



Biosocial wellbeing: Conceptualizing relational and expansive well-bodies

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ABSTRACT

Cross-epistemological, transdisciplinary team research on health and wellbeing is critical to improving how we understand the human body and, ultimately, how we care for it. The authors have recently been involved in a different kind of “translational medicine”—translating across disciplines and epistemologies in order to come up with a template for thinking about the human body that captures all of an individual body’s relational complexity. This paper explores how a simple desire to think differently about the body can set off a series of subsequent theoretical shifts and political imperatives with respect to health and wellbeing. After describing our recent trials with cross-epistemological theorizing/research on the biosocial body, we use concrete examples to link this work to theoretical and practical priorities in geographies of health and wellbeing. We characterize an approach to wellness that attends to the nuance of individual experience while asking what a liberatory practice of wellness, grounded in a relational and expansive conception of the body, would mean.

Introduction

The state of a human body, its health and wellbeing, its conditions or diseases or lack thereof at any given time, are co-produced by a wide array of forces, both those considered to be internal to the body and those understood to be part of the context that surrounds it. There is nothing new or controversial about asserting this contextualized nature of the body. Yet, the science we have for understanding this co-production, how it happens, and how to shape it, is limited. It is limited both because disciplinary silos, hierarchies, and reductionism prevent vital synergies between disparate fields, and because the momentum of typical ways of doing things—questions, methods, analyses—makes it hard to move in new directions.

There is relatively little precedent for cross-epistemological research on the human body that includes, on equal footing, both positivist or post-positivist life sciences on the one hand, and critical, interpretive, or structural approaches on the other (but see [Timmis and Williams, 2017](#)).¹ Medicine and other life sciences tend to create distinct hierarchies of knowledge, and while the recent labeling of ‘translational medicine’ attempts to reinvigorate interdisciplinary work between basic science and evidence-based medicine, that interdisciplinary work has little interest in alternate epistemologies. Likewise, the recent coining of

‘narrative medicine’ largely reinforces binary thinking between art/science and mind/body in the care of patients ([Solomon, 2015](#)), reproducing the idea that patient perception, social situatedness, and lived experience have very little to do with how the body works in biological terms. Meanwhile, critical, interpretive, and structural work on health and wellbeing may engage with a variety of epistemologies, including scientific literature that is written within a (mostly unspecified) post-positivist epistemology, but our publications remain isolated, largely speaking only to each other.

Outside of the domain of health and wellbeing, there are more examples of productive cross-epistemological collaboration. While silos and hierarchies are very much still the norm, we see a push to understand complex environmental challenges from multiple epistemologies at once. For example, in the broad field of inquiry known as “sustainability science” some have recently argued for the need to co-produce knowledge, including expertise beyond science and beyond the academy, to attend to the intractable, interconnected, and hyper-complex nature of a human-dominated biosphere ([Norstrom, 2020](#), but see [Goldman et al. 2018](#)). Comparably, a key premise of this paper is that the human body is one of these hyper-complex, human-dominated environments. Not only do the problems of human health and wellbeing require the same cross-epistemological collaboration as do those of the

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¹ Also note the work of Dr. Nik Rose as co-director of several research centers at King’s College, London, including Centre for Synthetic Biology and Innovation, which provides examples of fruitful engagement between critical social theory and life science.

biosphere, but also these two realms (bodily wellbeing and environmental wellbeing) are intimately interconnected (Meloni et al., 2021). Throughout the paper, we use the phrase “health and wellbeing” to indicate that we are interested in the contextual and empirical breadth of what it means to *be well*, within and beyond disease (e.g., Kearns and Andrews, 2010).

Part of the challenge at hand is the difficulty of attending *at once* to the relational uniqueness of each human body as it is situated in its broader, dynamic context(s), and the need to be able to speak beyond the individual (the *n* of 1) to be able to address structural challenges and to be able to create real change. Each individual human being has a unique, dense, and dynamic relationship with features, things, ideas, and structures in their broader context—from air quality and viruses to systemic racism and occupational hierarchies—all of which have physical impact on the body (Gravlee, 2020). While we are likely to find key patterns across population groups relevant to each of these relationships, and while these patterns tell vitally important stories, there is also enough individual uniqueness in the totality of such relationships that the answer to how context shapes health and wellbeing is inevitably heterogeneous. For this reason, we start with a desire to ask questions about the body, rather than starting with questions about health and wellbeing from a population level. We want to know more about how an individual body’s relational complexity matters to their health and wellbeing. For shorthand, we refer to the unique, dense, and dynamic relational complexity of the body as the “biosocial body.” After outlining work relevant to the biosocial body, we develop a model that integrates key ideas from this work, expressing human biography, biology, and biosphere, as inextricable dimensions of health and wellbeing. We then use two concrete examples (hypothetical cases of multiple chemical sensitivity and depression) to link this work to priorities in geographies of health and wellbeing. We characterize an approach to health and wellbeing that attends to the nuance of individual experience while asking what a liberatory practice of wellbeing, grounded in a relational and expansive conception of the body, would mean.

What is the biosocial body?

The ideas in this paper come from a few specific collaborations: The first of these was an NSF “innovations in graduate education” project that built a cross-epistemological research studio between biology and human geography, using the biosocial body as a boundary object around which to converge different types of questions/perspectives². This project allowed us to explore the dimensions of “biosocial” in life and social sciences not only through key texts (e.g., Lewontin et al. 1984, Haraway 1988, Tallbear 2013, Rose 2013, and more), but also through team projects that inquired about the possibility to understand specific bodily states from a cross-epistemological perspective (e.g., Croog et al., 2020; Kinsey et al., 2018; Wiese et al., 2018). That project led the first author to collaborations with medical colleagues who share an interest in how seemingly social features of life—i.e., biography—intersect with the biophysical body—i.e., biology (e.g., Horwitz et al., 2017a,b, 2021; Summers-Trio et al., 2019; Horwitz et al., 2022). Those collaborations also led to the founding of the Bio³Science Network, a budding research network that enables partnerships between life, social, and environmental sciences to study the interconnection of biology, biography, and biosphere (Bio³) in bodily health and wellbeing. The point of all this work on the biosocial body has been to move from theoretical/conceptual engagement to active, cross-epistemological research on health and wellbeing.

Our work on the biosocial body mirrors trends in what we broadly characterize as “new materialist” approaches in social science that

attend to the “matter” of life sciences (biology) and/or environmental sciences (biosphere) through charting out their interconnection with social processes, power, hierarchy, and/or discourse (e.g., Blackman 2021, Landecker and Panofsky 2013, Kreiger 2001, Meloni 2014, Meloni et al. 2021, Ahmed 2008, Barad 2003, 2007). This “matter” that demands attention is affective as well as biochemical, human as well as more-than-human (Andrews, 2019, 2020; Nichols and Del Casino, 2021). At stake here is not only the idea that the healthy or “well” body is more than population averages and a superficial grasp of place/space (Smith and Reid, 2018), but also and more profoundly that health and wellbeing are located in a set of dense, dynamic interrelationships between the body and the world around/within, which science is just beginning to understand (e.g., Mansfield 2008; Guthman and Mansfield 2013; Mansfield and Guthman 2014; Guthman and Mansfield, 2015; Meloni et al 2021, Lock 2015, Hall 2000). For those interested in the body, the promise of new materialist perspectives has been to provide new ways of theorizing the intersection of biology and society while (ostensibly) avoiding the essentializing and deterministic tendencies of the past (Meloni, 2019). Therefore, many of the common features of these perspectives—thinking relationally, recognizing matter as fluid, active, and uncertain/unfixed, paying attention to affect—are politically and ethically vital. This section outlines key features of the biosocial body that come out of such work.

Non-dualistic

Calling attention to the biosocial *body* is not to imply the absence or irrelevance of a mind. Binary thinking that divides mind and body not only gets us into trouble but also is unhelpful for understanding how the world around us comes to matter for health and wellbeing. In setting up falsely dichotomic categories, binary thinking creates hierarchy between these categories. A body feels and a mind thinks. Emotional versus rational. Nature versus nurture. The privileging of one side of these binaries in explanation has proven unfruitful. From Richard Lewontin’s descriptions of gene-organism-environment interactions to Donna Haraway’s troubling of the boundaries between physical and ‘not-physical,’ both the life sciences and social sciences have recognized that binary thinking is inadequate for understanding the human body (Lewontin, 1972; Gane, 2006).

Of course, the reverse is also not easy. Means of thinking beyond binaries may be understood as a step backwards rather than as innovation (Mehta, 2011). Inviting the infinitely complex, and dynamic realm of meaning making into the effectively packaged, universally applicable biophysical model of the body might appear to complicate our understanding of health and wellbeing. Representation, discourses, frames, theories, ideas, thoughts, categories, and norms are usually seen as immaterial realms of life that are apart from and external to the material human body. They perhaps influence what people do, but they have not typically been theorized as intervening in biophysical processes. Still, as McCormack’s (2007) work on molecular affects reminds us, these aspects of life also do things in the body. For example, the use of categories to make sense of a situation, the act of eagerly eschewing (or uneasily eschewing) norms, or the experience of feelings of belonging associated with specific modes of identity representation, all of these “immaterial” dynamics not only correspond with material processes in our social worlds, but they also correspond with molecular processes inside the body (McCormack, 2007). They might shift, momentarily, levels of adrenaline or cortisol; they might release neurotransmitters or influence synaptic development; they might influence habits of breathing or muscle tension; they might alter interoceptive cues; and much more.

Relational and contextually porous

Building from the above, the biosocial body is relational, and bodily health and wellbeing cannot be decontextualized from the world

² PI: Hayes-Conroy. #1545309. Our work on the biosocial body was supported by this award. The ideas in this paper do not necessarily match those of the U.S. National Science Foundation.

around/within (Lock, 1994; Lock and Kaufert, 2001 also see Miyamoto et al. 2013). The body and the milieu are so interconnected that, sometimes, the distinction between what is *of* the body and what is *of* the environment is a matter of feeling—the air outside of me becomes me when I breathe it, the water when I drink it, the microbes when they cause me trouble. But the body as relational also means more. The embrace of relational materialism in key subfields across the social sciences has pushed us to see relations, rather than discreet features/objects/things, as the center of our realities (e.g., Deleuze and Guattari 1988). What this means in practice is that if we pay attention to the relationships that a body has rather than its discreet conditions, phenotypes, or features, we realize that any given individual body is not the same, and its processes and states are not identical, between specific relationships. So, even compared to itself across space and time, as well as compared to other bodies, a body behaves differently, and thus is *different*, for example, in different locations or places, in interaction with different people/ideas/things, or in relation with (or in exile from) different normative structures or hierarchical systems. Philosopher Annemarie Mol makes a similar point in her work on “The Body Multiple” reflecting how in the condition atherosclerosis, the problem as experienced by a patient in a hospital, is slightly different from the problem atherosclerosis seen in a vascular echography, and different from the problem atherosclerosis lived at home (and so on). To be clear, this is not a question of definition; Mol describes ontological differences not epistemological ones. It is not that we *know* atherosclerosis differently in different places, but that the problem is different and thus the condition, understood relationally, is multiple (Mol, 2003). Such multiplicity is easier to grasp when applied to health and wellbeing at large—we know that *being well* is spatially and ecologically dynamic. It may be harder to be well in California during wildfire season, for example, then it is perhaps to be well in an area of clean air and low fire risk (c.f., Schwanen and Atkinson 2015).

Fittingly, our attention to relationality and context must include a reworking of how the biosphere—the worldwide sum of what is around/within us—shapes and is shaped by bodily health and wellbeing. Mansfield (2008) pushed us to see health as a nature-society question (also King 2010, Sultana 2012, Jackson and Neely 2015, Nichols and Del Casino 2021). A rapidly growing interdisciplinary literature on health and the environment now urges geographers of health and wellbeing to study multiple dense, multi-scalar relationships relevant to the body (Prior et al., 2019; Senanayake and King, 2019). Most recently, Meloni et al. (2021), demonstrate how ideas like the Anthropocene (at the macro scale) and epigenetics (at the micro scale) might be used as heuristics through which to “detect and make sense of the unprecedented impact of human activities on geophysical and biological bodies alike” (p. 2).

Meloni et al. (2021) go on to emphasize the importance of recognizing the social as intrinsic to the materiality of (and the wellbeing of) these bodies (see also Mansfield 2018, Oreskes 2015). This insight bears special consideration when emphasizing a relational approach to the body because it is possible that an emphasis on relationality can flatten rather than illuminate power relations by favoring complexity over structural inequality as an explanatory tool, thereby eschewing important concerns of social justice (in medicine or otherwise). To be clear, we see bodily relationality as expressly important to social justice concerns for many reasons, and perhaps most basically because a relational approach questions the presumed “location” of bodily disorders. For instance, it is common for bio-medicine to locate complex diseases/disorders like diabetes or depression in the body itself, instead of in the relational exchange between the body and the (always uneven) social context. Widely accepted models like the bio-psycho-social model for mental health or the social determinants of health framework are a useful corrective for reminding us that oppressive, unjust living conditions have significant, negative impacts on physical and mental health. Still, attempts to intervene usually address issues of human health as separately social and biological, leaving social problems like poverty or

structural racism as the work of activists and politicians, while problems like diabetes or depression remain—as diseases and disorders of the human individual—the work of medical professionals. Scholarship within the field of critical disability studies, however, has long pointed to the necessity of considering both at once (Crow, 2010; Hall, 2000; Goodley, 2014). In addition, we find other scholarship that troubles the presumed bodily “location” of human health and disease useful for illuminating what is at stake when we mislocate problems of human health and wellbeing (e.g., Cvetkovich 2012, Berlant 2010). For example, in asking us to consider depression as a “public feeling,” Cvetkovich insists on narrating how life within neoliberal capitalism can materialize in the body as bad feelings (Cvetkovich, 2012). Such work acts as reminders as to why, ethically, politically, and *scientifically*, we need an approach that allows us to locate health and wellbeing at once in the body and in other spaces—not as an either/or, or a both/and but as a relational exchange.

Emergent and plastic

It is worth noting that when we consider the biosocial body as relational, the notion of the biosocial itself shifts: The term “biosocial” has been used for decades to indicate an interaction, sometimes vaguely understood, between biological and social features in the study of the human body. Roberts (2018) makes a key distinction between “older” biosocial science that sought a biological explanation for social difference (i.e., eugenics thinking), and “newer” biosocial science that seeks to understand individual biological differences through renewed attention to the social dimensions of life. In lay terms, such work is interested in how “things happening to the body” produces health and wellbeing. (This body of work is now vast, including much research in positivist social and life sciences). However, a relational view of the biosocial indicates an interest not simply in “things happening to the body,” but rather in “the body happening.” A subset of work on the biosocial now advances an understanding of the biology of the body as *emergent* (c.f. Dewsbury 2011), in ways that mirror advances in social theory’s understanding of subject formation and identity. Both the “bio” and the “social” are now seen as always becoming, non-linear, active, and fluid, as well as inseparable (e.g., Meloni et al. 2018, Weise et al. 2018, Hall 2000, Brison 2011, and many more already cited in this paper). Aspects of the body once considered to be biologically “fixed” or universally known are now understood as dynamic (e.g., Hopkins and Pain 2007, Rose and Abi-Rached 2013; see also Roberts and Rollins 2020).

In understanding the biosocial body as flexible, plastic, and emergent, we challenge long-held deterministic assumptions embedded in the biomedical model of the body. There is no universal, pre-known body, only singular, relational, unfixed, plastic bodies. While research into plasticity has proliferated in the first two decades of this century, particularly in neuroscience and genetics (Rose and Abi-Rached, 2013), the plasticity of the physical body is also understandable from an experiential perspective. Perhaps we feel different at a work meeting than we do taking a walk outdoors, or perhaps we notice a rise or fall in symptoms associated with a chronic condition under particular circumstances like acute inter-personal stress or job insecurity. Bodies are constantly acting; they judge our surroundings, diverse cells and systems mediate our bodily assessment of a situation, and in doing so they learn and acquire new relational expertise that shapes bodily judgement in the future (Latour, 2004). Additionally, while we tend to experience and talk about the body as a complete whole, it also makes intuitive sense that some cells, groups, or systems of the body may judge our surroundings differently than other cells, groups, or systems. For example, our eyes might experience a bright sunny autumn day with intensity while our skin experiences it with calm. The compound nature of such an experience is biologically salient but is also shaped by social experience.

Bringing it all together

If the body is non-dualistic, relational, porous, plastic, and emergent, then what? This lurking “so what” of social-theoretical scholarship pushes us to seek cross-epistemological translation of a biosocial conceptualization of the body, perhaps as a counterpoint to the biomedical model of the body. We sincerely appreciate skepticism of broad “geo-bio-social synthesis” from critical scholars (Meloni et al., 2021). Major epistemological and methodological barriers continue to prevent the integration of critical social science expertise with life sciences, environmental sciences, and biomedicine, despite clarity over the need to engage in ways beyond critique (Rose, 2013).

One potential path forward is what we call “biosocial mechanisms”—bodily processes that are at once recognized by biomedical researchers as distinct and observable, yet also recognizable as broad conceptual heuristics that can be used to illustrate interrelated and complex sets of bodily responses. Social scholarship is increasingly paying attention to biosocial mechanisms like epigenetics or the microbiome where so-called social, environmental and biological elements of life are seen to blur (Landecker, 2016; Landecker and Panofsky, 2013; Lappé and Landecker 2015; Lock 2015; Muller et al., 2017; Rose and Abi-Rached 2013; Meloni et al 2021). Epigenetics does much to highlight the porousness between bodies and environments, while also suggesting a notion of heredity that is less stable and a reflection of ever-emerging environmental conditions (Guthman and Mansfield, 2013; Shantz and Elliot, 2021). The microbiome, meanwhile, serves as an acknowledgement that our bodies are co-constituted alongside non-human actors (Blackman, 2021; Lorimer, 2017). Unfortunately, in the life sciences most work on such biosocial mechanisms still privileges biological explanation over social (Roberts, 2018; Bliss, 2020), and in doing so reinforces a one-directional, static model of the biosocial. Still, as Prior et al. (2019) argue, biosocial mechanisms push science to recognize bodies as “active components in fluid health and place relationships” (Prior et al., 2019, 554), rather than simply receptacles positioned within static space. Could we use such mechanisms, then, as broad heuristics or “boundary objects” through which to integrate biosocial thinking across diverse disciplines and epistemologies (Star, 1989)? Our next section is an attempt to translate and model the biosocial body towards that possibility of integration.

Embodied biography

One premise of this paper is that by paying attention to individual biography, rather than assuming health effects through group-level proxies such as zip codes or income levels, we will come closer to understanding how context matters for health. To be clear, our interest in individual biography does not resist the simultaneous need to understand effects of structure, it simply insists that we ask about the individual nuance of those effects. Like others, our concern is that scientific attempts to generalize the damaging effects of ‘things done to the body’—including poverty, racism, trauma, and stress—can (re)inscribe assumptions of inferiority on particular bodies or sub-populations (Meloni, 2016b).

Our focus on biography also comes from collaborations with clinical researchers who worry that they do not have the information they need to understand the individual body. The emphasis on randomized controlled trials in the paradigm of evidence-based medicine has meant that science knows a lot about population averages but not about how any given individual will respond to a particular type of treatment or care (Summers-Trio et al., 2019). To this end, Horwitz et al have recently debated the challenge of including nuanced biographical information in the science of medicine, health, and wellbeing (Horwitz et al., 2021). Of concern is not only what kind of data is needed, but also what can be done with it and, importantly, for what end, and/or who controls it? Current means of bringing “biography” to health sciences tend to try to fit biography into a set of behavioral variables, or a list of common

questions (e.g., the “Adverse Childhood Experiences” test), or, at best, a standard table of social determinants, all of which belie the dynamic nuance of biography as it is lived. Epistemologically, these features of biography become static givens, with no framework for understanding how such health categories themselves shape knowing and being (e.g., Moss and Dyck 1999). Of course, good physicians, nurses, and other health professionals accumulate a different, dynamic, flexible, and nuanced knowledge of individual biography through their everyday interactions with patients. They may even maintain some level of what Metz and Roberts (2019) call structural competency (e.g., awareness of how structures impact health and wellbeing, and clinical understanding of each), while simultaneously noticing how individual experiences shape both wellbeing and disease. This knowledge comes from years of direct interaction with patients, and is mostly uncodified scientifically, although narrow pieces of such knowledge are now being legitimized through medical research on specific types of experience—e.g., research on the health effects of experiences of discrimination and racism (Williams and Mohammed, 2009; Kaholokula et al., 2010; Chae et al., 2019), or research on the health effects of loneliness (Levine, 2021; Hawley and Cacioppo, 2010).

Below we use the language of “embodied biography” as a shorthand to capture the intersection between the environmentally-porous body and all of the felt, perceived, practiced, and experienced aspects of life that we tend to think of as “social” at any scale. While the language of biosocial indicates a general interrelating of biological and social realms of life, a focus on biography serves to remind us that what happens to a person is always part of what a body is and what a body is becoming, and further calls attention to the uniqueness of individual bodies. Below we describe biography as emerging within and shaping the biospheric-biological substrate of human life. To bring clarity to the breadth and depth of biographical processes that are at play in bodily health and wellbeing, we have modified a diagram that we began to use almost a decade ago to talk about the complexity of embodied life – the Political Ecology of the Body (PEB) model (Hayes-Conroy and Hayes-Conroy, 2013; Nichols and Del Casino 2021). In the first modified diagram (Fig. 1), we still see three ‘wheels’ of a Venn diagram that call our attention to the impact of structural forces, knowledge production, and the experiential, or “visceral” realm (lived experience) on the health and wellbeing of human (and more-than-human) bodies.

As a model for both inquiry and analysis, the original PEB model offered researchers an opportunity to “systematically interrogate the production and reproduction of the material body” by asking questions related to all three realms of biographical context. Here, our modified model “PEB 2.0” speaks directly to an interest in health and wellbeing by specifying how biographical context comes to shape the material body. In the image, dense biographical detail is embedded in the other bios—from the macro/biospheric to the micro/biological—with the gradient from green to purple depicting the lack of a distinct boundary between them. Examples of the types of structural, discursive, and experiential elements that are likely to be relevant to health and wellbeing are listed in the wheels. At the interstices we group pathways as broadly related to exposure, affect, or behavior, three key groupings that are *not mutually exclusive*, yet each relevant to the overlap of either structure/experience, discourse/experience, or structure/discourse. Below we describe these pathways. Together these pathways help us to see the body not as a single social actor but as a collection of social actors; the cells of diverse bodily systems make judgments, learn, and respond to the world around them in ways that are not pre-determined but are likely to be shaped by previous experience.

Exposure pathways: Prior et al. (2018) have done well to summarize the notion of the “exposome” for geography. There is much utility to the “exposome” as an ostensibly parallel concept to the genome covering every exposure to which a body might be subjected, however, the desire to capture everything within the purview of exposure may be both an advantage and a weakness (Prior et al. 2018). External exposures like heat/cold, pollution and contamination, pathogens, and other



Fig. 1. Political Ecology of the Body Model: PEB 2.0 with biography embedded in a porous biospheric-biological substrate depicted by a green-purple gradient.

environmental burdens, are immediately salient. Yet, as many exposome researchers recognize, more general features, such as one’s relationship to the built and ‘natural’ environments, the benefits or lack thereof that are derived from these relationships, and one’s relative exposure risks due to economic pressures and occupation, are also equally important. Moreover, experiences like hunger, the challenges of food and clean water access, and questions of lack or scarcity, as well as access to safe housing, good medical care, and positive social interaction, may also be relevant to the general notion of exposure, very broadly cast. Such relationships are clearly shaped by structural forces, but also are experienced by the individual body, which is why we put them at the overlap of structural forces and experience.

Thinking about exposure pathways in broad terms also helps us to identify some well-known as well as less-studied biosocial mechanisms. Perhaps the quintessential biosocial mechanism representing a major shift in biology research for the 21st Century, epigenetics has helped scientists to understand how changes in gene expression can be modified by a wide variety of environmental cues. Louis et al. (2017) describe epigenetics as a “body of evidence” that is strongly consistent with the “exposome research paradigm” (Louis et al., 2017 p. 4). Alongside epigenetics, the microbiome stands tall as a second well-known biosocial mechanism that is often associated with exposure pathways, while simultaneously signaling a complex set of relationships and synergies across pathways. Research on the microbiome forces us to see the body

as “a composite of microbial and human cells” (Turnbaugh, 2007, 804), that builds/shifts dynamically through exposure to microbes (as well as to anti-microbial substances) over a lifetime. The extent, type, mode, and temporality of exposure will vary with each biographical detail of life.

Of course, there are a myriad of other, less iconic mechanisms that are also relevant to exposure – from immune response to pathogens, to cellular responses to breathing particulate matter or ingesting heavy metals, to metabolic processes related to acute or sub-acute heat or cold exposure. Again, these examples speak to the overlap of structural and experiential forces—e.g., heavy metal exposures of urban communities like Flint, MI; exposure to COVID-19 due to occupational risk; or exposure to air pollution across the urban landscape. Still, the takeaway here is that while “exposure,” as a generic pathway of influence on health and wellbeing, does well to capture the effects of a wide array of biographical details, it cannot alone depict all relevant biographical details.

Affective Pathways: Affect has been equally well characterized for geography (Anderson, 2006). Affect is often assumed in medical contexts to refer simply to a person’s emotional tone or mood, but affect for many social scientists is a resolutely relational concept referring to the ability of a body to be affected (to experience a shift in feeling or state) when in relation with *another* (e.g., another person, idea, place, process, or event). McCormack (2007) reminds us that affective pathways are

always relevant to the health and wellbeing of the biophysical body and are not simply or primarily “mental.” Affective pathways are highly relevant both to how we experience and how we make sense of the world, and for this reason we place them at the overlap between discourse and experience in Fig. 1.

The iconic biosocial mechanism of the affective pathway group is allostatic load (McEwen, 1998). As codified in the literature, allostatic load is an attempt to capture the “wear and tear of stress” (broadly construed) on the body, and it has given science a means to operationalize the vague concept of social stress. The heightened neuroendocrine responses to stress that characterize allostatic load are organized in non-linear, relational networks (McEwen, 2000), mirroring the production of “threats” (a relationally discursive category) triggering the response. Thus, allostatic load speaks to the biophysical effects of how we experience and make sense of our realities—everything from inter-personal conflict to job loss/stability to perceived aggressions, racism, or ableism to the affective results of physical or natural environments. To be clear, we locate matters of stress here not because they are irrelevant to structure; on the contrary, stress is highly relevant to the ways in which structural forces are understood as well as judged/experienced viscerally. For example, people experiencing similar forms of discrimination will interpret and live this discrimination differently, and these differences can have a direct impact on health and wellbeing (Chae et al., 2015). Of course, that same discrimination may also expose them (see exposure pathways above) to noxious environments, inadequate healthcare, or acute need, all of which impact the body through other means and can circle back to compound stress. Beyond allostatic load, there are likely dozens of other biosocial mechanisms that relate to affective pathways. In particular, pain and energy levels are both known to be heavily influenced by affect (e.g., Finan and Garland 2015). We already know that these embodied experiences shape bodily states in heterogenous ways—perhaps compounding anxiety or depression or promoting or inhibiting certain states of being or coping mechanisms, or triggering changes in the brain’s grey matter (May 2008), changes in hormonal and metabolic processes (Sharma and Kavuru, 2010), or changes in immune function (Ho et al., 2010).

Pain and energy also bear special consideration as examples of affective bio-social mechanisms because they help to lay bare the epistemic violence associated with dualistic modes of understanding the body. When the body is opposed to the mind, or biography is opposed to biology, we create the potential for pain and fatigue syndromes (like CFS/ME, chronic Lyme, or even long COVID and other hard-to-classify disorders) to be understood as primarily “of the mind” and therefore not relevant for biological intervention like other bio-medically codified diseases such as cancer or diabetes. In contrast, affect conceptually locates one’s *ability to be affected* in multiple sites throughout the always-minded body. A non-dualistic approach might see, for example, the cells of the lungs, the cells of the arteries, or the cells of the nervous system as collections of social actors that are judging and responding to the world around them. And, deviating from a traditional psychological paradigm, positive moods or attitudes may not be always seen as productive in a non-dualistic approach: As one Long COVID patient, experiencing debilitating fatigue, publicly explained, “...hope hurts. Hope is actually the thing that causes me the most pain, when it does not work out. So you know, I can have all the positive thoughts in the world I want. But the reality is there’s something going on inside my body. ... it’s neurological. It’s cardiovascular. It’s pulmonary. And positive thinking does not change that” (Chaney, 2022). A focus on pain and energy as affective, then, would demand that we ask how different systems of the body respond to biographically complex situations and events. Such a focus also lays bare the vital relation between affective pathways and exposure pathways, as well as behaviors and rhythms of life (described below). The biology of these systems is always already biographical because the body has lived and experienced things prior to the moment at hand (c.f. Rose et al., 2022).

Behavioral Pathways: Much research on behavior either explicitly or

implicitly blames the individual for problems with health and wellbeing (Metzl and Roberts, 2019). Furthermore, while behavior-oriented research might claim to include context, it tends to be ahistorical, apolitical, and inattentive to power. It may be possible, however, following the work of scholars like Lauren Berlant (2011), to reframe behavior around questions of coping, and life rhythms, and patterns. For example, instead of categorizing eating behaviors as unhealthy, a reframing would inquire what an individual gets out of specific eating behaviors and what kinds of living or coping these behaviors enable. Thus, rather than categorizing a behavior as good or bad, inquiries into behavior can tell us about conditions of life under systems of oppression, including the interworkings of neoliberal capitalism and systemic racism and sexism. We see the need to reframe behavior to matters of coping and rhythm because questions attentive to power—Who has access to various coping strategies? What kinds of coping needs exist? How are life rhythms controlled by wage/unwaged labor? —are probably more important to understanding effects on health and wellbeing than questions that frame behavior as individual choice. Behavioral pathways, expressed this way, are highly relevant both to structural forces and to how we make sense of the world; for this reason, we place it at the overlap between structural forces and discourse.

If there is an iconic biosocial mechanism associated with behavioral pathways it might be circadian rhythms. Describing internally driven cycles that rise and fall during the 24 h day, shaping sleep and wake patterns, circadian rhythms are highly affected by what people do and how people live, and they are also thought to play a role in dozens of different states and conditions, shaping individual health and wellbeing (Foster, 2020). Disruption of circadian rhythms can be imposed—such as through wage labor that requires overnight work—or can be caused by a wide variety of actions that people do to cope with the realities of their lives—such as screen and social network use, or the timing of eating or alcohol ingestion (e.g., James et al. 2017, Kumar Swain et al. 2021, Güldür et al. 2017). Again, even though we locate circadian rhythms between the structural and discursive, experiential aspects of life can both shape and be shaped by circadian rhythms. For example, prolonged emotional distress might factor into circadian rhythm disruption through patterns of coping, which could then further exacerbate emotional distress.

Beyond circadian rhythms, there are likely dozens of other biosocial mechanisms at play in behavioral pathways—activity patterns and rhythms of life are broadly accepted as shaping, and being shaped by, individual health and wellbeing. Above we mentioned nutrition, which has long been a focus of behavior-oriented research, much of it inattentive to the harm it has done in placing blame on individual eating patterns in an effort to intervene in matters of metabolic health. Conceptualizing nutrition and metabolism as biosocial mechanisms would mean first reorienting our thinking around what behavior is, and what it points to. An individual act of eating, for example, is not just an isolated “poor choice” but instead made up of a complex web of biographical/social processes including, for example, what and how a body has learned to crave (Lara, 2017), what immediate bodily needs must be attended to and why (Berlant, 2011), what cultural expectations require navigation (Hayes-Conroy and Hayes-Conroy, 2010), and what geographic, economic, and temporal circumstances allow. These seemingly social processes are necessarily biological, albeit unexplainable through a universally knowable and predictable biological body. Thus, we might need to ask, for example, how an individual’s complex bodily systems (e.g., digestive or endocrine systems) respond to and judge certain foods or food-environments. We might also ask how different foods and food environments act simultaneously as mechanisms of affect and exposure, which may further shape and interact with behavior (e.g., Landecker 2011). All of such questioning necessarily locates the matter of nutrition and metabolism in multiple sites within and beyond the body. Thus, with nutrition and circadian rhythm as examples, the key point here is not only that the health effects of any given behavior are likely to be heterogenous, but also that we cannot understand a

behavior's impact on the individual body without attention to the relationships that diverse bodily systems construct with the world around them.

In summary, we emphasize that the utility of these three pathway groupings—exposure, affective, and behavioral—is *not* in isolating specific biosocial mechanisms to particular groupings. In fact, any attempt to do so will quickly implicate the interconnection between these heuristic groupings. Coping mechanisms described as behavioral may indicate new exposures or produce new affects. Harmful exposures will directly shape affective realities, as well as shape future behaviors. It is critical, then, that rather than seeing these pathways as mutually exclusive, we recognize them as widely interactive. Recognizing this, we can use these pathway groups as means to interrogate different edges of the same materiality, providing a malleable outline as we attempt to ask questions about how health and wellbeing connect with, well, everything.

The fact that the PEB 2.0 model grows out of political ecology is not surprising. The field has been described as “the everything pill”, a theory and method where literally everything matters (Robbins and Bishop, 2008: 748). Our model (PEB 2.0) arguably attempts the same, offering a way to make sense of all of the broad domains of life while at the same time hinting at specific questions or areas of inquiry that might be fruitful. In the model, while biosphere may be understood as macro (green in Fig. 1), and biology as micro (purple in Fig. 1), the boundary between the two with respect to the body is porous, and ultimately, the three bios interconnect and *become* together in the production of individual human life. While it may be largely beyond the scope of this paper, much more could be said about the role of the biosphere in shaping health and wellbeing, and about how bodies themselves are implicated in the shaping of social and natural environments. Future work will need to study the ways in which biography, biology, and biosphere work as different edges/dimensions of the same materiality. Vital work by Meloni et al. 2021, and Rose et al. 2022 differently express what this work might look like. Importantly, while we conceptually locate the biology of the body, at the center of the PEB 2.0 model, health and wellbeing are located in multiple places across this gradient. PEB 2.0 thus broadly invites new kinds of inquiry on health and wellbeing across the biological-biospheric substrate, and calls for novel analyses that may enable new assemblages of research (c.f., Dewsbury 2011). In the next section we try to model what PEB 2.0 may look like in action through two concrete examples.

An expansive view of the body

Above we outlined an expansive view of the body, arguing that it is non-dualistic, relational, porous, emergent, and plastic. We also diagrammed the structural, discursive, and experiential breadth of embodied life, highlighting three pathway groups—exposure, affect, and behavior—through which the body and its context interrelate, actively shaping health and wellbeing. Below we read an expansive view of the body *through* two concrete spaces: the clinic and the academy. Ultimately, changing what each of these institutions are, and the structures they are embedded within, would be essential to enabling the pursuit of expansive wellbeing.

The clinic

The clinic is a key point of engagement of the broader political struggle of health and wellbeing. There are numerous institutional constraints that negatively shape clinical care—e.g., control of care by institutions/corporations, economic hierarchies of access, and bureaucratic obstacles. Structural and inter-personal racism, ageism, fat phobia, transphobia (and more) also shape people's access to, quality of, and experiences of clinical care. These problems are hard to disentangle from epistemological barriers that prevent clinicians from building an expansive view of the body, as described below. In this example we use

the hypothetical case of someone with multiple chemical sensitivity (MCS) who experiences chronic pain. So far, the biomedical model has not been able to help this patient. Can the PEB 2.0 model help patient and clinicians alike to understand MCS and chronic pain more expansively?

Major hierarchies of knowledge within the medical sciences prevent advancement of an expansive view of the body. Intellectual denigration of conditions that are often understood as psycho-experiential like MCS, or fibromyalgia, chronic Lyme, or even long COVID, prevents science from asking comprehensive questions about how structure, discourse, and experience shape bodily health and wellbeing. In MCS, there tends to be an originating chemical exposure to which the body reacts. The body is then hypothesized to maladapt, learning from this original exposure to react to subsequent exposures to other chemicals (NRC, 1992). Our hypothetical MCS patient experiences intense pain upon exposure to a wide array of synthetic or natural substances, including fragrance and animal protein, and the expanse of reactivity has increased throughout their lifetime.

Exposure pathways are already inherent to current understandings of how patients develop MCS; An expansive view of the body would also push us to ask how subsequent environmental triggers matter to our patient's chronic pain, despite their seeming innocuousness for other bodies. Such exposures may be voluntary or involuntary—encountering a triggering scent, protein, or substance—but the outcome—pain in the case of our patient—is always unsought. How can we understand this material process? First, our patient's bodily relationship with environmental triggers is shaped by the extent to which they can control their environment. Thus, we might ask: What conditions prevent or enable continued contact with environmental triggers (exposure)? What coping mechanisms or mitigation tactics (behaviors) does our patient have access to? For instance, maybe they use air purifiers, climate-controlled housing, or less-processed foods as means of diminishing exposure to triggers. Such behaviors mitigate immediate exposure, but could near-complete isolation from triggers further shape bodily alertness to them? Also, how might general awareness of the potential for triggering materially shape pain pathways? In clinical literature, many authors have characterized MCS as entirely psychogenic, due to high rates of anxiety and/or depression among patients (Saito et al., 2005); therefore our patient may be treated as though the condition is merely “in their head.” The PEB 2.0 model would demand that we ask about the materiality of affective pathways. Is it plausible that affective mechanisms (like allostatic load) could shape the body's reactivity to potential triggers? Also, might the debilitating and isolating nature of chronic pain increase negative affect, and further exacerbate pain? Likewise, what role does the medical dismissal of MCS itself play in our patient's chronic pain?

In summary, an expansive view of MCS would mean asking questions about the material interplay between exposure, behavior, and affect. The expansive view enabled through PEB 2.0 allows us to see how, at any given time, the patient's chronic pain may be produced through materially intertwined pathways of exposure (e.g., a protein), behavior (e.g., prolonged avoidance), and affect (e.g., adaption to stress), which interact with inflammatory and pain signaling pathways. Also, our hypothetical patient has specific environmental needs that shape their broader relationship with the biosphere; thus the PEB 2.0 model would encourage us to examine the materiality of those relationships beyond matters of environmental trigger – what modes of engagement with the environment are possible for the patient? What do they wish for? And, in what sense do these needs and desires circle back to shape the biosphere? Asking such questions, and demanding recognition of their biological salience, would be part of a broader liberatory practice of wellbeing in the clinic, which would locate health and wellbeing in multiple sites within and beyond the body; this same practice would recognize diverse bodily systems as collections of social actors that may be judging the world around/within them in different ways (e.g., the muscular system demands animal protein while the immune system

revolts against it). To be clear, the current clinical and bio-medical paradigm belies this kind of understanding when labeling MCS as psychogenic, and fails to ask in what ways is MCS a structural and relational condition? Thus, a liberatory practice of wellbeing in the clinic would entail not only new kinds of knowledge production and new kinds of scientific and clinical disposition, but also solid integration of patient experience into clinical care.

The academy

The spaces of the academy that many of us occupy and shape daily are another venue in which struggles for health and wellbeing signal the need for a more expansive view of the body. In 2020, the academy emerged as a site of complex struggle over health and wellbeing. Two crises of human health—one, the novel virus COVID-19 that led to a global pandemic, and two, the entrenched conditions of structural racism that triggered demonstrations against police violence—converged on college campuses amidst the ever-looming backdrop of global climate change. Further exacerbating an already dire moment are the endemic and insidious conditions of life in late-stage capitalism, which for most students (at least in the US) mean enormous debt, few job prospects, low wages, and the promise of long, debilitating work hours. These conditions apply to employees as well, with precarity the norm for adjuncts, contract employees, graduate students, and many others. Even before the dual crises of 2020, rates of mental distress in the (neoliberal) academy were concerning (Peake and Mullings, 2016).

All of this provides a perfect storm for what Cvetkovich calls “feeling bad” (Cvetkovich and Wilkerson, 2016), or what eventually became pandemic “burnout”—the inability to continue living, working, and being under such conditions. Let’s consider a hypothetical student—an undergraduate student enrolled in a residential college—who has recently sought help for, in biomedical terms, depression. What does it mean for an institution to support such a student’s wellbeing? Can the PEB 2.0 model help us to think more expansively?

In 2020, limiting COVID-19 exposure became a pressing institutional issue, changing the daily choreography of college campuses. Classes went online. Meals were offered as take-out. Masking and social distancing became the “new normal.” The shifts that helped to protect students from COVID also exposed them to a way-of-life previously unknown. It seems obvious that such conditions could impact our student at an *affective* level; “feeling bad” during a pandemic needs little explanation—even less so when the physiological impacts of COVID-19 itself are factored in. What does need emphasis, however, is the way that the combined effects of *exposure* and *affect* impact our imagined student’s capacity to do work. After all, in the (neoliberal) academy, falling behind on work is a sign of failure. Under these conditions, *behavioral* pathways are best understood as mechanisms of coping, easing the body’s movement through the compressed circuits of daily (pandemic) life (Berlant, 2011), especially by combatting the student’s symptoms that can impact work capacity and speed—fatigue, sleep problems, lack of concentration or motivation, etc. Coping *behaviors* may include things like alcohol abuse, fast food consumption, using caffeine and energy drinks, taking drugs (Rx or otherwise), and skipping class. Feeding back into our student’s affective pathway of “feeling bad” is the reality that these behaviors are usually deemed “individual choices”—and shameful ones at that. Importantly, many of these so-called “choices” also link our student’s bodily debility to planetary debility; that is, the contextual necessity of bodily coping often happens at the expense of our broader biosphere—creating new stressors down the road.

Structural racism is also a health crisis, though it has only recently begun to be treated as such within the academic and health policy discourse (American Public Health Association, 2020; Walensky, 2021). A systemic review of articles published in leading public health journals between 2002 and 2015 found only 25 out of 207 which used the term “institutionalized racism” or related terms in their titles or abstracts

(Hardman et al., 2018). Despite the seeming novelty of this notion, racialized communities have, of course, long understood that structural racism has clear impacts on health and wellbeing across the life course (Loyd, 2014). Amongst the pathways shaping these impacts are *affective* pathways seen through allostatic load (Geronimus et al., 2006) as well as through the physical and psychic trauma of surveillance and police brutality (Cahill et al., 2019); the *exposures* caused by environmental racism (Kaufman and Hajat, 2021); the coping *behaviors* associated with chronic stress (Berlant, 2011; Beaubouf-Lafontant, 2013); and even the—justified but harmful—*behavior* of vaccine hesitancy among Black Americans (Laurencin, 2021). For students of color at least, “feeling bad” within this context, again, needs little explanation.

What does the PEB 2.0 model do here? For one, it draws critical attention to the presumed “location” of depression. Though pharmaceuticals may be (legitimately) used to treat such disorders, it is clear that pathways to depression for our hypothetical student are likely to be more-than-bio-chemical. As such, some of the work of resolving their problems clearly falls on the institution—requiring changes to policy, structure, curriculum, and more. More precisely, however, as a relational model, PEB 2.0 helps draw attention to the ways that traditional interventions in student wellbeing—things like free yoga classes, pet-a-puppy events, or nutrition posters—address neither the expansive scope nor the cumulative impacts of exposure, affect, and behavioral stresses on human bodies. As such, PEB 2.0 exposes the inflexibility of such institutions to relationally emergent differences in bodily needs for being-well, and gives us a lens through which to better observe how the labor conditions they generate ultimately act-back upon the biosphere. Peake and Mullings (2016) work on mental and emotional distress in the academy asks provocative questions not only about how to “slow down” academic productivity but who will “dare” to do it, and how to reevaluate the priority of wellbeing above that of financial reward. Such work helps us to clarify what kinds of shifts would be needed in academic spaces and institutions if wellness were to be centered as a liberatory practice, instead of treated superficially.

Conclusion

Meloni et al. (2021) have asked for “agile tents” rather than rigid frameworks for advancing 21st century theorizing on matters relevant to the interrelation of biological, social/biographical, and geo/biospheric aspects of life. While only a first step, our PEB 2.0 model identifies points of interrogation relevant to these three dimensions of health and wellbeing. The model centers embodied biography, recognizing that human biography is impossible without an existing biological organism (person) and an existing biosphere (earth); and, moreover, the biology of that organism is impossible without the existing social and environmental set-ups (specific life histories and specific natural histories) that brought a person into being. As we said in the beginning, the point of this kind of modeling is both theoretical and practical. It helps us to think, and to ask questions, but it also could help us to find places of intervention and to make positive change.

Of course, while the PEB 2.0 model offers some guidance for how to reign in and ask questions about the interrelationships that every human body has with the world around/within, developing scientific, clinical, institutional, or social understanding of those interrelationships for the sake of health and wellbeing is a daunting task. So we must simultaneously ask: Who is prepared to tackle this complexity? Dror (2011), writing about the medical humanities, raises a similar concern about domain expertise in human/social fields; if the medical humanities have eclipsed the nuance of the humanities in order to make it palatable for health professionals, we do not want the same to happen here—to eclipse the nuance of biography, as understood through critical social fields, for the sake of specialized experts like biomedical researchers, clinicians, administrators or officials. Making use of PEB 2.0 in the science “lab” or “field” as well as in the clinic, in the academy, or in broader government and society, may require diversifying teams to include

expertise from critical social fields and community advisors, and creating effective mechanisms for listening to patients,' students,' and others' own bodily knowledges and perhaps mapping their experiences (c.f. McCurdy 2016). An expansive vision of the body not only requires multiple domain expertise, but also deep interrogation of how people experience the institutions around them. It would require reflexivity on the ground—people who ask what does an expansive vision of health and wellbeing look like here? What does it feel like? What could it do?

We are uncertain but hopeful that the translational potential of PEB 2.0 may also help to address the problem of entrenched intellectual hierarchies, which are at the root of the theoretical dilemmas discussed in this paper. The academy at large and geography in particular struggle with familiar silos and hierarchies of knowledge between, for example, post-positivist vs. interpretive, big vs. nuanced, data-driven vs. ethnographic, or quantitative vs. qualitative. Yet an expansive view of the body demands that we attend to many of these partial knowledges at once, and to be agile when specific challenges of health/wellbeing arise. Can we work with the biomedical researcher? The clinical psychologist? The microbiologist? We do not mean that we should try to engage with researchers who are indifferent about power – both the ways power works in the academy to reinforce epistemological hierarchies and the ways it works in different bodies to produce health and wellbeing. We are interested in working with those who do care, but who may come from vastly different areas of training. Therein, critical geographers of health and wellbeing should prepare for active intervention in the positivist life and environmental sciences, including within our own discipline. Finally, in doing such work, we must recognize how our current intellectual hierarchies are intimately tied with a politics of health that has failed to understand the relational location of health and wellbeing. Thus, destabilizing intellectual hierarchies must come together with a liberatory practice of wellbeing that is capable of thinking, synthesizing, and acting across multiple locations at once.

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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