sex, age, and population differences. *American Journal of Physical Anthropology* 2005;127(4):385–391.

Walker PL. Sexing skulls using discriminant function analysis of visually assessed traits. *American Journal of Forensic Anthropology* 2008;136(1):39–50.

Walks M. "We're here and we're queer?": An introduction to studies in queer anthropology. *Anthropologica* 2014;56(1):13–16.

Wareham J. Murdered, hanged and lynched: 331 trans people killed this year. *Forbes*. November 18, 2019. https://www.forbes.com/sites/jamiewareham/2019/11/18/murdered-hanged-and-lynched-331-trans-people-killed-this-year/#12146dbf2d48. Accessed June 15, 2020.

Wareham J. Murdered, suffocated and burned alive—350 transgender people killed in 2020. *Forbes*. November 11, 2020. https://www.forbes.com/sites/jamiewareham/2020/11/11/350-transgender-people-have-been-murdered-in-2020-transgender-day-of-remembrance-list/?sh=177954e865a6. Accessed December 4, 2020.

Wierckx K, Mueller S, Weyers S, Van Caenegem E. Roef G, Heylens G, T'Sjoen G. Long-term evaluation of cross-sex hormone treatment in transsexual persons. *The Journal of Sexual Medicine* 2012;9(10):2641–2651.

Wiepjes CM, Vlot MC, Klaver M, Nota NM, de Blok CF, de Jongh RT, Lips P, Heijboer AC, Fisher AD, Schreiner T, T'Sjoen G, den Heijer M. Bone mineral density increases in trans persons after 1 year of hormonal treatment: A multicenter prospective observational study. *Journal of Bone and Mineral Research* 2017;32(6):1252–1260.

Williams BA, Rogers TL. Evaluating the accuracy and precision of cranial morphological traits for sex determination. *Journal of Forensic Sciences* 2006;51(4):729–735.

Winburn AP. Subjective with a capital S? Issues of objectivity in forensic anthropology. In: Boyd CC, Boyd CD, eds. *Forensic Anthropology: Theoretical Framework and Scientific Basis*. New York: John Wiley & Sons Ltd.; 2018:21–37.

Winburn AP, Jennings AL, Steadman DW, DiGangi EA. Ancestral diversity in skeletal collections: Perspectives on African-American body donation. *Forensic Anthropology* 2020a; doi: 10.5744/fa.2020.1023.

Winburn AP, Martinez R, Schoff SK. Afro-Cuban ritual use of human remains: Medicolegal considerations. *Journal of Forensic Identification* 2017;67(1):1–30.

Winburn AP, Schoff SK, Warren MW. Assemblages of the dead: Interpreting the biocultural and taphonomic signature of Afro-Cuban Palo practice in Florida. *Journal of African Diaspora Archaeology and Heritage* 2016;5(1):1–37.

Winburn AP, Tallman SD, Scott AL, Bird CE. Changing the mentorship paradigm: Survey data and interpretations for forensic anthropology practitioners. *Forensic Anthropology* 2020b; doi: 10.5744/fa.2020.4028.

World Health Organization. Gender and Health. https://www.who.int/health-topics/gender. Accessed August 28, 2020.