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ARTICLE

What's next for compassion science? A multi-scalar framework for measurement and public health action

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Abstract: Current approaches in compassion science, focused on individual traits and self-report, are insufficient for a public health agenda. This article proposes a multi-scalar epidemiology of compassion, expanding it from an internal state to an enacted, transpersonal skill shaped by systems. It argues that compassion is not only a trainable skill but also an innate capacity that can be unfettered by supportive structures. Our framework outlines measurement and action across three levels. At the micro-level, we call for moving beyond self-report to performance-based and physiological measures of dyadic interaction. At the meso-level, we propose ethnographic and network-based methods to assess "ecologies of compassion" in workplaces and schools. At the macro-level, we conceptualize "structural compassion"—the institutionalization of care through policy and economic systems—and propose developing indices for its measurement. This model emphasizes compassion's cognitive dimension, aligning it with public health strategies that address deficits in understanding, not just emotion. By integrating contemplative science for testable interventions, this framework provides a robust research agenda to inform policies that build more resilient and caring societies by removing systemic barriers and creating enabling structures for care to flourish.

Keywords: compassion, epidemiology, measurement, dyadic interaction, empathy, prosociality

1. A story about systems and care

During my father's recovery from open-heart surgery at Mass General Hospital (MGH), I (the first author) was struck by the high quality of his care. The attentiveness, the skill, and the palpable sense of concern from the staff were extraordinary. I tracked down his primary nurse to express my gratitude. "The compassion of your team is just amazing," I told him, assuming I was complimenting a culture of innate virtue.

"It's the competition," he explained, much to my surprise. "Boston has so many world-class hospitals, so there's fierce competition for talent. To attract and retain the best nurses, they have to offer superior conditions: better pay, more reasonable hours, and a supportive work environment." The result, he concluded, is a nursing staff that isn't frazzled by the usual chaos of hospital life. They are happier, healthier, and more able to do the work they love. The compassion I was witnessing, in his analysis, wasn't something anyone had trained them in, nor was it any different from the compassion he believed existed in nurses everywhere. Rather, it was the natural outcome of a system that allowed their innate desire to care—the very reason they became nurses—to flourish.

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This answer, so obvious and clear once spoken, struck me hard. It offered a startlingly different etiology for compassion than the one that has dominated its scientific study in neuroscience and psychology. While applied settings such as healthcare and the field of Positive Organizational Scholarship (POS) have broadened the scope to examine systems that support compassion,[1-5] psychology, neuroscience, and contemplative studies have overwhelmingly focused on compassion as an individual capacity that must be rigorously trained into people through practice or intervention. The nurse's insight suggested a complementary truth: that compassion is an innate capacity that needs to be at least unfettered through systemic and structural support, and at best facilitated by the norms, shared values and beliefs, and structures that help organize and shape our behaviors and experiences.

Is one right and the other wrong? This article argues that this question itself reveals a false dichotomy, one that has limited our ability to foster compassion at scale. The way forward lies in embracing another obvious truth: the profound interdependence of systems and individuals—an interdependence outlined by organizational scholars,[5] but not yet fully explored in other areas of compassion science. To unravel this, we must move beyond the individual and adopt the tools of public health to build a true epidemiology of compassion: a science that studies its distribution, its determinants, and the conditions that allow it to spread.

2. Problems in compassion science

To build this epidemiology, we should start by diagnosing why the field has been slow to adopt such a systemic perspective. The individual focus is not accidental. Firstly, research on compassion has largely taken place in psychology and neuroscience. Due to limitations in methods and measures, such as neuroimaging and self-report, this "brain-centric" and individualistic research model typically studies the internal state of the "giver" of compassion in isolation, often measuring neural responses to static images of suffering, rather than two-way interaction with an actual person. While valuable, this has left us with profound gaps in understanding compassion as it exists "in the wild": as an embodied, embedded, and transpersonal phenomenon that unfolds between people in the complex, dynamic contexts of real life.

Second, contemplative science approaches have prioritized research on studying the effects of meditation practices like lovingkindness or compassion meditation, and this research similarly prioritizes individuals as the "givers" of compassion, but also prioritizes individual practices that are largely non-interactive, even when performed in group settings.[6]

Third, and on a broader level, is the problem of negativity bias, or the general psychological principle that negative events, information, emotions, or actions are more causally potent than positive.[7,8] With respect to compassion science, a negativity bias on the individual level may lead to outsized attention toward suffering cues and/or to an overemphasis on the reduction of suffering compared to a promotion of flourishing. In intervention research rooted in contemplative science, compassion is often discussed alongside but disambiguated from loving kindness, or the wish that others be happy and well.[9,10] One outcome of that precision is attention toward the possibility that wishing others to be free of suffering may be distinct from wishing they flourish, along with the possibility that there are distinct pathways towards each outcome. However, in focusing on compassion toward suffering, foundational research on the nature of compassion and the contexts and systems that cause it to arise has contributed to a gap in our knowledge of how the promotion of flourishing differs from compassion toward overt suffering. Meanwhile, in organizational science on compassion, which takes a more integrated view of

givers and recipients of compassion within systems, some have argued that there is not enough focus on suffering, suggesting a need for balance.[11]

Fourth, compassion is often seen as something extraordinary. This has led many researchers (though not all[12]) to neglect the everyday acts of compassion that may seem mundane but are actually essential for human social life, causing us to overlook what we might call the "banality of goodness." Society does not function because of a few heroic saints, but because of the constant, largely invisible flow of mundane compassion. This is the 99.9% of drivers who follow the rules, the 99.9% of shoppers who don't steal, the daily acts of consideration in a workplace, the implicit trust that holds our social and economic systems together. Like the air we breathe, we often only notice this foundational compassion in its absence—in moments of rupture, betrayal, or cruelty. This does not mean ignoring the importance of those ruptures or the need to address them and establish even stronger norms of compassionate behavior. Nevertheless, downplaying mundane compassion can lead to misattributing good outcomes to heroic action instead of to complex systems of influence (attributing what was likely the outcome of complex long-term international diplomacy to heroic short-term decision-making, for example[13]) or to the long humdrum of competent action (overlooking the diligent and multifaceted efforts to correct computing problems associated with Y2K that averted what could have been a significant disaster[14]). A science that only studies these ruptures, or the rare heroes who mend them, will never grasp the systemic conditions that make everyday social life possible in the first place, nor will it be sensitive to uncovering the individual and interpersonal factors that sustain mundane forms of compassionate action.

Fifth, the prevailing focus on compassion as primarily an emotional or motivational state has obscured the profound role of cognition and accurate information in driving compassionate action.[15,16] Non-compassionate behaviors result not just from malice or apathy, but often also from deficits of understanding, i.e., ignorance. This presents a significant opportunity for a public health approach, as cognitive interventions can be more tractable than attempts to directly manipulate emotional states. For instance, environmental degradation is frequently driven by short-term thinking, a misunderstanding of long-term ecological consequences, or ignorance of sustainable alternatives, rather than simply a lack of "caring" for the planet.[17] Similarly, research on stigma around infectious diseases, mental illness, and a range of other conditions repeatedly finds ignorance about the condition to be a major factor, showing stigma can be combatted by education and accurate information, which fosters understanding and challenges misconceptions, rather than simply demanding an emotional shift.[18-21] This aligns with work suggesting that compassion can, and should, be "rational," and that rationality is supportive, not contradictory to, compassion as a felt response to the suffering of others.[22]

This cognitive dimension aligns directly with established public health strategies. Campaigns to reduce smoking did not primarily appeal to individual compassion for one's lungs; they disseminated information about health risks, benefits of cessation, and the science of addiction, empowering informed behavior change. Likewise, efforts to combat vaccine hesitancy or promote healthy diets rely on providing accurate information, addressing misinformation, and cultivating an understanding of long-term health outcomes. By recognizing that non-compassionate behaviors often stem from a lack of wisdom - specifically, a failure to grasp interdependence, common humanity, and the long-term implications of actions - we shift the focus from an abstract emotional deficit to a measurable and cultivable knowledge gap. Addressing knowledge gaps contributes to the cultivation of wisdom, often described in contemplative science as seeing things clearly as they are and thought to go hand-in-hand with compassion.[23] Non-compassionate actions that prioritize the benefits of an individual or single

group against the interests of others often miss the profound implications of these interconnected principles, leading to outcomes that are ultimately self-defeating within a broader system. This re-framing makes the epidemiology of compassion more actionable, allowing for interventions that educate, promote critical thinking, and cultivate systems-level understanding.

This paper proposes a theoretical framework to expand our concepts and methods, enabling compassion science to achieve results that support a future epidemiology of compassion. It posits that shifting from a trait-based to a multi-scalar systemic model can facilitate public health research and action. Such a reframing invites us to ask questions about compassion's distribution in society (who has access to expressing it, and where?), its determinants (what systemic factors cause it to flourish or wither?), its transmission (how do compassionate norms spread?), and how to mitigate and control its opposites: indifference, bias, and cruelty.

3. A multi-scalar framework

To create a scope for the work of compassion science that would support an epidemiology of compassion, we propose a multi-scalar framework for measurement and action. Our tripartite approach is reflected in the anecdote that began this article. At the micro-level, we have the individual nurse's skill and motivation, their expression of compassionate care and the patient's receipt of it. At the meso-level, we have the "local moral world" of compassion in groups and small-scale communities, in this case, the "ecology of compassion" created by the hospital's specific work environment, which encompasses the internal and affective, as well as collective and externally enacted policies, norms, and procedures. These combine to form expressions of shared core values, "what really matters" in this place, for these people. At the macro-level, we have the market forces and policies that shape that environment; these larger scale forces are further removed from both individuals and local moral worlds, yet powerfully shape them and their ability to be spaces of compassion, for better or for worse. This article will propose a framework for measuring and intervening at all three levels, moving us from a science of individual traits to a public health of collective well-being.

This multi-scalar approach demands a fundamental shift in what we measure. Most compassion science to date has focused on the micro-level, often studying individuals in non-relational contexts—measuring internal states in response to social stimuli rather than observing actual interpersonal interaction. A public health framework, however, requires an additional focus on behavior and dyadic interactions. While the internal experience of compassion is important, we cannot build a science of compassion at scale if we disconnect emotion from action. Ultimately, as a public health concern, what actually matters socially is what we do, especially with, for, and to one another. This principle—that compassion must be understood as an enacted skill, "compassion in action"—is the foundation for measuring it at every level, from an individual's helping behavior to the policies that institutionalize equitable care for millions.

Significant methodological challenges lie ahead. Bridging the gap between the rich, often qualitative concepts presented here—such as "ecologies of compassion" or the lived experience of care—and the development of valid, reliable, and scalable instruments required for epidemiological research is not an insignificant task. Operationalizing a behavioral "case definition" of compassion that can be applied consistently across diverse contexts remains a fundamental hurdle. Reframing compassion—which has so often been seen as an internal motivational state or emotion, rather than an expressed behavior—runs significant risk and must be considered carefully lest we superficially reduce compassion to a crude list of "good" and socially acceptable behaviors. Moreover, moving beyond a simple "giver-centric" model requires

a sophisticated approach to integrating the potentially divergent perspectives of the giver, the receiver, and the system itself.

We propose that progress will require a two-stage research process: first, using rich qualitative methods to identify the most salient behavioral indicators of compassion in context, and second, using those findings to develop and validate the scalable quantitative instruments necessary for a robust public health of compassion.

Our article proceeds as follows. Part 1 outlines how the core tools of epidemiology—from surveillance and case definition to prevention and harm reduction—can be adapted to study compassion. Part 2 details a concrete measurement framework at the micro-, meso-, and macro-levels, moving from dyadic interactions to organizational ecologies and national policies. Finally, Part 3 discusses the implications of this measurement approach for an applied translational science that uses epidemiologically informed compassion measurement to evaluate interventions, policies, and systems to cultivate compassion.

4. Part 1: Applying the epidemiological toolkit to compassion

To move compassion from a subject of personal virtue to a target of public health, epidemiology provides a frame for thinking. What happens if we attempt to systematically translate its core principles—surveillance, prevention, and intervention—to the study of a prosocial, rather than a pathological, phenomenon? The goal is not to treat compassion simplistically as a "positive disease" to be spread, ignoring the significant differences between compassion and an infectious disease, but rather to use the powerful logic of epidemiology to understand the distribution of compassion in a population, to identify the factors that determine its prevalence, and design interventions that create the conditions for it to flourish. This section outlines how this translation can be achieved, beginning with the most fundamental task of all: defining what, precisely, we intend to measure.

4.1 Surveillance: Identifying and mapping compassion

The first principle of public health surveillance is that you cannot count what you have not defined.[24] Without a clear and consistent case definition, it is impossible to track prevalence, identify hotspots, or measure the impact of an intervention or policy change. For decades, compassion science has struggled with this foundational step. Definitions often remain abstract or conflate distinct psychological constructs, such as cognitive perspective-taking, affective resonance, and prosocial motivation, leading to a conceptual confusion that has hampered measurement.[25,26] While valuable for psychological and neuroscientific inquiry,[27] a focus on internal states alone is insufficient for a public health agenda that must, by necessity, concern itself with observable actions and their societal consequences.

4.2 A behavioral case definition for public health

To build a viable epidemiology of compassion, we propose a pragmatic, behavioral case definition intended specifically for public health and the study of compassion at a population level: Compassion is the enacted skill of recognizing suffering and engaging in a skillful and informed co-created process oriented toward its alleviation.

This definition has three crucial features for public health. First, it is behavioral—it centers on the observable enacted process, which includes skillful action or even intentional inaction. Second, it frames compassion as both an innate developmental capacity and as something that can be learned, practiced, and improved through intervention and the intentional organization

of compassion-conducive conditions. Third, it is transpersonal, encompassing action directed toward both self and others, which is critical for understanding phenomena like caregiver burnout where a deficit in self-compassion directly impacts the ability to care for others.[28-30] Lastly, by defining compassion as a skillful, informed, co-created process, it embeds the importance of efficacy, information, and feedback. The compassionate quality of a process is judged not by the giver's intent alone, but by its attunement to the recipient's needs and its effectiveness within a broader social context, informed by an understanding of long-term consequences and interdependence The inclusion of *skillful* and *informed* highlights that effective compassion is not merely well-intentioned, but also based on an understanding of the broader situation and an accurate understanding of the source(s) of suffering, addressing root causes rather than just symptoms. What we can measure is not compassion as an internal emotional or motivational state, but the *expression* of compassion in behavioral forms and the cognitive dimension that compassionate action must be informed and skillful to be efficacious. To create an epidemiology of compassion and to study compassion at a population level, we cannot talk about compassion simply as an emotion, as that would result in attempting to regulate and/or promote emotions on a population level, an unenviable task. A focus on emotions/affect also risks the absurd turn toward implying or inferring that one society is more compassionate than another on the basis of metrics that would no doubt be rightly criticized for their arbitrariness, ethnocentrism, and lack of cultural sensitivity and nuance. Rather than trying to promote emotions at a population level or create instruments that would result in such comparisons and inequalities, we can orient towards the promotion of informed and skillfully enacted compassion. This means finding the ways that some societies have found to actualize and manifest compassion behaviorally and systemically, serving as a model from which other societies could learn and benefit. We see this as a standard public health approach, similar to the elimination of infectious diseases, which can be accomplished in one country in a way that then becomes a model to inform approaches in other societies, recognizing cultural and other differences that may affect implementation. In so doing, an epidemiology of compassion would orient toward the goal of maximally organizing our societies and ways of relating to one another that allow for informed and skillfully enacted compassion to manifest in ever increasing ways.

This move seems simple, but it is important to recognize why compassion is often *not* defined behaviorally. One main reason is that as humans, we consider that the moral or ethical dimensions of acts are contextualized heavily by the motivations and intentions that provoked them. A person giving money to the poor might generally be seen as an act of generosity, but our judgment changes if we realize they are only doing it to look good, or to get a tax deduction. An example that is frequently cited is this: Is it compassionate to slice a person with a knife? This depends on whether you are trying to murder them or remove a cancerous tumor.

These considerations are essential for compassion training, where the objective is to expand one's affective relationship towards others to be characterized by genuine love, affection, care and even altruism.[31-33] Here, the emotional and motivational side of compassion is paramount, as the objective is to take an innate sense of compassion and increase it, expanding it beyond in-group bias, to include strangers and even enemies. Compassion training and the expansion of compassion at the level of the individual, together with a decreasing of indifference, bias, and hostility towards out-groups, should be an essential part of an epidemiology of compassion. However, it would be a mistake, we feel, to use a definition of compassion well-suited to compassion cultivation for a field interested in studying, measuring, and promoting compassion at scale on a societal and global level. Just as individual psychotherapy is essential for the treatment of specific cases of mental health but would be completely inappropriate as the sole

public health strategy for combating the epidemic of loneliness, so must we consider new ways of conceptualizing compassion for our current purposes.

It could be argued that by prioritizing the cognitive and behavioral dimensions of compassion, we are straying from definitions rooted primarily in affect and motivation. However, this shift is essential for a culturally humble and global epidemiology of compassion that does not prioritize Western understandings of emotions. Many languages lack a direct translation for "compassion," and cultural expressions of care vary widely. By focusing on observable behaviors, knowledge, and systemic outcomes, our framework is better equipped to serve as a universal model for prosocial action. The emphasis on logical consistency, understanding of interdependence, and rational action to alleviate suffering provides a common ground that is arguably more universally accessible and less culturally loaded than individual emotional terms that vary across cultures. This is a crucial step towards defining and pursuing global well-being in a way that respects diverse human experience and transcends ethnocentric biases.

From an individual perspective, it makes sense to define compassion as an inner state or "action potential"—a genuine wish to alleviate suffering, motivated by care, even if one is unable to act. From a systems perspective, however, if this compassionate potential is consistently not realized as effective action, or is enacted but received as non-compassionate, we must diagnose a failure in the system itself. The deficit of compassion may not lie in the individual, but in the absence of structures that allow individual action-potentials to be realized and successfully received, or in a lack of the necessary wisdom and information to guide effective action. This conceptual move is the foundation of a public health approach: it allows us to focus on observable behaviors and the systems that shape them,[34] which in turn enables a true epidemiology of compassion.

This perspective also highlights how an action's compassionate quality is not determined by the giver's intention alone. Drawing on an enactive framework, we argue that compassion is not a unilateral act bestowed upon a passive recipient, but a dynamic, co-created process. The ultimate test of a compassionate act is whether it is received as helpful and attuned by the person suffering and the wider society. A system that enables compassion, therefore, must do more than simply unfetter the giver; it must facilitate successful dyadic and social processes, creating the conditions for listening, feedback, and mutual adjustment. A compassionate system has effective feedback loops that prevent well-intentioned action from becoming paternalistic or harmful.

Reframing a compassionate act from a gift bestowed by a "giver" to a dynamic, co-created process moves measurement beyond the isolated individual and into the dyad and group, which is the locus of most meaningful social outcomes. For example, a physician and patient engage in joint action to manage a chronic illness; their success depends on a shared commitment to the goal of well-being and the skillful coordination of their respective roles.[35] This move also provides a framework for understanding failures of compassion not as a simple lack of feeling, but as a breakdown in commitment, shared experience, or effective coordination.[36]

By engaging in these framings, we are able to define the epidemiology of compassion as a scientific discipline focused on identifying, measuring and understanding the *mechanisms* by which societies and their members effectively actualize compassion. The purpose of this discipline then becomes to facilitate mutual learning and the adoption of best practices in structural and relational organization and culture, leading to the maximal manifestation of suffering alleviating behaviors and outcomes, and the promotion of individual and collective health and well-being. Deprioritizing individual emotional states as primary metrics allows the

discipline to instead focus on observable behaviors, cognitive drivers and systemic enablers/barriers, which appear more tractable from a public health perspective.

This proposed epidemiologic lens for compassion is not without challenge. Measuring internal states through self-report or neuroimaging offers a controlled, replicable environment that is difficult to achieve when observing messy, real-world interactions.[37] Furthermore, a purely behavioral lens risks downplaying the role of motivation; an action that appears helpful could be driven by self-interest, while a failure to act could stem from fear rather than indifference.[38] There are also significant risks of cultural bias, as the expression of care is deeply shaped by local norms and values.[39]

Despite these valid concerns, a public health approach requires this behavioral pivot. While intent matters psychologically, population health is ultimately determined by actions and their consequences; furthermore, intent may be unclear when looking at a single act, but arguably becomes clearer over longer time scales. We cannot build a public health of compassion by measuring only what people feel; we must measure what they do and the systems that shape those actions.[40] This also means that any surveillance system for compassion cannot exist separately from the surveillance of its opposite: cruelty. Just as the study of health requires understanding disease, the study of compassion requires understanding the conditions that foster violence, abuse, and systemic indifference. Measures of structural violence, discrimination, and social injustice are not separate from an epidemiology of compassion; they are its essential baseline, defining the "zero point" against which compassionate outcomes must be measured.[41]

While the nuances of compassion present a definitional challenge, a pragmatic starting point for any epidemiological effort is to focus on the most unambiguous indicators. Tracking societal care for our most vulnerable populations—children, the elderly, the poor, prisoners, and the stigmatized—can be a starting point for studying structural compassion. Conversely, by gathering data on breakdowns of care for the vulnerable—intentional or ignored barriers to care, the implementation of policies or approaches that exacerbate inequity—we can compare such indices against their presumed opposites. If we cannot begin by mapping these most visible manifestations of the "banality of goodness and cruelty," the more subtle forms will remain forever out of reach.

4.3 Symptom identification: The observable indicators of compassion

With a behavioral case definition established, the next step in surveillance is to identify its "symptoms" or indicators. In epidemiology, a syndrome is a collection of signs and symptoms that characterize a particular condition. Similarly, we can conceive of a "compassion syndrome" as a cluster of observable indicators at the micro-, meso-, and macro-levels. These are not just isolated acts of kindness, but patterns of behavior and systemic features that, taken together, signal the presence of a compassionate system.

At the micro-level, symptoms include observable dyadic behaviors such as empathic listening (e.g., reflective statements, non-verbal attunement), spontaneous offers of help, and patterns of physiological synchrony between individuals engaged in a supportive interaction.[42,43] The absence of these, or the presence of their opposites—interruptions, dismissiveness, physiological discord—can be seen as symptoms of a compassionate deficit. Moral injury, for instance, is best understood not as an individual pathology, but as a severe symptom of a systemic failure in compassionate joint action.[44]

At the meso-level, the symptoms of compassion are embedded in the "local moral worlds" of organizations and communities that impact the prevalence or distribution of compassion.[45,46] In a compassionate workplace, for example, indicators would include high levels of psychological

safety, where members feel secure enough to take interpersonal risks like asking for help or admitting mistakes.[47] Other signs include norms of cooperation and resource sharing, transparent communication from leadership, and low rates of burnout and turnover.[48,49] Conversely, a compassion desert at the meso-level would be characterized by a culture of blame, information hoarding, and hyper-competition, creating an environment where the energy required for compassionate action is systematically depleted.

Finally, at the macro-level, we find the indicators of "structural compassion"—the institutionalization of care through policy, economic systems, and legal frameworks. These are the societal-level social determinants of health and well-being. Indicators include robust public investment in care infrastructure (e.g., universal healthcare, affordable education, childcare), low levels of income inequality as measured by the Gini coefficient,[50,51] and a justice system that balances punitive measures with restorative practices aimed at rehabilitation and social reintegration.[52] A society with these structures automates a baseline of care, reducing the burden on individuals to address systemic failures through private charity or heroic effort.

Structural compassion is based on, and exists interdependently with, "cultural compassion": the beliefs, "mental models," and cultural practices that undergird, perpetuate or eventually result in changing institutional and economic structures. A society with universal healthcare has institutionalized compassion, reducing the need for individual GoFundMe campaigns; in various countries, such institutions are different because their culture is different. To address the macro-level, we can and must learn across national boundaries, which also helps us address the problem of "humility" in global health: the problem of elites in rich countries dictating conditions in the Global South and in minority communities in ways that impact adversely, rather than help.

4.4 Mapping compassion: Hotspots and deserts

Once we can identify the symptoms, we can begin to map their prevalence, moving from case definition to active surveillance. An epidemiological approach reveals that compassion, like any health outcome, is not evenly distributed. In such instances, it is important to recognize that such deficits in measured compassion are not because some groups are less innately compassionate than others, but because their meso- and macro-level systems have not allowed their innate compassion to express itself. As the powerful literature on adverse childhood experiences (ACE's)[53] and the emerging literature on loneliness[54] suggests, this is almost always due to a lack of received care.

By mapping the distribution of the expression of compassion, we can identify "hotspots"—areas where compassion predictably flourishes—and "deserts," where it is systematically scarce. Studying compassion hotspots is analogous to studying communities with natural immunity to a virus. These are natural experiments that reveal the conditions under which compassion thrives.

By contrast, compassion deserts are environments where the conditions for compassionate action are systematically undermined. These are not necessarily places devoid of caring individuals, but rather systems that erect structural barriers, making compassion an exhausting, high-cost endeavor. It is important to note that in a complex system, the distinction between a "symptom" (the manifestation of compassion) and a "cause" (the determinant) is often circular; a compassionate norm is both a symptom of a healthy culture and a cause of future compassionate acts. For the purpose of measurement, however, we treat them as observable indicators.

Table 1. Examples of compassion "hotspots" and "deserts."

Hotspots	
Post-disaster communities	In the aftermath of events like earthquakes or hurricanes, communities often exhibit a surge of altruism, cooperation, and solidarity, a phenomenon Rebecca Solnit calls a "paradise built in hell." (ref: 46) The sudden, stark recognition of a shared fate and profound interdependence creates a powerful, if temporary, commitment to the concordant goal of collective survival.
High-functioning palliative care and neonatal units	In these settings, the shared goal—a dignified death or the survival of a fragile infant—is exceptionally clear and compelling. This fosters an intense environment of commitment and joint action among staff, patients, and families, creating a powerful ecology of care (ref: 47).
Successful restorative justice programs	These programs are explicitly designed to create a structured context for compassionate joint action. By bringing victims, offenders, and community members together to collaboratively address the harm caused by a crime, they create a framework for mutual understanding and repair that is often absent in traditional punitive systems (ref: 48).

Deserts	
Over-stressed healthcare systems	Unlike the well-resourced hospital in our opening anecdote, many healthcare environments are characterized by understaffing, excessive administrative burdens, and immense time pressure. These conditions create chronic burnout, a state of emotional exhaustion and depersonalization that directly inhibits the capacity for compassionate care (ref: 49)
Hyper-competitive corporate and academic environments	Cultures that reward zero-sum competition and individual achievement at all costs can create "moral mazes" where cooperation is seen as a liability and empathy is a strategic risk (ref: 50).
Politically polarized online spaces	Digital architectures designed to maximize engagement often amplify outrage and out-group animosity, fostering echo chambers that reduce complex human beings to simplistic, threatening caricatures, thereby eroding the mutual identification necessary for empathy (refs: 51,52).

4.5 Prevention, promotion, and stigma reduction

Identifying hotspots and deserts is the diagnostic work that informs intervention. An epidemiological framework offers a powerful triad of strategies: prevention, promotion, and stigma reduction.

Prevention strategies can be modeled on the public health distinction between primary and tertiary care. Primary prevention acts as a "vaccine," providing universal skills to the general population before deficits arise. Comprehensive social emotional learning programs in schools are a prime example, designed to equip children with the foundational competencies for a lifetime of compassionate engagement.[55] Tertiary prevention, or treatment, involves intensive interventions for those already suffering from severe compassion deficits or related harms like moral injury. This includes targeted programs like Cognitively-Based Compassion Training (CBCT) or Mindful Self-Compassion, or individual counseling designed to restore compassionate functioning.[56-59]

Beyond prevention, a public health approach emphasizes compassion promotion, a concept adapted from harm reduction. This strategy focuses on changing environments to make compassionate action the easier, more natural choice. It is about providing the tools and conditions—the stairs" and "removed walls" described below—that enable our innate capacity for care to flourish. This includes structural changes like designing less stressful work schedules for nurses, implementing communication protocols that de-escalate conflict, or creating platforms for civil discourse that are intentionally designed to foster mutual understanding rather than tribalism.[60] As the field grapples with balancing issues of paternalism, autonomy, and agency,[61,62] so too must it grapple with the epidemiologic measurement of compassion that is sensitive to the influence of structural factors on agency and autonomy.

Finally, a mature epidemiology of compassion must address the impact of stigma, the unseen cultural barrier. Examining the influence of stigma on compassion may be particularly essential for a just and ethical epidemiology of expansive compassion because public health is often conducted at a distance and with power and status imbalances.[63] Public health campaigns have successfully fought stigma around HIV and mental illness, and a similar effort is needed for compassion. The target of this stigma is rarely the "worthy" (e.g., innocent children), but rather the "unworthy": criminals, political opponents, or members of stigmatized out-groups. In many contexts, extending compassion to these groups is framed as weakness, naivete, or even betrayal. An expansive epidemiology of compassion asks, who do we declare is unworthy of our compassion, and why? A public health narrative must counter this by framing compassion not as a sentimental emotion, but as a form of courageous, clear-eyed strength essential for social cohesion and justice.[64,65] Similar to re-framings of empathy (shown below), compassion must be differentiated from self-sacrifice and reframed as a behavioral attitude that facilitates mutually-beneficial joint action. By tackling these cultural narratives, we can create a society where compassion is not only possible but is recognized as an essential public good.

5. Part 2: A multi-scalar measurement framework

Part 1 established the conceptual logic for an epidemiology of compassion. Now, we turn to the central methodological question: how do we measure it? A public health agenda requires instruments that are not only valid but can also capture compassion as it operates at different scales—from the intimacy of a dyad to the policies of a nation-state. This section outlines a multi-scalar measurement framework designed to move compassion science beyond its traditional focus on individual traits and towards an analysis of enacted, co-created, and structurally supported care (Figure 1).

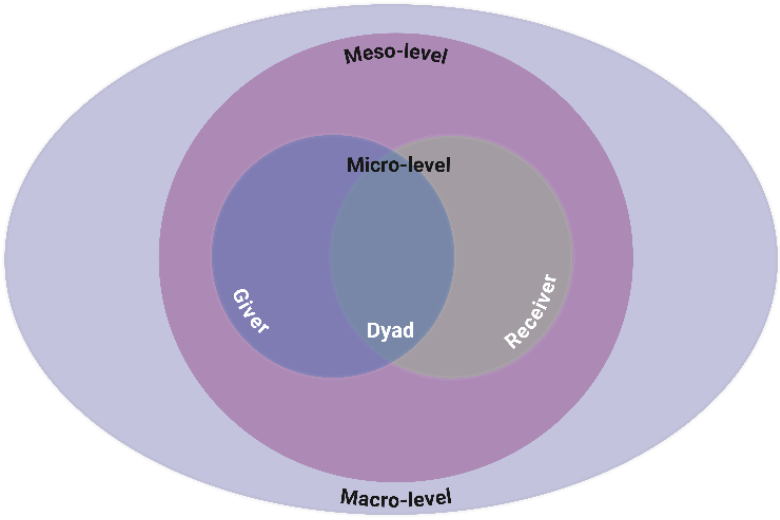

Figure 1: Schematic of multi-scalar measurement framework for an epidemiology of compassion

5.1 Micro-level: From a giver-centric trait to a co-created process

The most significant methodological shift we propose is at the micro-level: moving beyond a "giver-centric" analysis to a multi-perspectival framework that measures compassion as it is co-created between people, and that focuses on the expressions of compassion (compassionate behavior) rather than a mental state. The dominant research paradigm has treated compassion as a stable trait or internal state residing within the "giver" (Type 1), often measured through self-report or neuroimaging in response to static stimuli. [11,6] This approach, while valuable, is incomplete. It risks measuring unvalidated projection rather than effective, received compassion, and it cannot capture the dynamic, interactive process that defines most meaningful human encounters.

To build a more ecologically valid model, we draw on an enactive framework, designed for the study of empathy, that conceptualizes compassion as an embodied social process.[66] This allows us to organize measurement around four distinct but interconnected units of analysis:

Type 1 (The Giver). This includes the traditional measures of the individual offering compassion. Self-report scales like the Compassionate Love Scale[67] or neuroimaging paradigms that assess brain responses to suffering[68-71] fall into this category. While these tools provide insight into an individual's disposition and internal processing, they represent only one lens through which to understand a complex and dynamic phenomenon and must be contextualized by the other levels of analysis.

Type 2 (The Receiver). This perspective, critically under-studied, focuses on the recipient's experience of being cared for. The ultimate test of a compassionate act is not the giver's intent, but the receiver's experience of feeling seen, understood, and supported. To capture this, we propose the use of phenomenological inquiry. Methods like micro-phenomenological interviews can meticulously explore the first-person, felt sense of a compassionate encounter, providing rich data on what makes an action feel genuinely caring.[72] This qualitative data is not merely descriptive; it serves as an essential validity check for Type 1 and Type 3 measures, helping to distinguish genuine connection from well-intentioned but ineffective action.[73]

Type 3 (The Interaction/Dyad). This is the core of an enacted, transpersonal approach, measuring the dynamic process that unfolds between participants. Here, the unit of analysis is not the individual but the interaction itself. To measure this, we must move beyond static

observation to performance-based tasks and physiological synchrony. Because Type 3 is so important to an epidemiology of compassion, we will spend a little time unpacking methods for its measurement.

Method: Dyadic measures. Researchers have designed laboratory scenarios that measure the quality of joint action towards a shared, pro-social goal.[74,75] For example, pairs are tasked with collaboratively solving a difficult problem under time pressure, with one member designated to provide support to a stressed partner. While these tasks are often employed in laboratory settings, they can also be brought "outside the lab" to study dyadic compassion in the real world.[75] Still other dyadic measures are designed specifically for *in vivo* data collection. For example, the electronically activated recorder (EAR) unobtrusively measures ambient sound, allowing a daily record of behaviors that can be operationalized to reveal indicators of compassion.[76-78] Other key metrics could include observable communication patterns (e.g., frequency of supportive utterances, interruptions, and connectional silences), behavioral coordination, and mutual adjustment of strategies.[79-83] These tasks provide objective, behavioral data on how compassion is enacted in real-time.

Method: Physiological and behavioral synchrony. As individuals engage in supportive" joint action, their physiological states can become coupled. Measuring heart rate variability (HRV), respiratory, and even neural synchrony (via hyperscanning) between partners can serve as an objective proxy for the quality of their embodied attunement and connection.[43,84] This approach captures the non-verbal, embodied resonance that often underlies the feeling of being "in sync" with another person, providing a powerful, implicit measure of the interaction's quality. For an epidemiology of compassion, measures of real-world physiological and behavioral synchrony will be crucial, aided by technological and statistical innovations. For example, smartphone sensing data can be used to capture real-world behavioral synchrony such as social proximity, face-to-face interactions, and synchronous movement across time and space.[85] Moreover, dyadic experience sampling measures can be yoked to facilitate the ambulatory measurement of a dyad's experiences, allowing for the examination of the impact of one person's behavior on another's.[86]

Method: Moral injury as a system failure. This multi-perspectival framework for compassion also offers a new lens for understanding moral injury. Traditionally viewed as an individual pathology, moral injury can be re-conceptualized as a measurable indicator of a breakdown in the compassionate system—specifically, a failure of commitment or effective joint action at the dyadic or group level.[44] When a soldier is ordered to perform an act that violates a deeply held moral commitment, or a doctor is forced by systemic pressures to provide care that falls short of their professional and ethical commitments, the resulting injury is not just internal. Moral injury is a symptom of a relational and systemic failure, a breakdown in the possibility of engaging in compassionate joint action. Measuring moral injury thus becomes a critical diagnostic tool for identifying compassion deserts in an epidemiology of compassion.

5.2 Meso-level: Assessing ecologies of compassion (Type 4)

At the meso-level, we move from the dyad to the group, assessing "ecologies of compassion" within organizations and communities. It is here that we see that work in psychology and neuroscience must be supplemented with approaches from anthropology and sociology. This meso-level corresponds to Type 4 (Group/Community), which examines how a group's norms, shared history, and collective identity shape its capacity for compassionate joint action (Roerig et al., 2023). The goal is to measure the properties of the "local moral world" (Kleinman, 2006) that either enable or inhibit the flourishing of compassion among its members.

5.2.1 New measures

The "What Matters Most" Protocol. This ethnographic method can be adapted to map the gap between an organization's stated values (espoused commitment) and its lived, everyday practices (enacted joint action). By interviewing members about what is truly at stake for them in their work, researchers can identify points of alignment or friction between individual moral experience and institutional culture (Yang et al., 2014). The size of this gap—for instance, between a hospital's mission of "patient-centered care" and the reality of 15-minute appointment slots—can serve as a measurable compassion deficit.

Institutional Ethnography. This approach involves observing the "unwritten rules" and routine practices that govern joint action within a system (Smith, 2005). An ethnographer might ask: Do team members instinctively hoard resources or share them? Is asking for help (a recognition of interdependence) treated as a sign of weakness or a core component of effective collaboration? Are meetings structured to facilitate shared understanding or to reinforce hierarchy? These observations provide qualitative data on the structural facilitators and barriers to compassionate behavior within an organization.

Compassion Network Analysis. Drawing on social network analysis, we can map the flow of help, support, and information within a group to visualize its compassionate infrastructure.[87] Who are the key "nodes" that facilitate support? Are certain individuals or sub-groups systematically isolated or excluded from compassionate joint action? This method can reveal hidden patterns of care and identify structural vulnerabilities, such as an over-reliance on a few key individuals whose burnout would cripple the entire system's compassionate capacity.

Compassionate Leadership. Central to these ecologies is the role of leadership. Leaders do not merely authorize policies; they have an outsized impact on determining the "local moral world" through their own behavior, explicitly and implicitly. To operationalize this, we must leverage existing measures to examine not only leader traits but also leader-follower dynamics, which may vary cross-culturally. This includes assessing how leaders model vulnerability, respond to failure (punitive vs. restorative), and allocate resources. A key meso-level intervention, therefore, is shifting leadership training from "management" to the cultivation of psychological safety and the explicit modeling of empathy and interdependence.

5.3 Macro-level: Measuring structural compassion in societies

Finally, a comprehensive epidemiology must measure compassion at the macro-level, where it manifests as a key Social Determinant of Health. As noted above, we term as "structural compassion" the policies, laws, and economic structures that institutionalize and automate care on a societal scale. We term as "cultural compassion" the beliefs, "mental models," and cultural practices that undergird, perpetuate or eventually result in changing institutional and economic structures.

This concept helps resolve the challenge of comparing societies where care is primarily an individual, charitable act versus those where it is a collective, public good. For example, a society with universal healthcare has institutionalized a form of compassion that reduces the need for individuals to rely on private fundraising for essential medical treatment. Measuring these structures is critical for understanding the systemic foundations that either support or undermine a population's capacity for well-being.

To operationalize this, the development of composite measures, such as a compassion index, may be a necessity, although we must proceed here with significant caution. The indicators listed below are illustrative (Table 2), not exhaustive, and are intended to demonstrate the feasibility and necessity of such measures. The development of a "version 1.0" would require a rigorous and

transparent validation process by an interdisciplinary, non-partisan body to establish its legitimacy for global health policy.

By combining these diverse data points, the Compassion Index would offer a panoramic view of a nation's structural compassion, providing a vital tool for epidemiologists to track, compare, and advocate for the systemic conditions that allow entire populations to flourish.

Table 2. Index and indicators

Transparency Index: Measures the openness and accountability of institutions.
Trust Index: Assesses the level of social and institutional trust within a society.
Friendship/Connection Index: Gauges the strength of social bonds and the prevalence of social isolation.
Inequality Measures: The Gini coefficient, which measures income inequality, serves as a powerful proxy for social stratification and fairness (refs: 43,44).
Public Investment in Care: National expenditure as a percentage of GDP on public health, education, and family support services (e.g., childcare, eldercare, parental leave).
Justice System Orientation: The ratio of spending on punitive measures (e.g., incarceration) versus restorative and rehabilitative justice programs, reflecting a society's approach to harm and repair.

6. Part 3: A translational epidemiology of compassion

The framework for an epidemiology of compassion that we have presented affords several opportunities for scientific growth and its utility can be judged by how well it lends itself to generating actionable new knowledge about the most pressing challenges of our time.

6.1 A multi-indicator framework

A fundamental challenge in the behavioral measurement of compassion is distinguishing authentic care from performative helping, namely actions that appear compassionate but lack genuine concern for the other's wellbeing. We propose a multi-indicator authenticity framework that addresses this concern through convergent validation. First, temporal consistency: authentic compassion should manifest across multiple observations and contexts, not just in formal assessment situations. Second, recipient validation: the receiver's phenomenological report serves as the ultimate validity check—does the action feel genuinely caring or merely dutiful? Third, cost-benefit analysis: authentic compassion often involves personal cost (time, energy, resources) without clear reciprocal benefit, distinguishing it from strategic helping; at the same time, reciprocal compassion can lead to "win-win" scenarios in which both or all parties benefit. Finally, behavioral coherence: compassionate individuals and groups should show consistent patterns across the micro-level indicators (empathetic listening, spontaneous helping, physiological synchrony) rather than excelling in only one domain. By requiring convergence across these multiple indicators, we can build confidence that our measures capture genuine compassionate engagement rather than superficial compliance with social expectations. We should also consider that the differences in time and scale when studying compassion at a population level may actually make the task easier, rather than harder; for example, at larger time scales and with a larger number of individuals, inauthentic or inconsistent helping behaviors may become statistical outliers, while authentic prosocial patterns can emerge as a reliable and measurable central tendency of the group.

6.2 Entering into conversation with public health models

The focus on operationalizing compassion as a measurable action across time and space also places compassion science in communication with the science of behavior change. Models and theories of behavior change help us understand how people maintain healthy behaviors across time, place, context,[88] and offer a new lens for understanding patterns of compassionate behavior in the context of healthcare and public health. The science of behavior change begins with the premise that individuals are faced with multiple behavioral options at any one time. Their choice can be explicit or implicit and is impacted by internal factors such as their motivation and habits, as well as by contextual factors such as their available resources, support, external cues, cost/rewards, and opportunities.[89] Compassion, as defined and operationalized here, lends itself well to this framework. Moreover, a distinction is often made between initiating and maintaining behavior change,[89] which may be helpful toward understanding the propensity for compassionate behavior at critical junctures (e.g., at the beginning of a relationship or job, immediately after a mistake, during times of hardship or natural disaster) versus during relatively more static periods.

6.3 Cross-cultural considerations

A critical challenge for any epidemiological approach to compassion is ensuring cross-cultural validity without imposing Western conceptual frameworks on diverse populations. We propose a "cultural triangulation" approach to validation that combines emic (insider) and etic (outsider) perspectives. This involves three parallel validation streams: (1) Community-based validation, where local stakeholders define what constitutes compassionate action within their cultural context, providing the foundational "ground truth" against which our measures must be calibrated; (2) Cross-cultural behavioral anchoring, where observable behaviors (such as resource sharing, time allocation for helping, or conflict resolution patterns) serve as universal indicators while allowing for culturally-specific expressions; and (3) Convergent validation across multiple data sources (self-report, peer nomination, behavioral observation, and physiological measures) within each cultural context. For the Compassion Index specifically, we recommend developing culturally-adapted sub-indices that weight components differently based on local values—for example, emphasizing collective versus individual measures of trust in more communitarian societies—while maintaining core structural indicators like healthcare access and income inequality that transcend cultural boundaries.

6.4 A translational framework

Translating this multi-scalar framework from research concept to practical implementation requires a phased, resource-conscious approach that acknowledges real-world constraints. We propose a tiered implementation model that begins with readily available data sources and progressively incorporates more resource-intensive measures as infrastructure develops. Tier 1 leverages existing datasets (national health surveys, organizational climate assessments, publicly available policy indicators) to establish baseline Compassion Index measurements and identify preliminary hotspots and deserts. Tier 2 introduces targeted behavioral assessments in key settings (healthcare facilities, schools, workplaces) using streamlined protocols that can be administered by trained paraprofessionals rather than requiring specialized researchers. This tiered approach allows for implementation in resource-constrained settings; where high-tech physiological measures are impossible, Tier 1 and 2 protocols utilizing community-based observation and existing administrative data may provide a viable, low-cost entry point for

surveillance. Tier 3 implements the full multi-perspectival framework with physiological measures and institutional ethnography in selected sites that serve as "compassion observatories"—ongoing research partnerships that provide high-quality data to validate and refine the simpler measures used in Tiers 1 and 2. This approach ensures that resource limitations do not prevent initial progress while building toward the comprehensive surveillance system the framework envisions. This implementation strategy positions community health workers, school counselors, and organizational development professionals as key partners in data collection, embedding measurement within existing care structures.

If the multi-scalar framework in Part 2 provides the "what" and "how" of measurement, then contemplative science offers a powerful answer to the question of "what now?" For centuries, contemplative traditions have served as laboratories for the systematic cultivation of prosocial qualities like compassion. In recent decades, secular, evidence-based programs derived from these traditions have emerged, providing a rich source of testable interventions. For a public health of compassion, contemplative science is not a spiritual or purely therapeutic pursuit; it occupies a "Third Space" as a practical methodology for developing the ethical know-how and prosocial skills essential for individual and collective well-being. Thus far, however, contemplative approaches have largely focused on the individual (micro) level; the meso- and macro-level have been confined to the structures of monastic or religious communities.

Thus, a reframing is critical. Programs like Cognitively-Based Compassion Training (CBCT) and Social, Emotional, and Ethical Learning (SEE Learning) are structured, scalable public health interventions designed to increase compassionate capacity at the micro- and meso-levels.[55,90,91] But a macro-level approach is indispensable for an epidemiology of compassion. The epidemiological framework we have outlined provides, we believe, tools to move beyond small-scale clinical trials and conduct large-scale research on their population-level effects. We can now ask more ambitious questions: Can a district-wide implementation of SEE Learning measurably improve the "ecology of compassion" in schools, as assessed by institutional ethnography or compassion network analysis? Can widespread training in CBCT for healthcare workers shift organizational metrics of burnout and patient-reported care, thereby moving the needle on a meso-level compassion desert? What happens when macro-level policies are restructured to enable the unleashing of innate compassion, bolstered further by such programs? Epidemiology provides the map and the measurement tools, while contemplative science provides targeted interventions to test.

Contemplative science also offers a powerful parallel to what epidemiology calls "cure research." While compassion is not a disease to be cured, its opposites—indifference, bias, and cruelty—stem from identifiable root causes. Contemplative traditions have long identified these as cognitive biases (such as reification and in-group preference), afflictive emotions (like anger and fear), and a fundamental misapprehension of the self as an isolated, independent entity. Intensive contemplative practice, at its core, is a methodology for investigating and transforming these root causes on an individual level. A combined approach across all three levels is essential.

6.5 Facilitating systems thinking

The insights from contemplative practice and the framework of epidemiology both point toward a systems-level approach to compassion. This requires us to design and advocate for "structural compassion"—the policies and systems that institutionalize care. What such systems look like, however, may be more subtle and variegated than we think.

Japanese society, for example, through its education and cultural norms, has masterfully built enabling structures for consideration of others (*omoiyari*). Children are trained from an early age

in practices of group harmony and collective responsibility. The result is a society of remarkable safety and social cohesion, where the "banality of goodness"—the everyday, mundane compassion of civic life—is incredibly strong. Yet, this same powerful structure can sometimes be experienced as a constraint on individual expression, a pressure to conform that can stifle dissent and personal aspiration.[92]

This distinction suggests a useful heuristic for analyzing systems, adapted from the idea of "negative" and "positive liberty": thinking of structures as either stairs or walls.[93] We unpack this heuristic below with the important preface that, although useful, even these conceptualizations are context-dependent and must be understood within the system they are operating. Take the role of 'competition' voiced by the nurse in our opening anecdote, a *stair* in the anecdote but so often a *wall* in other contexts or circumstances.

Enabling Structures (The Stairs): These are structures that help us do what we cannot easily do on our own. Literacy is a good example: a skill that can reach close to 100% in societies, but that would never be learned on one's own. These structures build our collective capacity. The livable working conditions at MGH noted above are an enabling structure; they give nurses the support they need to climb to a higher level of care. Universal healthcare, public education, and robust social safety nets are all "stairs" that enable a society to collectively care for its members.

Freeing Structures (Removing the Walls): These structures work by removing barriers that inhibit our innate agency and capacity. While literacy must be taught, speaking their native language comes naturally to children everywhere. A "wall" might be a discriminatory law, a policy that creates burnout, or a bureaucratic process that prevents people from accessing help. Removing these disabling structures unfetters the compassion and potential that is already there. The nurses at MGH didn't just have stairs; they had the walls of burnout and exhaustion removed, freeing their agency to shine.

To move horizontally, all we need is to not be put in a cage, behind walls. To move vertically, we need stairs. An effective epidemiology of compassion must therefore do two things. First, it must identify and measure the impact of enabling structures that actively promote compassionate outcomes. Second, it must identify the disabling structures—the "walls" of policy, economic pressure, and social injustice—that create compassion deserts and advocate for their removal. This is not to suggest that all walls (restrictions) are bad, and all stairs (facilitators) are good; it is to suggest the need for critical discernment around how structures impact and intersect with individual and collective agency. The goal is not to create a perfectly managed society, but one that is intentionally and compassionately constructed with all the sophistication we can muster.

Despite its emphasis on *omoiyari*, Japan is regularly lowest among countries polled on acts of charity.[94]. This reflects, however, a different approach to society's relationship to individuals in distress. In the United States, where social welfare is limited, individual acts of charity are necessary and expected. In Japan, individual problems should be taken care of collectively. Anthropological critiques of international studies of flourishing and wellbeing invite us to ask important questions of cultural context.[95] Which system is more compassionate? One that provides healthcare for everyone, or one that relies on individuals and non-profits to fill the gaps that government has left open? The success of the epidemiology of compassion will depend on such critiques.

6.6 Moving compassion science into the future with humility

An epidemiology of compassion should also be positioned to examine the role of technological innovation on each level of compassion. For example, as healthcare and public health grapple

with the role of AI in person-centered medicine and ecologies of care,[96] epidemiological indices of compassion can be leveraged for evaluation and as a key outcome for decision-making.

At the same time, we must acknowledge the limitations of such a broad framework. First, as noted, developing metrics like the Compassion Index raises very real risks of reductionism, potentially simplifying complex cultural dynamics, and thus depends on local and anthropological critique. Second, arguments for behavioral definitions must recognize that "observable behaviors" are themselves culturally coded. Finally, the transition from conceptual framework to empirical validation will require rigorous methodological scrutiny, including psychometric testing, which this article outlines but does not detail. Future research should prioritize the development of these instruments with diverse global populations to avoid replicating Western-centric biases.

7. Conclusion

The scientific study of compassion is at an important juncture. To meet the pressing needs of our time, we suggest moving beyond a traditional focus on the internal states of individuals and embrace the methods and models of public health. This article has proposed a multi-scalar framework to guide this transition, offering a new set of tools to measure compassion as an enacted, transpersonal skill and a structural determinant of health.

By defining compassion behaviorally, we can begin to map its distribution, identifying the "hotspots" and "deserts" that reveal the conditions under which compassion thrives or withers. By developing new measures at the micro-level (dyadic tasks, physiological synchrony), the meso-level (institutional ethnography, network analysis), and the macro-level (a Gross National Empathy Index), we can make the invisible architecture of care visible and quantifiable. This approach, enriched by the testable interventions and mechanistic insights of contemplative science, provides a robust research agenda for the next decade.

This addition transforms the "epidemiology of compassion" from one that might struggle to address purely emotional deficits into a more robust and actionable model. By identifying non-compassionate behaviors as largely stemming from a lack of understanding (of interdependence, common humanity, and long-term consequences), this model squarely aligns with some of public health's most effective tools: information dissemination, education, and the cultivation of informed decision-making. This makes the concept of compassion not only behaviorally measurable but also cultivable, greatly enhancing its tractability for both study and intervention. This directly mirrors work in areas like vaccine hesitancy, sexually transmitted infection prevention, or promoting healthy diets. More than a lack of caring, these are often due to a lack of accurate information, misunderstanding of risk, or short-term thinking, and perhaps most importantly, to systems that impede or place barriers on healthy behavior change. Public health interventions that are educational, communicative, and structural can build upon everyday compassion through information campaigns about interdependence and systems thinking around long-term consequences.

Just as the epidemics of loneliness and mental health among youth are forcing us to identify and implement structural solutions rather than the treatment of individual pathologies, the scale needed for establishing cultures where compassion can manifest fully necessitates that we shift the burden from arduous individual self-improvement to collective, structural change. The task ahead requires a new, interdisciplinary collaboration between epidemiologists, anthropologists, economists, and contemplative scientists. Together, we can build the data infrastructure and theoretical models needed to make compassion a central priority for public policy and global

health, fostering a world where it is not seen as a heroic exception, but recognized as the expected and natural foundation of our shared public life.

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