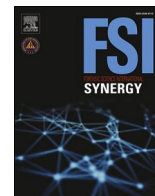




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Structural vulnerability approaches to forensic anthropology: Beyond evolutionary theory

Diverse bodies of theory inform forensic anthropology [1,2] in addition to the evolutionary frameworks or biological paradigms most often invoked [3]. Despite this theoretical depth, a vast array of anthropological theory remains to be fully examined by forensic anthropologists. This can be explained, in part, by the siloing not only of subdisciplines, but also of interest areas within a subdiscipline, leading some to view even closely aligned specialties such as forensic anthropology and bioarchaeology as theoretically isolated from one another [4–6]. Given the burgeoning conversations in the field on ethical practice, strengthening standards, expanding the scope of forensic work, relevance of forensic practice in relation to broader socio-cultural issues, and holistic approaches to forensic anthropology [6–9], we need to embrace and incorporate anthropological theories that have the potential to inform or transform these issues. Among these discussions, several studies have underscored structural violence and structural vulnerability theories as they apply in forensic anthropology [10–13]. Relatedly, social and structural determinants of health have emerged as lenses through which we can consider forensic anthropological practice [13]. This special issue resides at the intersection of these theories, wherein contributors were asked to broadly apply these frameworks to forensic anthropology.

1. Theories in violence and health

Violence has been studied extensively and can be broken down into seemingly countless, interrelated or overlapping taxonomies (e.g., colonial, bureaucratic, political, necroviolence) that extend well beyond the scope of this paper [14]. Schepers-Hughes and Bourgois [15] describe the entangled nature of multiple forms of violence as the *continuum of violence* (Fig. 1). Anthropologists are particularly well-positioned to observe not only evidence of physical violence, but also evidence of other forms of violence that manifest in the physical body or are inflicted upon the body postmortem. As part of this violence continuum, we find *structural violence*, introduced by Johan Galtung [16] and brought to anthropology more broadly by scholars including Paul Farmer [17], and Nancy Schepers-Hughes and Phillippe Bourgois [15]. Structural violence describes the invisible and indirect forms of violence in which social systems of inequity and oppression cause physical injury to bodies often via policies, beliefs, and social behaviors.

Structural vulnerability, in turn, describes how some people may be particularly vulnerable to (i.e., at greater risk for) experiencing structural violence. For instance, Quesada and colleagues [18:pp. 340] explain structural vulnerability as “a positionality that imposes physical/emotional suffering on specific population groups and individuals in patterned ways ... a product of class-based economic exploitation and

cultural, gender/sexual, and racialized discrimination, as well as complementary processes of depreciated subjectivity formation.” This leads to the question, given the many intersecting social identities a singular group or individual may have, are they more or less likely to experience deprivation? Organizations across sectors have made use of these theoretical lenses to inform distribution of health resources and disaster planning (e.g., World Health Organization, Centers for Disease Control and Prevention). These sociocultural factors that impact the physical body are discussed by behavioral and health scientists in terms of the social determinants of health, referencing how the circumstances in which we are born, live, and work shape our bodies and our health outcomes. These factors can be more accurately understood, however, as the *social and structural determinants of health* (SSDH), as our social conditions are themselves structured by inequitable political and economic fault lines at the systems level. While the impacts of physical violence on the human skeleton have been extensively studied by forensic anthropologists, the ways in which SSDH may be skeletally embodied remain underexamined within the field.

In terms of skeletal health, a variety of lenses, frameworks, and concepts from social and biological sciences can and sometimes have been applied to discuss SSDH or violence and vulnerability. Relatedly, some research posits that repeated exposure to social and economic inequity creates an increased likelihood of poor health outcomes, ultimately due to increased exposure to stress and physiological stress responses [19–21]. This Weathering Hypothesis relies on the biological understanding that chronically high levels of cortisol and other stress hormones have detrimental effects on physical health, such as increased instances of Type II Diabetes, high blood pressure, compromised immune response, and heightened anxiety. Efforts made by the body to maintain homeostasis using stress responses fall under the study of *allostasis*, with the damage from periods of prolonged allostasis described as the allostatic load.

Others frame these phenomena in terms of embodiment of social and cultural experiences [22]. Social embodiment theory has deep roots in human behavioral studies, proposing that sensory and motor inputs from the environment influence thoughts and emotional responses. Clinical medicine recognizes this relationship through treatment plans that address this mind-body connection. Similarly, sociocultural practices may disproportionately impact individuals based on their social identities. In Puerto Rico, for example, while instrumentally measured skin pigmentation has no association with blood pressure, social classifications of race do correlate, with people perceived as darker-skinned experiencing elevated blood pressure [23–26]. In other words, in a racialized society, perceptions of race are associated with physical health indicators—it is not race but *racism* that contributes to poor health

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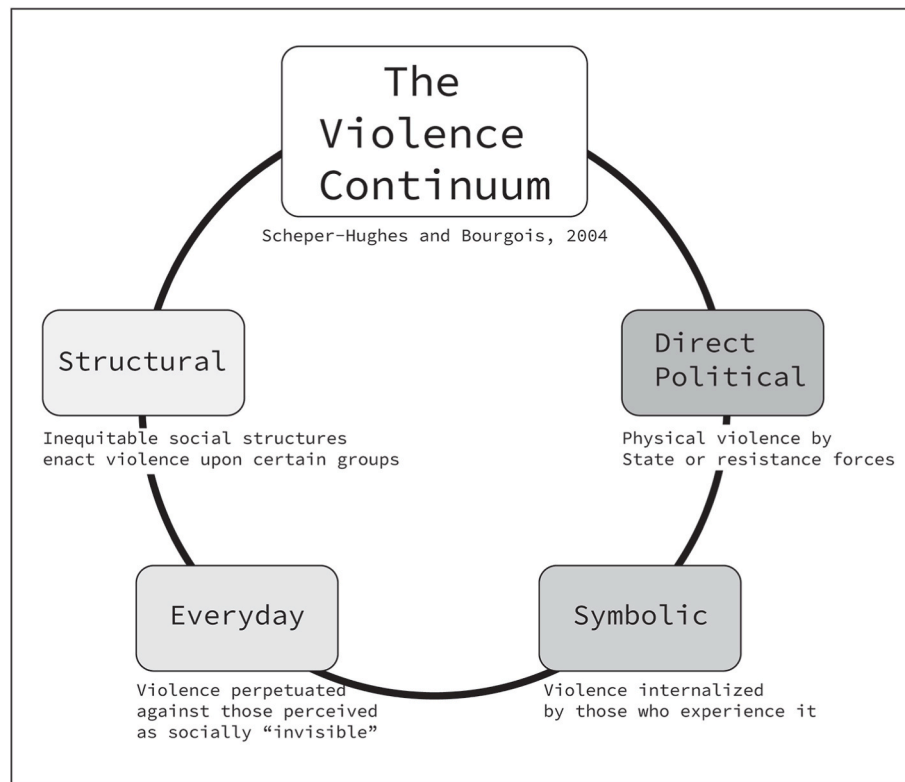


Fig. 1. Scheper-Hughes and Bourgois' [15] continuum of violence draws on the work of Galtung [16] and Farmer [17] to include four types of violence in addition to the physical violence frequently studied by forensic anthropologists—all of which are relevant to research and practice within the subdiscipline.

outcomes.

Social vulnerability and structural violence differentially impact a wide array of identities. Not all members of a marginalized group experience vulnerability and violence in the same way, and this is in part due to the intersectional nature of identity [27] and variable access to resources based on the diverse identities a single individual may possess. To illustrate, a misconception in the US is that White males cannot experience marginalization. While White males in the US do experience race and sex-based privilege, there can be vulnerability or marginalization based on factors such as education level, socioeconomic status, sexual orientation, or physical and mental health, to name a few.

Understanding these SSDH and their dynamic interactions currently inform health practice and policy and equity in the development of laws. The US Centers for Disease Control and Prevention (CDC) use sixteen variables collected as part of census data to create a Social Vulnerability Index. Medical examiner's and coroner's offices also act as a source of data generation for the medicolegal and public health sectors (e.g., National Center for Health Statistics, US Federal Statistics System). Mortality rates and causes and manners of death directly contribute to public health and legal rights discussions. Whether based in a US medicolegal system or not, this bears the question of what the role of forensic anthropology is in contributing to public health and other data. Through applying a structural vulnerability and structural violence lens, there is an opportunity to identify areas of growth in the field as it pertains to related fields of research (e.g., health sciences, human rights) and the potential for community-oriented and publicly grounded forensic anthropological practice. With the possible diverse applications of forensic anthropology data also comes a need for the development of standards, further research on marginalization as it impacts human skeletal variation, and considerations on relationships between vulnerability and various social identities.

2. Introducing the forensic science international: synergy special issue on structural vulnerability approaches to forensic anthropology

In 2022, we proposed a special issue for *FSI: Synergy*, putting out a call for our colleagues in forensic anthropology, law enforcement, and humanitarian/human rights work to contribute manuscripts to what would become an open-access collection of publications. These works would explicitly explore the incorporation of structural vulnerability perspectives and approaches into forensic anthropological casework, research, and practice. The call for papers proposed submissions that include structural vulnerability-related case studies, original research, proposals for practical application, and theory-based perspectives drawn from anthropological, thanatological, human rights, and related literature. We proposed that our contributors might pose and answer questions including, “How would anthropologists report structural vulnerability in casework?”; “How would the resulting data be archived, shared, and accessed?”; and “What are the challenges, dangers, or logistical barriers to these approaches?”

The response from our colleagues was overwhelmingly positive, and it is exciting to share the results of the past two years of work in the form of this special issue. Academic contributors boast affiliations with at least 15 institutions and span ranks from graduate students to senior scholars. Authors work in contexts ranging from law enforcement and medical examiner's offices to hospitals and museums. The pieces thoughtfully address both the potential and benefits, as well as the risks and challenges of expanding structural vulnerability approaches into forensic casework. We have grouped the articles into several thematic clusters for discussion here, addressing: 1) How forensic anthropologists can systematically collect and report structural vulnerability data; 2) How such an approach forces a reckoning and reconsideration of social identity in a traditionally biologically oriented discipline; 3) The types of vulnerabilities that may be revealed when research is conducted with this focus; and 4) How to implement a structural vulnerability approach

thoughtfully, productively, and ethically.

2.1. Collecting and reporting data: the structural vulnerability profile (SVP)

In the special issue's inaugural contribution, Winburn and colleagues [28] propose the *Structural Vulnerability Profile*—a term that deliberately refocuses bioanthropology's traditional *biological* profile to shed light not on the heritable (and frequently misrepresented as typological and immutable) sources of human skeletal and dental variation, but on the upstream, social and structural sources of that variation. Specifically, they posit that specific skeletal and dental biomarkers [28: Table 1] can reflect the embodiment of social and economic stressors experienced by marginalized populations. Inspired by medical anthropology's Structural Vulnerability Assessment Tool [29], which similarly framed biomedical interventions among social factors including financial security, food access, residence access, and discrimination, the SVP proposes that forensic anthropology shift to illuminating the sources of stress, disease, ill health, morbidity, and early mortality that—while often inequitably patterned along lines of race, class, and gender—are ultimately *solvable*. In essence, they challenge us to use forensic anthropological data to “speak truth to power” with the goal of informing public policies, improving public health, and addressing legal rights. The published dialogue that followed the proposal of the SVP has proved transformative and far-reaching.

Kim and Friedlander [30] build upon the notion of an SVP to discuss the possible types of data to include in an SVP and the implications of said data. Mirroring humanitarian forensic anthropology, or forensic human rights anthropological investigations, the authors suggest that contextual data from the scene, personal artifacts that inform living situations, and skeletal data be considered collectively. Their analysis also reminds the reader that forensic investigators are understood by behavioral scientists to be (perhaps unwilling) social agents, which then adds an ethical dimension to what is or is not reported in forensic anthropological findings. Parallels can be seen between domestic casework and international human rights investigations, and the authors discuss the potential benefits of applying a structural vulnerability approach in forensic casework to public health, justice and human rights, and missing persons cases.

Gruenthal-Rankin and colleagues [31] take readers “Beyond the Report,” challenging practitioners to explicitly state goals for how SVP data will be used in analysis of cases and research and reminding us to integrate contextual data (e.g., recovery scene, historical trends, regional trends) into our analyses of vulnerability. Emphasizing community-oriented practice, the authors argue that ethical applications of an SVP must center on identifying harmful power structures in ways that translate to community-level action, rather than restricting our findings to reports and journal articles with a limited audience.

3. Reconsidering social identity: framing race, ethnicity, and gender within SVP approaches

In their powerful critique of forensic anthropological practice, Dwyer and colleagues [32] explore the dangers of homogenizing Black Americans with Black Caribbean migrants, calling out the violence inherent in forensic identification standards that are tantamount to ethnic erasure. They challenge us to consider how vulnerability shapes circumstances of death and subsequent identification processes and caution that adding structural vulnerability approaches to the forensic anthropological toolkit will not adequately or accurately portray embodied inequity until the broader, foundational ways in which “forensic anthropology continues to misinterpret and mismeasure human variation” are addressed and remedied.

In their study of error and bias in New Mexico medical examiner records, Appel and colleagues [33] find frequent misreporting of race and ethnicity for decedents who identify as “Hispanic”—especially

regarding the designation of manner of death as “homicide” and causes of death as “injury” and “substance abuse.” The authors raise the question of whether inaccuracies may cause biased misperceptions of violence within specific, vulnerable communities and affect investigative processes.

Extending the sensitive considerations of race and ethnicity raised by these authors to the social identity of gender, Flaherty and colleagues [34] ask how forensic anthropologists might account for gender—and specifically, the possibility of misgendering—in case analyses. Their investigation is enabled by collaboration with a trans stakeholder from the local Nevada community who provided computed tomography (CT) images to enable 3D printing of her skull; they find that, even given her multiple facial feminization surgeries and decades of hormone replacement therapy, *FORDISC 3.1* [35] discriminant function analyses still classify their trans woman collaborator as male. The authors propose that future casework might be able to estimate not only assigned sex at birth, but also gender, if forensic anthropologists utilize a bio-cultural approach that accounts for marginalized social identities and their effects on the human skeleton.

4. Revealing structural vulnerability: data from case studies and empirical research

Other collaborators present data revealing the various forms that structural vulnerability can take within a society. In their case study of an individual disinterred from the historic Mississippi State Asylum (MSA) cemetery, Adams and Goliath [36] contextualize antemortem trauma to the left parietal by applying a structural vulnerability framework. Their osteobiography posits that the location of a cranial depression fracture, likely resulting from physical interpersonal violence, would have had caused a traumatic brain injury that in turn led to the institutionalization in the MSA. Other variables adding to this vulnerable life history include nutritional and physiological stressors evidenced by linear enamel hypoplasia and periostitis, all of which paint a broader portrait of the structural violence that led to interment in the MSA cemetery.

Gaddis and colleagues' [37] findings underscore elderly adults as socially vulnerable by exploring the mechanism for elderly death before and after the COVID-19 pandemic. They report a statistically significant increase in suicide rates in this elderly population in Clark County Nevada that correlates to the increased risk factors of social isolation exacerbated by the pandemic. These results underscore the importance of documentation of structural vulnerability in forensic case reports in an effort toward improved public health policies to reduce risk and prevent premature death in these already vulnerable populations.

Walkup and colleagues [38] use data on antemortem tooth loss (AMTL) to investigate the axes along which social inequity might be embodied in an Eastern Tennessee community — specifically exploring the effects of poverty (via socioeconomic status [SES]) and racism (via skeletal donors' self- or kin-identified social race categories). They find significantly more AMTL in their sample's low-SES White individuals than in age-matched samples of either People of Color or high-SES White individuals, invoking the weathering hypothesis [19] to interpret this premature dental aging in a structurally vulnerable population and implicating poverty as its major driver.

5. Implementing SVP approaches: shifting our focus to patterns and populations

Litavec and Basom [39] argue for the use of structural vulnerability and social inequity perspectives in forensic anthropology curricula, envisioning how this type of data collection could be taught. They provide a framework that includes the weathering hypothesis [19], biomarkers for studying structural violence (with a focus on the important work with Latin American migrants), and a review of indicators of gender to recognize transgender and non-binary decedents.

They also emphasize the importance of addressing the limitations of the structural vulnerability profile in addition to discussing its merits. These authors underscore that the need to incorporate SVP frameworks into the curriculum for graduate programs is ultimately so that future forensic anthropologists can become better allies to the marginalized communities in which they will serve.

Reineke and colleagues [40] support a structural vulnerability framework, but caution against reporting observations as a “profile” due to the risk that reporting decedents as vulnerable could be misinterpreted, with the potential to perpetuate the marginalization of already vulnerable populations. They also caution against the over-interpretation of pathological conditions and skeletal indicators of stress, emphasizing that skeletal findings do not hold primacy over other forms of data. Alternatively, they encourage medicolegal documentation of pathological conditions that contextualizes historical, sociopolitical, cultural, and environmental, among other factors in a more nuanced approach. These authors strongly support the development of forensic anthropology practices that encourage detailed observation, contextualized documentation, and further discussion of structural violence.

Several of Reineke and colleagues’ [40] concerns are addressed by Znachko and colleagues [41], who emphasize that the purpose of an SVP is not to report individual decedents as vulnerable but to report population-level patterns of suffering to the State, with the goal of influencing policy and improving public health. With an authorship including not only forensic anthropologists but also forensic pathologists, they present case scenarios to demonstrate how simple modifications while working within the current medicolegal reporting infrastructure could have a significant impact on state and federal policy. They give examples for how to apply the structural vulnerability assessment tool (SVAT) [29] in a forensic anthropology context to better understand the relationship between biomarkers, demographics, death-scene context, and associated evidence. The authors present this SVP method as an opportunity for faithful accounting of structural inequality at a population level and a chance to shift the focus on upstream, structural-level factors contributing to poor health and early death.

Additional approaches to implementing the structural vulnerability profile within the medicolegal context and suggestions for population-data aggregation are offered by Kim and colleagues [42]. These authors present mock case reports and provide examples for how to aggregate contextualized data, as well as samples of end-of-year reporting to better recognize and record public health trends. They recommend collaborations with other medicolegal professionals concerning what data to collect, how to compile databases, and how to share that data. They acknowledge the potential drawbacks and further burden this additional documentation may place on forensic anthropology practitioners, but recognize that some of the data may already be gathered by other medicolegal professionals. Collaborations can enable a path forward in determining how to move from an individual-focused skeletal analysis to a community- and population-based approach for data collection, and ways to standardize this approach.

6. Challenges, potential, and next steps

This special issue is not the beginning of structural vulnerability applications to forensic anthropology, nor is it the end. We are pleased to report that, in the months since our special issue’s submission deadline closed, much allied research has emerged. Galvanized, perhaps, by our contributors’ work and the recent volume edited by Byrnes and Sandoval-Cervantes (2022 [43]), formal discussions about enhancing forensic science with anthropological theory—including the theories of structural vulnerability, structural violence, and SSDH—have had an increasing presence in the discipline. Recent conference presentations have discussed how our practice can be enriched by structural vulnerability approaches [44–46], and related symposia have been held at the annual meetings of the *American Academy of Forensic Sciences* [47], the

American Association of Biological Anthropologists and Human Biology Association [48], and the *American Anthropological Association* [49]. Perhaps most significantly, some of these conversations have flowed into the biological anthropology community beyond the forensic sciences, and even into the broader community of medical and social anthropologists.

This inter-subdisciplinarity, we believe, is a key component to the ethical incorporation of structural vulnerability approaches in forensic anthropology. Forensic anthropologists did not create these theories; we did not pilot these approaches. They come from the broader discipline, and we must draw on the expertise of those who have used and developed them. The fear, echoed in several of this issue’s contributions [31, 32,40] that we may cause harm to the dead, or even to their living communities, by implementing these approaches may perhaps be assuaged by the knowledge that they were developed and by medical anthropologists—many of them activist-scholars whose careers have explicitly been dedicated to helping living communities [e.g., 17,18,29]. Structural vulnerability approaches have already been successfully and ethically implemented within healthcare contexts [e.g., 50]. We must work with those scholars to ensure that the forensic application of these theories follows the same ethical compass.

Another fear expressed in less-formal disciplinary discussions is that reporting patterns of skeletally and dentally embodied vulnerability with the intention to inform policymaking and spur social change is tantamount to advocacy, raising the specter of subjectivity that threatens to undermine the scientific objectivity many practitioners deeply value. To us, this is a red herring. Good science—done well, following strong standards, verified by quality-control protocols—remains good science whether or not the resulting findings are reported to the State to leverage social change. As decades of work in public health, medical anthropology, and social epidemiology show, good science and social advocacy can go hand in hand. Further, contrary to the falsely dichotomous framing of the “objectivity/neutrality vs. subjectivity/advocacy” debate, strong scientific standards are inherently complementary with structural vulnerability approaches. As our methods improve, our standards strengthen, and our practitioner base becomes more and more proficient at following them, there is less of a need for the disciplinary culture to maintain its allegedly neutral facade, which only masks a subjective refusal to challenge the status quo [51]. The better, stronger, and more standardized forensic science becomes, the more room there is for forensic scientists to engage with the social issues our work intersects [51–53]. Science and advocacy go hand in hand, because when we are constrained by the standards of ‘good science,’ the integrity of our work is maintained regardless of what we think, feel, want, and desire socially or politically [54].

Other challenges to implementation of these approaches are less easily dismissed. A desire to synthesize population-level data from forensic casework may be undermined by inaccurate records. Partial analyses of human remains may occur for a variety of reasons, resulting in incomplete data collection that would need to be accounted for in development of standards and reporting. Medicolegal systems in the US and globally do not consistently utilize anthropological consultants, and those that do may emphasize trauma-only consults rather than the complete analyses that would enable the synthesis of pathological data relevant to public health. The specifics of how case reports can be mobilized to inform social policy remain to be developed, and those specifics will differ from jurisdiction to jurisdiction. There are also problems of interpretation. How can medicolegal personnel accurately interpret structural-level patterns when they themselves may not have achieved the *structural competency* [55,56] necessary to identify and call out upstream causes of embodied violence? Collaboration with the Structural Competency Working Group [57,58] to develop specific, directed structural competency trainings for forensic anthropologists, pathologists, death investigators, operations directors, and other medicolegal personnel may be warranted.

7. Conclusions

Despite these challenges, we firmly believe that the potential of this theoretical and methodological shift outweighs the negative. The power of structural vulnerability approaches is that they not only show the root causes of social problems to be structural, but they also reveal them to be solvable. We look forward to working with our colleagues in the years to come as we take the next steps toward the ethical, productive, and potentially transformative implementation of structural vulnerability approaches in forensic anthropology.

Acknowledgments

We wish to acknowledge all those who submitted articles for the special issue—including both those whose work was ultimately published and those who were unable to publish at this time. To those latter colleagues, we value your contributions and hope to read them in another form and venue soon.

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