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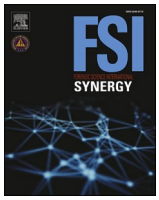

Adapting forensic case reporting to account for marginalization and vulnerability

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ABSTRACT

Scholarship of forensic sciences has shown politicalization of human remains and potential biases in criminal investigations. Specifically, concerns have been raised regarding how forensic anthropology analysis and documentation may hinder identification processes or obfuscate other data. As part of this scholarship, some have suggested that forensic anthropologists expand their reporting to include broader public health and safety information as well as reconsider who should be included in reports of anthropological findings. In response to these burgeoning discussions, this piece provides examples of ways anthropologists may formulate reports that capture evidence of marginalization or structural vulnerability. Documentation of findings can occur in myriad formats, including, but not limited to, individual case reports, reports on population analyses from cases, collaborative end-of-year reporting conducted with other medicolegal professionals, and collaborative data-basing. This piece provides various templates and suggestions for reporting this kind of data while encouraging further discussion on related merits and concerns.

1. Introduction

Far-reaching scholarship has explored ideas of embodiment and biology of traumatic experiences, sociocultural barriers to resources, marginalization, and vulnerability [1–7]. Of these, structural violence (SV) theory focuses on barriers to accessibility, such as "disparate access to resources, political power, education, health care, and legal standing" [5]. Within forensic anthropology casework of a given region, indicators of the embodiment of trauma or lived experiences of marginalization may be observed on the skeleton; yet, it is unclear in the field what could or should be done with this data.

Forensic anthropology is traditionally conceived as both practically and individually focused—i.e., relying on casework aimed at enabling identifications of individuals and descriptions of the circumstances surrounding their death. Yet, there have been calls both from within the subdiscipline and from the broader forensic science community for a more holistic approach to forensic science [8,9]—one that dwells at the intersection of practice, research, and policy/law [10,11] and one that acknowledges the power for forensic scientists to not only enable case resolution but also contribute to broader issues of criminal justice [12]. It is within this more holistic, societally focused model of forensic science that the application of SV perspectives has the potential to be particularly powerful.

To that end, Winburn and colleagues recently proposed the use of a structural vulnerability profile (SVP) in forensic analyses [13,14], which is a modification of medical anthropology's Structural Vulnerability Assessment Tool (SVAT) [15]. Both of these approaches draw from long-standing research in medical anthropology, social epidemiology, and public health that discusses the impacts of sociocultural factors on health status [16–18] (Fig. 1). To build an SVP in forensic analysis, Winburn and colleagues [14] offer examples of biomarkers, the social processes indicated by the markers, and possible interpretations of social processes. The SVP approach builds on their previous work, which highlighted the importance of sound recovery protocols and the consideration of recovery context in addition to the examination of biomarkers indicating lived experiences of inequity [13]. In their review of casework from southeastern Michigan, Moore and Kim [19] exemplify one manner of applying an SV approach to casework. Their study goes beyond an osteobiographic analysis to take into consideration skeletal biomarkers as well as crime scene contexts and material artifacts, which can function as indicators of access to resources such as healthcare, dental care, housing, and basic utilities. Kim and Friedlander

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[20] go one step further to note the potential assistance SVP data could provide in tracking trends or pursuing identification in missing persons cases, documenting public health and public safety concerns, and preventing historical revisionism. Similarly, Znachko and colleagues [8] posit that reporting aggregate statistics on deaths that are socially and structurally determined (e.g., infant mortality, opioid overdose, etc.) in end-of-year medical examiner and coroner reports represents an opportunity for medicolegal casework to interface with public-health goals. Gruenthal-Rankin and collaborators [9] also emphasize the need to acknowledge differential diagnoses and alternative causes for biomarkers aside from allostatic load, necessitating nuance and detail in forensic reporting.

Overall, interpretations of stress markers, crime scene context, and population demographics are not new within forensic anthropology. However, this particular application of structural violence or an SVP is an emerging concept in the field and has stimulated much discussion that extends beyond the scope of this paper. In efforts to ground the discussion, moving it away from theoretical discussions, this piece contributes to the above body of work with specific suggestions of ways anthropology practitioners might envision, conceptualize, and ultimately implement SV frameworks. In it, we provide several examples of how medicolegal evidence of structural violence may be incorporated into forensic anthropological casework.

Through this practical exercise, we aim to encourage forensic anthropology practitioners to explore possibilities in SVP reporting. Multiple reporting avenues are feasible: (a) individual anthropological case reports could contain SV/SVP information; (b) forensic anthropologists could generate periodic reports on their body of casework; (c) forensic anthropologists could work with other medico-legal personnel to integrate SV data into existing reporting [8]; (d) forensic anthropologists could collaborate with colleagues to create SV databases based on casework or research [14]; or (e) any combination of these options. We explore reporting options below, suggesting strengths and limitations of each. These examples are hypothetical and have not yet been implemented in casework. However, we argue that many of these avenues represent opportunities to report contextualized SV data to agencies of power to impact policy change, and we urge our colleagues to explore them.

2. Individual case reports and the SVP

Individual case report information could be organized in myriad ways if anthropologists and/or medical examiner's offices (MEO) elect to pursue this type of documentation. Complementary bench note forms should contain detailed information that may or may not be present in the individual reports themselves. Currently in the US, forensic anthropology case report data is designed to assist the medico-legal system in identifying individuals and reconstructing criminal events. Depending on the purpose of the SVP data, the content of the report may change. Legal concerns unrelated to homicides, neglect, or abuse—such as those related to environmental toxins or access to safe and affordable housing—could also be informed by the types of SVP data noted in MEOs [13,19]. Mock Scenario #1 provides an example of what the SVP might look like in the written narrative of an individual case report; however, the question remains for how this data will be aggregated and stored.

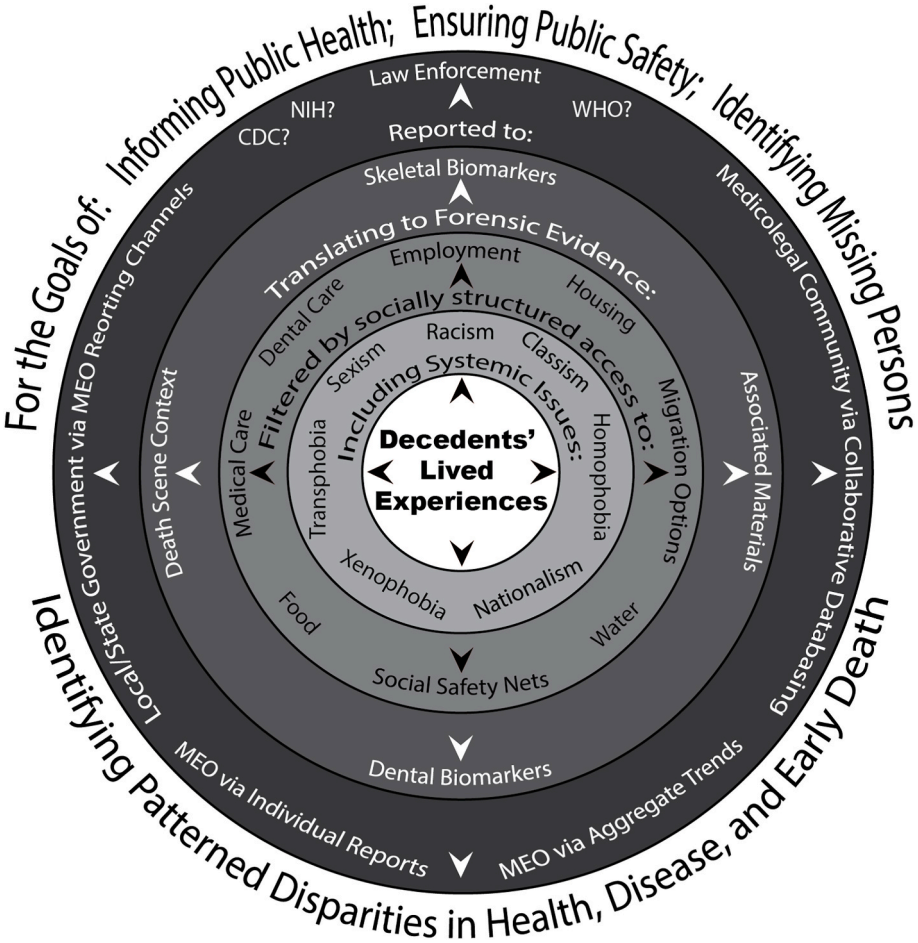

Figure 1. Visualization of anthropological work.

2.1. Mock Scenario #1 – individual case report

Structural vulnerability

In this section of the report, case information, scene context, and osteobiographic data that indicate possible barriers to resources, social epidemiology factors, or experiences of marginalization are identified. For the remains accessioned as 23-01234, scene data, material artifacts, and skeletal markers indicate limited or reduced access to housing, balanced nutrition, and dental care. See Appendix A for summarized, sociocultural and historical context.

Non-osteological considerations

The case registration summary provided by Medical Examiner Investigator (MEI) Smith states that the remains were found in a vacant residential building on a mattress. Personal belongings suggest the individual lived at this location. It is observed that the individual whose remains are accessioned as 23–01234 likely did not have access to reliable housing, heat, or running water at their residence. The remains were clothed in multiple layers of clothing and blankets with active frostbite noted on distal digits of the feet, further supporting the absence of a reliable heat source. (Information could be added here to contextualize this in recent trends or other cultural data or reserved for a summary report of the body of casework.)

Osteological considerations

For the remains accessioned as 23–01234, the superior wall of the eye orbits have a sieve-like appearance with pits in the cortical bone that cover a surface area in each orbit – approximately 15 mm medial-lateral and 12 mm anterior-posterior. This pathological change occurs bilaterally and is consistent with cribra orbitalia. Cribra orbitalia can indicate conditions related to nutritional deficiencies such as scurvy or anemia [21,22]. Additionally, pinpoint sized pitting is observed on the palatine processes and posterior maxillae, the basilar portion of the occipital and on the lateral aspects of the greater wings of the sphenoid bones. The distribution of this porosity is most consistent with scurvy, although anemias and infection cannot be ruled out [23,24]. Antemortem tooth loss is extreme in this individual, with mandibular teeth #23–25 representing the only retained teeth; the alveolus of tooth #23 is characterized by a roughly circular, periapical abscess approximately 4 mm in diameter on the mandible. The right fifth metacarpal displays a well-healed, poorly set, antemortem fracture at the approximate midshaft. Extreme osteoarthritis of the right manual phalanges may be partially post-traumatic. The left ulna displays a pseudo-arthrosis approximately 70 mm from the proximal end, representing a complete, antemortem diaphyseal fracture. The ulna fracture shows no evidence of medical intervention. (Information could be added here to contextualize this in recent trends or other cultural data or reserved for a summary report of the body of casework.)

Summary

The individual accessioned as 23-01234 likely experienced an inability to access affordable housing, medical care/dental care, and nutritive food sources. Rather than representing the result of individual decisions, access to these essential resources can be socially structured—for example, along class-based lines [25–27]. It is the recommendation of the undersigned that the potential for experiences of social inequity to have contributed to the individuals' health status and/or death should be considered. This case also likely represents the death of an unhoused individual, and may be considered as such, if the MEO aggregates statistics on unhoused decedents in end-of-year reporting.

3. Case "Population" data and the SVP

While individual SVP documentation has its merits, it may serve health organizations, MEO offices, and researchers more effectively if anthropologists aggregate the data themselves and provide periodic (e.g., annual, every five years) reports on structural vulnerability and marginalization seen in forensic anthropology casework. This type of contextualization of health-related data has a long history in health sciences and humanities with notable contributions from anthropologists [28]. Practicing forensic anthropologists who are also trained as anthropological researchers are particularly appropriate candidates for compiling, examining, and reporting data on trends seen in crime scenes, artifacts, biomarkers, and other indicators of lived experiences and relating them to cultural, historical, and political contexts. The ability to recognize differential causes of biomarkers, osteopathology, and medical interventions that impact the skeleton also may be outside the training or familiarity of the attending forensic pathologist, emphasizing the importance of anthropological documentation [21,29]. Medicolegal death investigators may also prove instrumental in this effort, as they already collect and aggregate contextual data for some types of cases (e.g., fetal and infant deaths), and SVAT-style data--collection sheets may also be utilized (see discussion and example in Ref. [8]).

In Mock Scenario #2, a possible layout for a structural vulnerability report using aggregated case data is presented.

3.1. Mock Scenario #2 - Study of body of casework

Structural Vulnerability Report

Allen County Medical Examiner's Office 2017–2022

Sociocultural and historical context of Allen County

Brief historical information specific to the region served would be presented here to indicate trends in economics, housing, health, that may contribute to limited healthcare, the presence of food deserts, and other factors that reduce access to resources. This information would be geographically and historically contextualized, and the same text could be present in each report for a given area and adjusted to reflect changes when appropriate. For example, when reviewing casework trends, Moore and Kim [19] contextualize the history (in part) of Detroit, Michigan, within the framework of economic decline influenced by outsourcing of the automotive industry and white flight. With this, a more in-depth study or supplemental references could be presented in the appendices.

Case population structural violence/structural vulnerability profile

Within the findings, a summary can be presented, but the categories should be relatively consistent from report to report for comparative purposes. This may result in a rather comprehensive list with no findings reported for some categories. These categories could be organized based on type of evidence (e.g., biomarkers, artifacts, scene context) or, if only biomarkers are examined, by type of biomarker. Ideally, if this information is documented, guidelines or standards would be developed in association with the appropriate organizations such as the American Academy of Forensic Sciences Standards Board (ASB) Anthropology

Table 1
Sample forensic anthropology SVP summary table.

Summary of Findings (1 January 2020–31 December 2024)		
	Male (n = 30)	Female (n = 20)
Biomarkers		
Average # of Teeth Lost AM per person	10	8
Individuals with Enamel Defects	12	3
Porotic Hyperostosis	7	7
Scurvy	1	0
Untreated Displaced Fractures	3	0
Material Artifacts		
Blankets Wrapped Around Individual/Layered Clothing	15	11
Improvised Bandages	2	0
Drug Paraphernalia	4	6
Found with Identification	18	8
Context Information		
Vacant Residence	21	15
Fallow Field	9	5

Consensus Body, or the American Board of Forensic Anthropology. Table 1 presents a hypothetical summary of forensic anthropology findings.

Interpretation of findings

This section would include interpretation of empirical findings and contextualize them in the regional history and cultural dynamics. Again, this could be presented in different ways depending on the type of documentation included. While anthropologist-authored aggregate reports have potential, it remains unclear how such reports would be disseminated within the medicolegal system, let alone to the broader public. To that end, existing reporting structures within MEO and coroner offices may be utilized for anthropological data to reach broader audiences.

4. Collaborating with other medico-legal Personnel

The recent work of Znachko and colleagues [8] represents a collaboration between forensic anthropologists and pathologists toward the implementation of SVP approaches in medicolegal casework. They propose that existing MEO/coroner structures for end-of-year reporting present an opportunity to contribute medicolegal data toward the goal of improving public health outcomes. The growing role of MEOs in the public health sector did not gain much attention until the 2000s [30], as scholars took note that organizations such as the US Centers for Disease Control and Prevention were increasingly using MEO data. MEOs may not be directly reporting public health data akin to the SVP, but other bodies and institutes have access to information generated by their offices that may find it useful. This ambiguous positionality of medical examiner's offices is noted by Bhullar and colleagues [31] who discuss the use of MEO data during pandemics. Similarly, Kim and Friedlander [20] draw on Kim's knowledge from collaborating with medical examiners and their death investigators and Friedlander's experience as a full-time forensic anthropologist employed by the Michigan State Police. They note the potential for supporting public health outcomes as well as contributing to law enforcement understanding of social factors that result in delayed discovery of human remains. As forensic anthropologists generating case data whether through full-time work, or contracted consulting, there should be clarification and discussion with MEs on how SVP data could be used or made available for public health purposes and discussions with law enforcement agencies on what data they track for public safety and identification.

In the below Mock Scenario #3, we follow Znachko and colleagues [8] to envision MEO end-of-year reporting of a category of already-reported data (on infant mortality) reframed within an SV context.

4.1. Mock Scenario #3 - Collaborative end-of-year reporting

Social and Structural Determinants of Infant Mortality

Allen County Medical Examiner's Office 2023

From June 2022–May 2023, Allen County MEO personnel investigated the deaths of five infants. In all five cases, social factors were determined to play a contributing role in the deaths. In all cases, the infants were either sharing a bed with an adult, sharing a bed with a child, or placed on a couch or other unsafe sleep space; in four cases, a crowded living space was noted; in three, maternal smoking was noted; in two, the supervisor was noted to have been impaired by drugs or alcohol. All these behavioral contributors to infant death have been shown to be structured by social factors [32,33]. Specifically, mothers and families living in poverty may experience extreme stressors related to occupation, transportation, medical care, and housing that may result in the unsafe sleep decisions reflected above. In the United States, lack of access to these resources is structured along axes of race and class, and until this pattern is altered, disproportionate infant deaths in families who experience social marginalization are likely to continue [34].

5. Collaborative databasing

The idea of collaborative database creation is not a novel one in the world of forensic anthropology. With examples including the Forensic Databank [35], New Mexico Decedent Image Database [36], and Subadult Virtual Anthropology Database [37], forensic anthropological databases have been developed to curate measurement data, imagery, and a wide variety of demographic data points. An initial first step for databasing structural vulnerability data could include collaborating with MEO personnel to aggregate and curate casework findings within one's own jurisdiction. Potential challenges might include resource limitations—personnel and funding issues within death-investigation systems have been well documented [38]—but these could be overcome by pursuing novel funding opportunities outside of the normal forensic funders (e.g., the National Institute of Justice); the Wenner-Gren Foundation, for example, has funded explicitly forensic anthropological research with societal impacts beyond the medicolegal sphere (e.g., Refs. [14,39]). Organizations such as the CDC also may provide data sharing funding (e.g., Ref. [40]). Another challenge would be limited access to MEO computer systems, for contracted forensic anthropologists who work outside of the physical MEO space; however, as forensic practitioners rely increasingly on digital records, virtual access to secure casework-organization systems are becoming more seamless. Regardless, in-house MEO anthropologists might be able to add databasing to their task list relatively easily, and there may be pathways to collaborate with death investigators and pathologists to integrate their complementary lines of SV data into new databases that align with existing standards of operation.

Alternatively, an anthropology-specific database could be developed, in which individual practitioners collaborate to share anonymized casework data from multiple world regions. In the United States, there is precedent for such an effort. For instance, in the 2010s, the US-based Society of Forensic Anthropologists developed a crowd-sourced and National Institute of Justice (NIJ)-funded database called the Forensic Anthropology Database for Assessing Methods Accuracy (FADAMA) [41]. Broadly speaking, FADAMA gathers information from forensic cases concerning which methods are used for estimating the biological profile and if those estimations align with known outcomes. Likewise, the University of Tennessee Forensic Anthropology Center, also with support from the NIJ, houses the Forensic Anthropology Data Bank which gathers demographic information, metric and morphological osteological data, and now, 3-D coordinate data. Given contemporary technology and advancements in crowd-sourcing forensic anthropological data, there exists the possibility of similarly gathering SV and SVP-related information from cases or from research participants and samples.

While it has potential, this option could have serious ethical implications that should be explored regarding the use of case data for research, considering remains have not been explicitly donated to science [42,43]. Other cultural concerns are also relevant; for example, remains could come through an MEO and undergo initial analysis prior to receiving a prehistoric, Indigenous designation. Aside from the nature of their being non-contemporary, non-forensic remains, the remains and the rights of their descendants should be protected under the spirit of NAGPRA and related laws [44,45]. Winburn and colleagues [14] have proposed beginning the database process on anonymized CT imagery of forensic case decedents that have been explicitly contextualized with demographic and life-history data by next of kin for research purposes. Perhaps this may represent a productive start for a database of skeletal and dental SVP data, while practitioners work through the ethical details of implementing such a database for actual forensic case decedents.

Overall, databases provide one avenue for tracking and analyzing case-related data. Further discussions within the field of forensic anthropology as well as with medicolegal professionals will help establish the usefulness and applicability of such databases for both research and tracking of context-specific trends. Discussion on ethical, practical, and

logistic concerns will surely shape the direction of any collaborative databasing endeavor.

6. Potential limitations and suggestions for redress

Within the burgeoning discussions surrounding SV approaches to forensic anthropology, salient questions have arisen that promote further interrogation of logistical barriers that come with the potential of an SVP report. Though a full consideration of the nuances of these practical questions is outside the scope of the current paper, we wish to provide some possible considerations as anthropologists visualize these possible report formats and uses and explore the potential with other medicolegal personnel. Until anthropologists publish on the challenges of SVP reporting that are drawn from experience, it is difficult to definitively know challenges and resolutions that will arise.

One such question that has arisen is whether it is realistic to add SVP reporting to the task list of forensic anthropologists who, along with MEO personnel, may already face heavy caseloads. We acknowledge the possibility for this additional burden, yet, as we note above, much contextual data about medicolegal decedents is already collected by medical examiner personnel. We believe that collaboration among anthropologists, death investigators, and pathologists may represent the smoothest route to implementation of SVP data collection, also enabling SVP to complement, rather than duplicate, existing medicolegal documentation. Moreover, while we cannot speak for other practitioners, our conversations with our own medicolegal agencies suggest that requests for assistance in tracking this type of data would be well-received. Rather than shying away from new, SV-based data, some of our stakeholders have publicly embraced it [8,20]. After all, one of the already-existing goals of the medicolegal system is to provide information about patterns in death and disease that inform public policies and protect public health; all that remains is for forensic anthropologists to play an active role in collecting and presenting that data.

Were this data to be produced by an anthropologist, it raises the question of standardization. Should structural vulnerability reporting become codified as a subdisciplinary focus, guidelines for documentation and standardization would need to be put in place, lest we render useless the data by collecting it in such a way that it is incomparable with other data sets or fail to address practical issues (or ethical issues; see above discussion of Collaborative Databasing) with its collection. While we have not even begun to resolve these issues, we hope that the visualizations of SVP reporting presented here will assist in the discussions and debates that may ultimately lead to standards development. Standardization will become particularly relevant given the possibility for cognitive bias to accompany SV approaches to casework: how, if anthropologists are to collect data on the lived experiences of our case decedents, will we remain "blind" to these data during our other analyses? The answer to this concern lies largely within the realm of quality control and the scientific epistemology known as *mitigated objectivity* [46,47]. In essence, contextual data are essential to interpreting the life history of a decedent—for anthropologists, these might range from the context of the decedent's recovery (e.g., surroundings, associated material evidence) to their medical records and the statements of their surviving kin [9,13]—but these must be sequentially unmasked (sensu [48,49]) at appropriate times during casework protocols. For example, in a multiple-practitioner laboratory scenario, one colleague might conduct the recovery and communicate with stakeholders while another remains blind to these data until the completion of their biological profile, taphonomic, and trauma analyses, at which point contextual data may be unmasked to inform SV analyses. How to deal with the potential for cognitive bias in sole-practioner casework will be more complicated to resolve, and what constitutes an "appropriate time during casework" must also be defined. These unanswered questions could form part of the standardization discussions that we envision stemming from this work.

Finally, as with all aspects of forensic anthropology reporting, the authors also encourage discussion of the issue of bias in a more insidious sense. Recent conversations within the field have raised the possibility that anthropological data might stymie case resolution if systemic issues of racism, classism, transfobia (etc) are reproduced in medicolegal systems [50,51]. Questions of how the different possible reporting methods may impact medico-legal prioritization of cases have been raised (e.g., is it possible that marginalization highlighted in an individual report would lower case priority for investigators? How would that weigh against assisting in honing in on possible identifications?). Regardless of what information is or has been reported by a forensic anthropologist, the issue of systemic and individual biases will be present. If we look to complementary fields, such as clinical medicine and public health, the same concerns are present. To capture the data, the experiences of marginalization are documented in these fields to assist in long term goals of improving health outcomes. We encourage forensic anthropologists to engage deeply with medical anthropology, social epidemiology, and other sub/fields that also tackle overt, implicit, and systemic bias while collecting similarly valuable data.

7. Concluding remarks

Thus far, forensic anthropology SVP-specific publications have focused more heavily on theory than on data, and this piece seeks to assist anthropologists in visualizing what reporting may look like, leading to greater data-driven publication. It also furthers discussions that address challenges and benefits of the SVP discussed in the greater body of literature. Much published research already indicates that social experiences have been skeletally and dentally embodied in multiple populations through time [52–55]. Further, evidence that structural vulnerability is skeletally and dentally embodied in the modern US has begun to emerge from recent case studies [20], experimental research on tooth loss [56], and experimental research on osteoporosis [57], and there is extensive evidence from public health and social epidemiology that these processes are also at work in this time and place [58,59]. We look forward to the publication of more results from SVP-focused research that is currently ongoing and being developed, and to seeing which biomarkers and contextual clues prove to be most relevant in various US sociocultural contexts of medicolegal practice.

These growing publications in the field and the ideas presented here have encouraged a move from an individual-focused to a community-level analysis of human remains. This humanitarian shift reflects work of forensic anthropologists in human rights contexts who evaluate and consider shared lived experiences of violence and that of medical anthropologists who study public health, bringing the diverse types of anthropological work into closer alignment. While identification and cause, mechanism, and manner of death remain central to the work of medical examiner's cases, anthropologists have the knowledge, training, and ability to expand the scope–making use of data and contextualizing it in local cultural, economic, and political trends. There are, of course, potential limitations to structural vulnerability and social factors of health data, arguably, in any context. Thus, as a field, systemic documentation and use of data should occur when known applications, ethical protections, and appropriate accessibility (or confidentiality) are in place and eventual standards should be developed. This requires increased collaborations not just with medical examiners, but death investigators, autopsy technicians, public health organizations, and potentially other stakeholders who contribute to the documentation of SVP data or its use. Optimally, this documentation would eventually go a step further to be part of a larger data set and analysis that included autopsy case data and other information gathered by the MEO for a more comprehensive understanding of MEO cases.

There are a finite number of medical examiner's offices and forensic anthropologists in any given country, which makes this level of development plausible. Forensic anthropologists in the United States are employed in diverse positions that differ in requirements for trauma analysis, pathology analysis, trauma-only analysis, biological profile

estimations, time since death estimations, use of radiographic analysis, odontological analyses, and identification procedures, all of which emphasize the need for clear guidelines and qualifiers to be present for data collection, analysis, and application. As anthropologists explore the potential for documenting structural vulnerability, social determinants of health, or forms of marginalization witnessed in casework, there is significant potential to provide a deeper understanding of the living and dying conditions of overlooked populations that would otherwise go unreported.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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