



Incorporating a structural vulnerability framework into the forensic anthropology curriculum

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1. Introduction

Structural vulnerability can be described as the combined result of class-based economic exploitation and cultural, gender, sexual, and/or racialized discrimination [1]. Human remains display the skeletal manifestations of biological resilience embodied by prolonged and elevated physiological stress in response to structural violence [2–6]. According to embodiment theory, bodies are actively involved in the environments in which they live and biologically incorporate the societal and ecological circumstances of their world [7]. No component of our biology can be fully understood without advanced knowledge of individual and societal lived experiences, particularly when there are systems in place that render some people more structurally vulnerable than others [7].

Recent research has demonstrated that these biological manifestations of structural vulnerability appear more frequently in individuals from marginalized communities, and thus their presence can be useful in the identification of unknown decedents [8,9]. Forensic anthropologists have begun to realize the utility of incorporating structural vulnerability biomarkers into their research and casework focused on marginalized groups, including Latin American migrants; individuals from communities targeted by structural inequality, such as BIPOC, transgender, and gender-diverse people; and socioeconomically disadvantaged individuals who may have grown up with moderate to high levels of systemic stress [8–13].

Structurally vulnerable individuals constitute the preponderance of

forensic cases and are at higher risk of becoming long-term cold cases [13,14]. In particular, the socially marginalized face an increased risk of dying from fatal violence, an accidental overdose from drug use, or dying in a context that delays discovery [11]. Therefore, it is very likely that a forensic anthropologist will encounter the remains of an individual displaying osteological evidence of structural vulnerability [13]. Due to intersectionality, different populations are affected by varying levels of social inequity, warranting further investigation into the appearance, frequency, and diversity of structural vulnerability biomarkers. Winburn et al. [6] have suggested the creation of a Structural Vulnerability Profile (SVP), which includes these embodied dental and skeletal biomarkers. Providing an SVP in casework, in addition to the standard biological profile, can also help differentiate privileged decedents from those affected by structural violence.

Reporting these skeletal indicators of preventable biological disruption also brings attention to the ramifications of structural inequality in the life histories of marginalized decedents [6,10]. Forensic anthropologists can expose the often invisible physiological effects of poverty, discrimination, and marginalization, even when they are not directly linked to physical violence. It is therefore vital to reveal the signs of embodied structural vulnerability so that those who have the power to ameliorate these oppressive systems can initiate social and political change, including law enforcement, politicians, and the next generation of future scientists. Being current graduate students in anthropology programs ourselves, it is this last group that the authors feel is particularly relevant to address in this paper.

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We argue that incorporating a framework focused on the intersection of structural vulnerability and social inequity into educational curricula will positively impact the future of forensic anthropology and marginalized decedents. To illustrate our point, a summary of potential applications of structural violence theory in casework and research is presented, including examples of how to incorporate these concepts into the classroom. The goals of this summary are two-fold: to provide thought for potential avenues of research and class discussion and to give concrete examples of incorporating a structural vulnerability framework into forensic anthropology. Secondly, we will address the current literature advocating for more consistency in forensic anthropology education to emphasize our stance on why structural vulnerability should be included as a core tenant in forensic anthropology curricula. Our discussion will begin with the weathering hypothesis, as it illustrates the effects of structural violence on the skeleton and its subsequent impact on the biological profile.

2. The weathering hypothesis

The weathering hypothesis exemplifies a form of structural violence where the body prematurely ages as a consequence of accumulated stress over time [12,15]. When individuals are marginalized due to structural inequality, this physiological stress can manifest in the form of illnesses like hypertension, cardiovascular disease, impaired immune function, type 2 diabetes, and maternal and fetal mortality [13,16–19]. Stressors that can lead to a continued and heightened immune response may include job instability, housing and/or food insecurities, labor-intensive or low-paying occupations, and disproportionately violent encounters at the individual and systemic levels due to discrimination [12,13,19]. Chronic stress extensively deteriorates the body and can cause premature biological aging as a result [13].

The effects of the weathering hypothesis have been most thoroughly examined on decedents from BIPOC populations [12]. Particularly, it has been well documented in Americans that young Black adults' health declines earlier and more quickly when compared to young white adults, leading to pronounced health disparities by middle age [13]. Black Americans must physiologically adapt to a disproportionate and persistent number of stressful encounters, and this prolonged response can increase the risk of early-onset chronic illnesses and premature death [6,15,20]. For instance, Simons et al. [15] found that stressful circumstances, such as limited income, living in a disadvantaged neighborhood, and racial discrimination, all contributed to accelerated epigenetic aging in middle-aged Black adults.

Premature aging has several skeletal-level impacts. Osteoarthritis may be more severe and prevalent at a younger age in BIPOC skeletons than one would expect to see in white populations [6,13]. Further, calcifications indicative of atherosclerosis may also be found with the skeletal elements, suggesting cardiovascular disease [21]. Lastly, the typical indicators used to estimate age-at-death may produce inaccurate and erroneously high estimates for individuals affected by the weathering hypothesis [13]. Walkup [12], for instance, demonstrated that the Suchey-Brooks and acetabulum aging methods often score older on BIPOC individuals than on white remains from high socioeconomic backgrounds. As aspects of the biological profile can be affected by structural vulnerability, it is necessary to document their presence in groups impacted by discrimination to provide the most accurate age-at-death estimates for these decedents.

Incorporating an understanding of the weathering hypothesis into forensic anthropology training at either the undergraduate or graduate level can occur in several ways. One option is to include a collaborative learning experience where students work in groups to develop research projects to better understand weathering and its impacts, and present that information to their peers. This exercise should also include discussion and feedback on both the project ideas and on ways to be cognizant in building an understanding of the weathering hypothesis into practice.

Further, educators should institute critical pedagogy into their readings and lectures on the weathering hypothesis, where issues of social justice and human rights are centralized and the historical and political ramifications of the race concept are contextualized [22]. Students should be exposed to the roots of racial marginalization, reflect on their own privileges, and self-assess their ability to enact social change [23]. Educators should also remark on how the history of our field has played a role in othering BIPOC people, reinforced racial boundaries, and contributed to weathering [24]. Critical pedagogy can be applied to the study of other structurally vulnerable groups as well, such as Latin American migrants.

3. Biomarkers of structural violence in Latin American migrants

It is of medicolegal importance to identify the possibility that a set of remains may belong to a non-U.S. citizen, as this information can be the first step in consulting with foreign authorities to identify the body [8]. Since the early 2000s, forensic anthropologists at the Pima County Office of the Medical Examiner (PCOME) have been at the forefront of applying a structural vulnerability perspective to their research and casework on Latin American migrants [8]. Through the creation of the biocultural profile, PCOME anthropologists have assisted in the identification of foreign nationals who perished while crossing the U.S.-Mexico border [8]. Similar to the criteria of the SVP, the biocultural profile includes the geographic context of the remains, personal effects, and the presence of structural vulnerability biomarkers such as oral pathologies, stunted growth, and poorly set fractures [8]. The biocultural profile provides a successful example of how to incorporate the osteological effects of structural violence into the identification of unknown decedents [8–10,25].

The skeletal biomarkers of structural violence found on migrant remains frequently result from a combination of stressful encounters that may simultaneously impact their decision to leave their home country. As an example of a stressor, the legislation of the North American Free Trade Agreement in 1994 devastated and displaced Mexican agricultural laborers and farmers [10]. By 2014, approximately 20.5 million more Mexicans lived in poverty than in 1994, causing some to leave in search of more favorable economic opportunities [26]. Many Central Americans may be forced or choose to migrate in order to escape gang, cartel, gender, or race-based violence [10]. As a result of the culmination of stress from structural inequality, poverty, and potential violence, there are specific biological indicators that become embodied within their skeletons [8,27].

Indications of the embodiment of structural violence in migrants often include the presence of oral pathologies, such as linear enamel hypoplasias, antemortem tooth loss, abscesses, and untreated carious lesions [8–10]. Short stature, cribra orbitalia, and porotic hyperostosis are other notable examples of non-dental stress indicators present on the remains of migrants [8,27]. In a study conducted by Beatrice & Soler [8], migrant decedents were 3 times more likely to exhibit linear enamel hypoplasias and 7.9 times more likely to present porotic hyperostosis when compared to U.S.-born decedents. Reporting these biomarkers in conjunction with the personal effects and context of the recovery may suggest an individual of foreign origin [8,10].

As families of decedents from other countries may not directly file a missing persons report with the U.S., it can be difficult to correctly match these reports and repatriate the remains [8]. Additionally, as the number of migrants who perish in the desert increases, there is an incentivized need to identify these individuals. Although likely a severe underestimate, 296 decedents have been recovered annually from the borders of Texas, Arizona, and California since 2013 [9]. Beyond those who die near the border, migrants originating from Latin America may reside anywhere in the U.S. after crossing. It is, therefore, essential for all forensic anthropologists to recognize the signs of structural vulnerability when identifying skeletal remains, not just those who work in border states [8].

However, one limitation of this approach is that it is contingent on the idea that U.S.-born individuals are healthier than Latin American migrants. Although migrants face additional physical and emotional suffering as a result of their exclusion from public services, jobs, and health care after crossing, recent data suggests that foreign-born Latin Americans have a lower mortality risk than both Hispanic and non-Hispanic groups born in the United States [28]. The biomarkers of childhood physiological stress may be evident on the remains of foreign nationals, but they can also be observed on U.S.-born individuals from lower socioeconomic backgrounds [6]. As a result, caution is advised before making broad assumptions about the health status of people from other nations while ignoring the adversity suffered by U.S. citizens, who are also affected by poverty, discrimination, and structural violence [6].

It is crucial in a classroom setting to situate the marginalization of Latin American migrants within the broader sociopolitical context that made them structurally vulnerable. Without a background understanding of the issues Latin American migrants face, future forensic anthropologists cannot properly address the needs of this community. Experiential learning has been recognized as an impactful method that could be readily applied to this topic [22,29]. Experiential learning is a pedagogical model that immerses students in content from their field of study by acquiring new knowledge, developing skills, reflecting on societal issues, and working directly with affected communities [22]. Students become actively involved in service projects directed at helping impacted communities rather than simply learning about these abstract concepts in the classroom. Critical pedagogy and experiential learning work together to benefit students by providing real-world experiences of the issues they learn about in lecture and also benefit the affected communities by providing voluntary student labor [22].

O'Daniel and Latham [22] provide a successful example of applying these pedagogical models in South Texas. Their team of forensic science graduate students and faculty participate annually in excavating unmarked graves, analyzing remains, and working alongside local communities to enact social change [22]. For example, students engage with community members by talking to locals about the impacts of migration, visiting women and children in detention centers, and assisting the South Texas Human Rights Center in building water stations along known migrant routes [22]. In addition to these experiences, students complete assigned readings and participate in discussions on the political and economic conditions of the migrant death crisis, the regional histories of Mexico and Central America, and consider how their work impacts the community. Students also write blog posts reflecting on their own experiences, self-assess their learning goals, and contemplate how their contributions have helped address these issues [30].

Unfortunately, actively engaging with the affected communities is not always feasible. In a course setting, however, instructors can still provide readings and a forum for discussion to contextualize how Latin American migrants are structurally vulnerable. For hands-on experiences, students could practice distinguishing remains with mock personal effects and indications of structural vulnerability, followed by a review and discussion of the relevant literature. If there are no skeletal examples readily accessible, students could use virtual specimens from the New Mexico Decedent Image Database [31]. Digital pedagogy is an excellent way to incorporate practical skills in osteological analysis without the need for a physical skeletal collection [32]. Online databases, such as the Virtual Skeleton Database [33], can be used to help compile a set of individuals with varying population affinities to distinguish the biomarkers discussed within this section. This exercise would be best suited for graduate students in forensic anthropology who already know how to create the biological profile and could also be applied to other structurally vulnerable groups, such as gender diverse decedents.

4. Indicators of transgender and non-binary decedents

Although the gender-diverse community comprises a variety of

identities and experiences, the simple act of identifying as transgender or non-binary puts these individuals at a higher risk of experiencing all levels of violence [34]. In particular, transgender women of color are at the greatest risk of fatal violence [35]. Between 2008 and 2022 in the U.S., 375 transgender people were murdered, and approximately 20% attempted or committed suicide in 2022 [36]. Despite the fact that there are fewer gender-variant individuals compared to cisgender people, they are more likely to become victims of self-directed, interpersonal, or physical violence, making them structurally vulnerable [34].

Additionally, structural violence can biologically harm individuals by forcing them into high-risk situations. For example, according to a 2015 survey conducted by the National Center for Transgender Equality, one in five transgender people had to resort to the underground economy at least once, in which sex-work or drugs are unofficially exchanged for goods or services (such as income, food, or shelter) [37]. Participating in these currently criminalized ventures only further increases their risk of violent interactions and harassment [34,37]. Gender-diverse individuals may therefore appear in casework in greater proportions than their cisgender counterparts and are also more likely to become cold cases if misgendered [34]. Thus, forensic anthropologists may need to assist in the identification of gender-variant decedents.

Unfortunately, forensic anthropologists currently appear to be ill-equipped to identify gender-diverse remains. Haug [34] noted several ways in which forensic anthropologists render gender-variant people invisible. One example is that there are no established methods to identify a decedent as transgender or non-binary [34]. On one hand, it is sensible to only report biological sex and not gender, as sex is often presented as an immutable binary in American culture, while gender is considered non-biological. However, biological sex also exists along a continuum, and not all individuals express masculine and feminine traits equally [34]. Additionally, the hormones, genes, and anatomic features that contribute to a person's sex may vary greatly between individuals, making the binary of sex much more complicated than it initially appears [34].

We do not advocate for reporting gender in casework. Rather, we suggest keeping an open mind regarding how an individual may have identified during their lifetime, regardless of the results of their estimated sex. Assuming a decedent's estimated sex correlates with their gender renders forensic experts complicit in the cycle of violence perpetuated against gender-diverse individuals [34]. These actions constitute a form of violence, as they signal to gender-variant communities that their identity becomes invisible after death. By excluding gender from the discussion of a decedent's identity, we are not recognizing gender-diverse and intersex bodies as valid and important [34].

Tallman et al. [35] found that, while 28.9% of forensic anthropologists have worked with transgender individuals in casework, the majority are unfamiliar with evidence indicative of gender affirming procedures. The potential biomarkers of male to female transition can include osteotomies, breast implants, and bone shaving [38]. Facial feminization surgery (FFS), in which the bones and cartilage of the facial skeleton are altered to feminize the features of the face, can be useful in identifying transgender women [34,38,39]. However, Haug [34] cautions that FFS is not limited to transgender women and that not all of them undergo the procedure. James et al. [37] reported that only 7% of transgender women received FFS, although 43% said they would consider it in the future.

For female to male transition, facial implants, bone grafts, penoscrotal prostheses, and augmentation of the thyroid cartilage with rib cartilage may be present [35,38,40]. However, it is crucial to identify a combination of these features within an individual to indicate gender affirming surgeries, as one or more of these procedures could be associated with trauma reconstruction in cisgender populations as well [38]. Other indications of structural vulnerability may be present in the form of repetitive trauma from targeted violence or biomarkers of poverty from reliance on the underground economy [6,34]. When a combination of these biomarkers is included in the report, along with the assigned sex

at birth and personal effects, it can present a more accurate representation of the decedent's identity, prevent further harm to them and their loved ones, and assist in the identification process [41].

Since law enforcement frequently does not distinguish between sex and gender, forensic anthropologists must be cognizant of the wording in their reports [34]. Simply updating the terminology in casework to "assigned sex at birth", rather than biological sex, allows forensic personnel to be open to the possibility of a gender-variant decedent. Additionally, reconceptualizing sex as broader than a binary makes the gender-diverse community more visible [34]. These efforts can begin in the classroom by teaching sex as a spectrum rather than a binary, using the most appropriate terminology, and learning the features of sex or gender affirming surgeries [42,43].

Reviewing the literature presented in this section is important for both undergraduate and graduate-level coursework. Additionally, adding readings such as Easterling and Byram [43] and including discussions on the incorporation of gender-neutral language when communicating with medicolegal personnel will help prepare students to discuss gender-variant individuals in forensic contexts. In general, forensic anthropology students often lack practice in presenting expert testimony in court, to the public, or to agencies involved in forensic investigations [44]. Presenting fake forensic cases in a mock trial format would not only help students prepare for their future careers but also allow them to practice using gender-inclusive terminology and explain complex concepts, like the spectrum of sex, to non-specialists [42,44].

Graduate students could also write a mock forensic anthropology report on a set of remains with features potentially indicative of a transgender individual. Again, if there are no elements available in the classroom, 3D-printed skeletal elements could be a viable alternative. Providing experiential learning activities to train forensic anthropology graduate students in recognizing these indicators will allow students to critically consider the effects of structural violence on gender-variant decedents. As a result, forensic anthropologists would be trained to recognize these features in their coursework, not just when encountering a gender-diverse decedent in their casework. The ability to notice these potential indicators of structural vulnerability is also crucial when examining decedents from lower socioeconomic statuses.

5. Indications of poverty

Structural violence within impoverished communities is also apparent on the skeleton, as limited access to health and dental care, quality nutrition, and/or shelter can lead to preventable deaths [11]. These individuals may be at an increased risk of physical and fatal violence as well. In areas where there are many unoccupied homes and businesses, such as Detroit, Michigan, vacant spaces may provide hidden locations where violent offenders can attack and hide their victims away from the public eye [11]. Although many BIPOC individuals are impacted by poverty at higher rates than white people, the osteological impacts of poverty are not limited to racial groups [21]. The disparity between those above and below the poverty line may be more apparent in some locations than others. For instance, 35–38% of all residents in Detroit make less than \$10,000 per year, compared to the national average of 6–15% [45].

Deaths resulting from the impacts of poverty can not only be observed on the skeleton but also from the location and condition of the remains. Often, these human remains are not found for several months and may become mummified, particularly if they are hidden from view in vacant houses, lots, or in houseless encampments [11]. If found in a cold climate, they may be wrapped in multiple layers of fabric in an attempt to keep themselves warm during the winter [11]. Lower-income residents will often exhibit pathological lesions as a result of inadequate or inaccessible dental and health care [11]. Other health conditions that are less often observed in modern society, such as scurvy, may also be present due to vitamin C deficiency [11]. Other indications of chronic and untreated health conditions, like severe rheumatoid arthritis, may

be another manifestation of lower socioeconomic status [6]. Individuals who are in chronic pain may be particularly at risk of accidental overdose and drug-related violence, especially given the opioid crisis in America.

If impoverished and marginalized individuals cannot afford adequate medical treatment, they may resort to self-prescription [11]. Chronic opioid exposure can be observed skeletally by producing osteoporotic effects on the bones and increasing the risk of bone fracture [46]. Pitting defects and regions of increased bone resorption uncharacteristic in younger individuals may also be present [46]. Skeletal remains can be tested for drug use, although they are frequently not [47]. Further, the nature and stigma of drug use often lead these structurally vulnerable individuals to dangerous and isolated spaces. Deaths resulting from an accidental overdose, violence, or the elements may then cause the recovery of the remains to be delayed if they are located in vacant spaces. Other traits that lead to social exclusion, such as mental health disorders and substance abuse, can also increase the likelihood of isolated deaths [46].

One practical experience for identifying biomarkers of poverty in a course setting could include a project where students choose a specific indicator to research and then present the literature surrounding this biomarker within the framework of structural vulnerability. This exercise provides an opportunity for inquiry-based learning at both the undergraduate and graduate levels. Instead of simply identifying how a condition presents itself in skeletal remains, students should consider what socioeconomic factors might lead to the development of a disease like scurvy in modern populations. What aspects of poverty might lead to a nutritional deficiency of vitamin C in U.S. citizens? How does their lack of access to affordable healthcare, fresh produce, and housing impact the severity of this condition? Students should understand and reflect on the consequences of structural vulnerability in the health outcomes of impoverished individuals in addition to identifying their biomarkers.

Students can also form service-learning projects to work with their local community and create partnerships to enact social change. However, it is essential to properly contextualize these issues, form equitable partnerships with the affected communities to avoid a sense of "charity", and develop achievable learning objectives and outcomes [22,48]. It is crucial in a classroom setting to situate the marginalization of impoverished individuals within the broader sociopolitical context that initially made them structurally vulnerable to help future forensic anthropologists properly address the needs of the communities in which they serve.

6. The importance of teaching a structural vulnerability framework and the SVP

Forensic anthropology has developed into a unique discipline that requires specialized education with the option of certification [49]. Within the United States and other countries, there are dedicated credentialing agencies that help validate the education and expertise of forensic anthropologists through testing and certification. The United States has the oldest credentialing agency, the American Board of Forensic Anthropologists, which was established in 1977 [49]. In Europe, the credentialing agency is the Forensic Anthropology Society of Europe (FASE). The Royal Anthropological Institute in the UK and the Asociación Latinoamericana de Antropología Forense in Latin America also offer certification [49,50]. However, while there are numerous certifying agencies for practicing forensic anthropologists, there are no official graduate training standards for forensic anthropology.

Several studies have highlighted the need for standards in graduate education for forensic anthropology [44,51–54]. While current practitioners in the discipline agree that training from a board-certified forensic anthropologist is an important component of graduate education, only 27 institutions offer this opportunity [53,54]. Additionally, a recent survey of forensic anthropologists and trainees found that over

80% of respondents agreed that courses in subject areas such as human osteology, forensic anthropology methods, skeletal trauma, archaeological methods, taphonomy, human variation, and human decomposition should be part of a standard forensic anthropology curriculum [54].

Neither the survey nor any current forensic anthropology programs include coursework dedicated to structural violence analysis in forensic cases [49,54]. Based on how structural vulnerability has demonstrated effects on forensic anthropological analyses, there is a clear need for this perspective as part of graduate coursework in forensic anthropology. If this training is left as a component of continuing education for forensic anthropologists, it could lead to a disparity in practice. Thus, we contend that as standards for forensic anthropology are developed for classroom curricula, they should include training in structural vulnerability analysis.

There is currently a movement in the United Kingdom called *Decolonizing the Curriculum* that aims to design curricula in forensic science education to support diverse and inclusive learning [55]. The core tenets of this movement are steps toward advocacy and improving the discipline, which can and should also be applied to forensic anthropology curriculum development in the United States. Incorporation of the structural vulnerability framework into graduate and even potentially upper-level undergraduate coursework is a form of cognitive justice, which approaches understanding science at the intersection of increasing representation and diversification through different cultures [56].

Education about structural violence in graduate forensic anthropology coursework should not only have standards and best practices for the SVP but also include a recognition of structural violence from historical perspectives within the field of anthropology. Having a deeper understanding of how structural violence played a key role in the development of the skeletal collections from which forensic anthropology methods were derived and how it affects case analysis will help future practitioners build a more inclusive, nuanced discipline that advocates for marginalized individuals in death.

In addition to the example activities provided above for each area of structural vulnerability, coursework could include discussions of how BIPOC individuals have been further marginalized after death historically through unethical skeletal curation and a lack of representation. Many of the prominent skeletal collections used in forensic research are disproportionately composed of BIPOC individuals, especially the historical skeletal collections, such as the Robert J. Terry Anatomical Collection, the W. Montague Cobb Skeletal Collection, or the Hamann-Todd Collection [57]. In both modern and historical contexts, using unclaimed remains in medical schools or skeletal collections is a form of structural violence. They were not given the opportunity to consent to being used for educational or research purposes and disproportionately originate from poor and marginalized groups as a result of 1800s anatomical laws [58]. As of 2004, 20% of anatomy laboratories in North America were still using unclaimed bodies for anatomical education, and procuring unclaimed remains is still legal in some countries, such as Italy [59,60]. The presence and curation of these individuals in laboratories and museums today furthers the structural violence inflicted on these decedents [57]. As future forensic anthropologists, students need to be aware of this history in order to move towards a more equitable discipline and practice.

In addition to the need for ethically curated skeletal collections, there is also an unfortunate preponderance of *donated* remains from white individuals compared to BIPOC decedents [61]. The hesitation for BIPOC individuals to donate their remains is understandable due to a long history of exploitation by scientists (e.g., the Tuskegee Syphilis Study, Henrietta Lacks' cell line, etc.) [62–64]. However, our forensic analyses often require population-specific standards to adequately identify the biological characteristics of all decedents [64]. Therefore, it is crucial to study the remains of ethically curated BIPOC decedents in order to help identify them in forensic casework.

Particularly, there is a notable lack of donated Asian populations

within skeletal collections, and those collections that do exist are often historical in nature or small in sample size [65–70]. Although including more cadavers of color will help mitigate the erasure of marginalized groups, it is not enough to simply add these individuals. Rather, we also need to reflect on the power dynamics and knowledge generated by these collections to ensure that all communities are benefiting equally from this research. Discussing the history of skeletal collections, the composition of individuals within them, and how to ethically improve the diversity and curation of these collections is a perfect example of how to incorporate the effects of structural vulnerability in a classroom setting.

Including a structural vulnerability perspective into graduate curricula can assist in creating a more inclusive teaching environment as well. As educators, it is important not to alienate students who are from marginalized groups by ignoring the modern and historical ramifications of structural violence. A student who knows that individuals like themselves will become invisible after death is unlikely to feel comfortable or accepted within their own classroom, let alone welcomed into the field of forensic anthropology. For this reason, the skeletal effects of structural vulnerability need to be addressed in forensic anthropology coursework. It is becoming increasingly important in this politically divided world to show our support and allyship to all marginalized groups, particularly when discussing the ramifications of social inequality.

This training can also lead to future research that could potentially impart meaningful change for marginalized communities that have suffered from structural violence. Forensic anthropology and anthropology as a broader discipline have been built and developed on the backs of historically marginalized communities. Practicing anthropology that incorporates structural vulnerability is a way for forensic anthropologists to become advocates for marginalized populations and help facilitate recognition of the impacts of structural violence, thus supporting change in systemic issues. However, without careful consideration, this approach cannot be easily implemented in the classroom.

7. Limitations to the Structural Vulnerability Profile and framework

Although we argue that a structural vulnerability perspective should be incorporated into educational curricula, we do not think it can be accomplished easily or without serious reflection. When examining decedents from marginalized communities through a structural vulnerability lens, it is crucial to consider their individual lived experiences, intersectionality between multiple groups, and personal resistance and agency to violence, all of which cannot be fully incorporated into an SVP. The osteological manifestations of structural vulnerability reveal the importance of intersectionality in forensic anthropology research. Although structural violence affects many marginalized groups, those individuals who identify at the intersection of marginalized races, genders, and socioeconomic statuses will be the most dramatically impacted. As the data shows, transgender women of color are the most at risk for homicidal violence, highlighting the need to identify their remains in forensic casework [71]. This intersectionality can also make it difficult to delineate which aspects of an individual's life history led to the embodiment of their physiological stress. It is one of the many limitations of a structural vulnerability framework that must be addressed.

Criticisms of the structural vulnerability perspective have noted the determinism inherent in this framework, which can overshadow the agency and lived experiences of the individuals being analyzed [1]. Although an SVP may suggest that an individual originates from a marginalized group, it is important to be mindful that all people will react differently to the social inequalities imposed upon them and will engage in various acts of resistance to persevere despite these oppressive social structures. These individuals are not powerless. They may be

limited in the opportunities presented to them to resist racialized and socialized health disparities, but we must acknowledge the capacity of people to fight their oppression in our discussions of structural vulnerability. As evidenced by the osteological paradox described by Wood [72], skeletal lesions do not indicate the weakest and sickest of individuals, but rather the strongest and healthiest people who were able to resist adversity rather than become victims of it [6]. Therefore, although the communities within these studies are generalized by their group dynamics (e.g., migrants, BIPOC, gender-diverse, etc.), group affiliation as evidence of marginalization may be where those similarities end.

8. Conclusion

Despite the fact that there is a demonstrated lack of standards in forensic anthropology training and education, both the current and future structure of graduate programs should include a structural vulnerability framework. Forensic anthropology cannot be done without considering the cultural impacts on bodies, particularly how they appear in death. Structural violence has a significant impact on the health and wellbeing of vulnerable individuals, which can manifest in visible skeletal pathologies. It has a demonstrated impact on forensic anthropological analyses, which needs to be recognized, discussed, and accounted for. This includes recognition of the intersectionality of structural vulnerability, understanding the historical role anthropology has played in perpetuating structural violence, best practices for incorporating the SVP into anthropological analyses, and further studies to understand the impacts of racial, political, socioeconomic, and gender inequities on vulnerable populations.

Anthropologists often write from an outsider's perspective, and the research conducted in our field makes bold claims about the lived experiences of marginalized individuals. As problematic as that may be, the alternative is to stand aside and force those within marginalized communities to step forward and advocate for themselves. This reaction cannot constitute true allyship, as those with the privilege and ability to enact change should bear the work of advocacy, not those who are directly impacted by it. Forensic anthropologists who work with a multitude of agencies and individuals should do their part by reporting the skeletal-level impacts of structural vulnerability. This record provides evidence of the often-imperceptible lived experiences of individuals affected by social inequality. Providing tangible evidence can help inform and influence politicians with the power to make changes.

Therefore, the first step in making these changes is to train future forensic anthropologists in recognizing indicators of structural vulnerability. It is crucial to incorporate a structural vulnerability perspective into the classroom, in lieu of continuing education, to ensure that all forensic anthropologists can perform these analyses and become better allies to marginalized communities. In doing so, we will not only be able to take steps towards providing visibility to vulnerable populations after death but also begin to offer support to aspiring forensic anthropologists from these groups in knowing their communities are being recognized, advocated for, and supported within the discipline.

Declarations of interest

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