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Rethinking minority stress: A social safety perspective on the health effects of stigma in sexually-diverse and gender-diverse populations

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ABSTRACT

For over two decades, the minority stress model has guided research on the health of sexually-diverse individuals (those who are not exclusively heterosexual) and gender-diverse individuals (those whose gender identity/ expression differs from their birth-assigned sex/gender). According to this model, the cumulative stress caused by stigma and social marginalization fosters stress-related health problems. Yet studies linking minority stress to physical health outcomes have yielded mixed results, suggesting that something is missing from our understanding of stigma and health. Social safety may be the missing piece. Social safety refers to reliable social connection, inclusion, and protection, which are core human needs that are imperiled by stigma. The *absence* of social safety is just as health-consequential for stigmatized individuals as the *presence* of minority stress, because the chronic threat-vigilance fostered by insufficient safety has negative long-term effects on cognitive, emotional, and immunological functioning, even when exposure to minority stress is low. We argue that *insufficient social safety* is a primary cause of stigma-related health disparities and a key target for intervention.

1. Introduction

In 2003, Ilan Meyer published a landmark article entitled "Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations" (Meyer, 2003), ushering in a new era of research on *minority stress*. Meyer defined minority stress as the chronic, cumulative stress associated with stigma, due to objective events (such as discrimination and victimization) and psychological responses to these events (such as internalized shame). According to minority stress theory, repeated exposure to such experiences overtaxes individuals' stress response systems, heightening their vulnerability to stress-related health problems over the life course. Meyer's original paper on minority stress has been cited over 11,000 times, and the minority stress model has become the predominant explanation for stigma-related health disparities among sexually-diverse individuals (those seeking sexual/romantic relationships with the same and/or multiple genders) as well as gender-diverse individuals (e.g., those whose gender identity or expression differs from their birth-assigned sex/gender, or expands beyond binary notions of gender, Bockting et al., 2020; Hidalgo et al., 2019; Newcomb et al., 2020; Testa et al., 2015). Gender-diverse individuals often experience different forms of stigma than sexually-diverse individuals, but the link between stigma and health

problems is thought to be similar across both populations, which is why we collectively refer to them as "SGD" (a definition that includes asexual individuals, Rothblum et al., 2020).

Studies of mental health problems among SGD populations (such as depression, anxiety, and suicidal ideation) have supported the minority stress model (for example Plöderl and Tremblay, 2015; Semlyen et al., 2016), but studies of the physical health effects of minority stress have yielded less consistent findings (reviewed in Diamond, Dehlin, & Alley, 2021). For example, Flentje and colleagues (2020) reviewed 26 studies published since 1996 that tested associations between sexually-diverse individuals' exposure to minority stress (such as workplace discrimination) and either biological markers of stress reactivity or physical health outcomes. Less than half of the tested associations were statistically significant, suggesting that our understanding of the health effects of stigma remains incomplete. Something *in addition* to minority stress is contributing to health problems in SGD populations: What is this missing piece?

We argue that it is social safety. We define social safety as reliable social connection, social belongingness, social inclusion, social recognition and social protection, which are essential human needs at all stages of life (Cacioppo and Hawkley, 2009; Holt-Lunstad et al., 2015). The availability of protective social ties is "the fundamental organizing

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principle of human behavior" (Slavich, 2020, p. 267), without which the human mind and body cannot thrive. Most of us give and receive hundreds of subtle cues and reminders of social connectedness as we go about our everyday lives, often without conscious awareness: Smiling if you make eye contact with a stranger; moving over to make room for someone on a bus; responding to individuals who request your help; speaking up when you see someone being mistreated; offering assistance to someone who seems hurt or lost; showing interest in other people's families. Such indicators of basic human concern and connection allow us to move through our social worlds without fear, because they remind us that we belong to an interconnected and protective social fabric: *No matter what happens, you are not alone.*

This protective social fabric is not available to stigmatized individuals. Once stigmatized individuals realize that *some* people consider them abnormal or unworthy, *all* people must be approached with new caution. Routine cues of social safety (respectful treatment, offers of assistance, eye contact, explicit inclusion, authentic interest) are often withdrawn once an SGD individual allows their identity to be known (Ellis and Fox, 2001; Gabriel and Banse, 2006), and so they learn to fend for themselves. A recent BuzzFeed news article highlighted the "unwritten rules" that SGD individuals routinely follow to maintain their everyday safety (Sloss, 2022), such as altering their appearance to avoid detection, monitoring their speech in certain settings, avoiding isolated highway exits or gas stations, avoiding public restrooms, and scrutinizing other people's language and demeanor to predict whether they are safe to approach. Hundreds of SGD individuals commented on the article, expressing gratitude that this hidden burden was finally being discussed. As one reader noted, "I went through the list like….yep, yep, yep. I do that too, oh that's a smart tip, yep, yep…We are so conditioned to think about our safety in the most random situations, in a way [cisgender and heterosexual] people don't generally have to even think about" (Sloss, 2022). Chronic threat-vigilance may become so routine for SGD individuals that they stop noticing it, but a growing body of research suggests that its health effects are just as significant as the effects of chronic stress reactivity, especially when sustained over time. Hence, the health consequences of stigma derive not only from what is *present* in the lives of SGD individuals (stress), but what is *absent* (safety). In order to reduce health disparities in stigmatized populations, we must reduce their exposure to minority stressors and also amplify their access to social safety.

We base this claim on a growing body of evolutionary-developmental and psychoneuroimmunological research indicating that the default state for the human brain is chronic threat-vigilance, which is maintained until sufficient cues of safety are detected (Brosschot et al., 2016, 2017, 2018). Just as a worried parent might not be able to sleep, rest, or work if their child is unsafe, our brains cannot sleep, rest, or work if *we* are unsafe. Chronic threat-vigilance involves a coordinated set of biobehavioral adaptations aimed at self-protection, such as perseverative cognition, heightened biopsychological reactivity to threat cues, chronic self- and other-monitoring, and social withdrawal. These processes overlap strikingly with those involved in *complex post-traumatic syndrome* (Maercker, 2021), a cluster of neurological, behavioral, attentional, and emotional symptoms observed in individuals who have lived with chronic and uncontrollable danger (such as childhood abuse, Spinazzola et al., 2018). The growing body of research on complex PTSD shows that even when no single stressor overwhelms an individual's coping resources, living with chronic unsafety can profoundly influence mental and physical health.

Our discussion focuses on sexual and gender stigma, but a social safety perspective also broadens our understanding of the health effects of other forms of marginalization, such as race, ethnicity, age, socioeconomic status, religion, citizenship, neurodiversity, physical ability, etc. Whenever individuals are considered *lesser* by others, their lives are fundamentally devalued (as reviewed by Pachankis et al., 2018), making them more vulnerable to harm and less likely to receive assistance from others. In 2020, there were 11,000 acts of bias-motivated violence

directed to individuals on the basis of their race, ethnicity, religion, or gender/sexual identity (US Department of Justice, 2021). Marginalized individuals do not need to experience such threats personally to internalize a sense of wariness and hypervigilance in their own neighborhoods, workplaces, and homes (especially when video evidence of the everyday mistreatment of marginalized individuals is disseminated regularly in the media, Agence France-Presse, 2020; Gill, 2020). In some cases, heightened threat-vigilance begins at an early age: Some parents specifically warn their children about discriminatory treatment they might experience in the future and show them how to detect and avoid unexpected dangers (Janey, 2021; McDonald, 2020). Chronic threat-vigilance is an adaptive response to chronic unsafety, but research increasingly shows that it takes a negative toll on the mind and the body over time (Meng et al., 2020; Semler & Harvey, 2007; Shechner & Bar-Haim, 2016). Hence, the harmful effects of stigma are conferred not only by what *happens* to individuals (such as workplace discrimination or police mistreatment), but through an ever-present awareness of what *could* happen, coupled with the knowledge that no one else might notice, care, or help. This is the silent, chronic, toxic phenomenology of stigma that we call *insufficient social safety.*

We begin by briefly reviewing current findings on health disparities in SGD populations, taking care to point out inconsistencies and knowledge gaps. We then introduce the Generalized Unsafety Theory of Stress (Brosschot et al., 2016, 2017, 2018) to argue that many of the negative effects of minority stress derive from insufficient social safety. This argument is based on the fact that the human nervous system evolved to "err on the side of caution" (Brosschot et al., 2017, p. 290), and to default to a state of chronic threat-vigilance until proof of safety is detected. We show that insufficient social safety has critical implications for long-term health because it triggers systemic immunological inflammation (see Section 5.2), a primary contributor to health and disease (building on Slavich's Social Safety Theory, 2020). We then review empirical evidence for the critical importance of social safety in the lives of SGD individuals, across a number of different domains (family, community, school, etc.). We outline a range of factors that might moderate individuals' biobehavioral responses to safe and unsafe environments, such as childhood adversity, genetic traits, and the experience of intersecting marginalized identities (Crenshaw, 1991) that might synergistically contribute to "syndemics" of health risk within marginalized groups (Quinn, 2022; Stall et al., 2003). We conclude by considering directions for future research, such as the development of novel measures of social safety and the development of interventions aimed at promoting SGD health by amplifying their social safety over the life course.

2. Health disparities in sexually-diverse and gender-diverse populations

As noted earlier, minority stress has been posited to explain both mental and physical health disparities in SGD populations. Regarding mental health, numerous population studies and meta-analyses find that SGD adolescents and adults show greater mental health problems than the general population, including mild psychological distress, social anxiety, obsessive compulsive disorder, major depressive disorder, suicidal ideation, and suicidal behavior (Cicero et al., 2020; Krueger and Upchurch, 2019; McCabe et al., 2020; Newcomb and Mustanski, 2010; Raifman et al., 2020). In fact, risks for clinical depression are so great among sexually-diverse individuals that Bromberg and colleagues (Bromberg et al., 2021) argued based on data from the Centers for Disease Control and Prevention that clinical depression now poses a greater health risk to gay and bisexual men than HIV.

Evidence for *physical* health disparities in SGD populations has been inconsistent, which may reflect the fact that stress-related physical health problems often take many years to progress to diagnosable disease, whereas mental health vulnerabilities often emerge in adolescence or early adulthood (Kessler et al., 2007). Diamond et al. (2021) reviewed

22 population studies published in the last decade that assessed SGD disparities in adults' physical health outcomes. They found notable variation from study to study, depending on the specific conditions assessed (arthritis, cancer, diabetes) and whether demographic and health-relevant covariates were accounted for (such as age, race, ethnicity, income, education, substance use, access to health insurance, etc.). The most consistent disparities were found for global self-ratings of overall physical health. All but two studies including this outcome found significant disparities, but the specific groups showing the largest disparities varied from study to study, with bisexual individuals generally reporting poorer health than lesbian and gay individuals (when referring to previous findings, we retain the group labels used by the authors – typically *lesbian, bisexual, gay, and transgender* – while acknowledging that these terms represent the identity options that were available to the study participants, and might not fully align with the participants' own chosen identities). Self-reported functional limitations showed similarly consistent disparities: All of the studies assessing this outcome found more limitations among one or more subgroups of sexually-diverse individuals (most commonly lesbian and bisexual individuals), and all but one of the studies including transgender individuals found disparities (these studies did not assess gender identity in a manner that consistently represented the full spectrum of gender diversity, which limits the generalizability of the findings to transgender men and transgender women).

Disparities in cardiovascular risk were the next most consistent outcome: Of the eight studies that assessed cardiovascular conditions or risk factors (hypertension, cholesterol, heart attack, cardiovascular disease), seven found elevated cardiovascular risks in SGD individuals (after adjusting for relevant covariates), but the specific subpopulations showing elevated risk varied from study to study. For example, one study found elevated cholesterol among lesbians only, whereas another found elevated cholesterol only among gay and bisexual men. Disparities in heart attack and self-reported cardiovascular disease were more consistent for transgender individuals than for lesbian/gay/bisexual individuals who were not transgender. Asthma and arthritis showed consistent health disparities for sexually-diverse individuals, but not gender-diverse individuals. Of the six studies assessing asthma or arthritis in sexually-diverse individuals, all found significant disparities in at least one subgroup (i.e., bisexual women, bisexual men, etc.), after adjusting for relevant covariates. Of the three studies that assessed transgender women and transgender men, none found disparities for asthma or arthritis, and there was also little evidence for consistent disparities in diabetes, kidney disease, liver disease, gastrointestinal (GI) disorder, or cancer (as noted, limitations in the assessment of gender identity and expression limit the generalizability of the findings).

The patchwork of effects reviewed above does not fit the notion of a generalized pathway leading from stigma to stress and from stress to health. If the cumulative stress of sexual/gender stigma fosters higher cardiovascular risk and depression in SGD individuals, then why is it *not* also associated with diabetes or GI disorders, both of which are known to be exacerbated by chronic psychological stress (Afrisham et al., 2019; Suarez et al., 2010)? It may be time to rethink the minority stress model's emphasis on cumulative stress as the primary mechanism underlying SGD health disparities.

3. The minority stress model

Meyer's (2003) formulation of minority stress was based on the extensive psychological literature on *stigma* (Allport, 1954; Goffman, 1963; Jones et al., 1984), which documented the broad-ranging effects of social stigma for individuals' social and psychological experiences across multiple life domains. Meyer synthesized insights from the stigma literature with insights from health-psychological research on the negative effects of stress, positing that excess psychological stress mediated the link between sexual stigma and mental health (Meyer, 2003). Hatzenbuehler (2009) critiqued this aspect of Meyer's model,

noting that it grants too much explanatory power to "stress" without specifying *how* stigma-related stressors influence mental health. Hatzenbuehler's psychological mediation framework argued that stigma-related stressors influence mental health through specific cognitive/affective/behavioral processes such as rumination, isolation, and emotion regulation (2009). Studies have supported this view for outcomes including anxiety (Mahon et al., 2021; Schwartz et al., 2016), depression (Baams et al., 2018; Sarno et al., 2020), suicidal ideation and behavior (Baams et al., 2015; Chang et al., 2020), general distress (Chan and Mak, 2019; Szymanski et al., 2014), and substance use (Burton et al., 2018; Fitzpatrick et al., 2020).

Hatzenbuehler's reluctance to posit "stress" as an overarching explanation for stigma-related health problems is shared by scholars studying stress and health more generally. Some have argued that the concept of "stress" has become too generalized to have meaningful scientific utility (Epel et al., 2018; Kagan, 2016; Slavich, 2020). After all, practically any experience can be considered a stressor, despite the fact that different types of stress create different adaptive challenges, provoke different emotional and behavioral responses, have distinct degrees of controllability, and are differentially amenable to coping strategies (Lazarus and Folkman, 1984). These concerns also apply to research on minority stress: As noted by Flentje et al. (2020), measures designed to capture minority stress include a broad range of divergent experiences (similar to the case for ethnic/racial stigma, as noted in Cuevas et al., 2020). Some studies focus on everyday discrimination events such as being treated unfairly at work or receiving poor treatment/service in restaurants or businesses (McLaughlin et al., 2010; Parra et al., 2016), whereas others focus on verbal threats, physical assault, harassment, or bullying (Bontempo and D'Augelli, 2002; Johns et al., 2019). Some studies emphasize the psychological burden of concealing one's sexual orientation (reviewed by Pachankis et al., 2020) whereas others focus on the effects of bystander stigma (in which SGD individuals observe or learn about the mistreatment of other SGD individuals (Salvati et al., 2019; Willis, 2012), "microaggressions" (defined as everyday denigrating events such as derogatory jokes or hurtful comments about sexual/gender identity, (Nadal et al., 2016), worries about future rejection (Dyar et al., 2018; Pachankis et al., 2008; Wells et al., 2020), or internalized homophobia or transphobia (Bockting et al., 2020; Newcomb & Mustanski, 2010)).

The time scale over which minority stress is assessed also varies widely. Some studies assess whether individuals have *ever* experienced a stigma-related stressor (Wardecker et al., 2020), whereas others assess experiences over the past year (Lelutiu-Weinberger et al., 2020), the past six months (Sarno et al., 2020), or across a series of days (Eldahan et al., 2016; Mohr and Sarno, 2016). The broader stress literature has emphasized the differential effects of *early* life stress, *chronic* stress, *cumulative* lifetime stress, and *acute* stress (reviewed in Epel et al., 2018), but these distinctions are not always made explicit in minority stress research. The time course of stigma may prove particularly important for SGD populations because of variation in the timing of gender and sexual identity development (Bockting, 2014; Katz-Wise et al., 2017; Rosario et al., 2008). Some SGD individuals first develop an awareness of their own sexual and/or gender identity in childhood or adolescence, whereas others do not do so until much later in life, or may undergo fluctuations in identity, behavior, and expression over many years (Diamond, 2016; Diamond et al., 2020; Ott et al., 2011; Savin-Williams et al., 2012).

3.1. Minority stress as cumulative burden

The minority stress model attributes the health effects of stigma to "allostatic load," which represents the cumulative psychological and biological toll of stress (McEwen, 1998, 2003). As summarized by Flentje and colleagues, "One can consider stress responses, which are necessary for everyday function, to be a process of allostasis, wherein multiple biological systems work together to maintain homeostasis in

the body and stress response. Chronic stressors, however, can result in overload of this system, termed allostatic load or overload, which involves multisystemic changes (e.g., immune, cardiovascular, metabolic) in response to stress" (2020, p. 674). Most minority stress studies invoke the allostatic/cumulative load model either explicitly (Correro and Nielson, 2020; Hatzenbuehler, Slopen, et al., 2014; Juster et al., 2019; Wardecker et al., 2019) or implicitly (Doyle and Molix, 2016; Hatzenbuehler et al., 2013; Morgan et al., 2019). This model is also frequently invoked in studies linking ethnic/racial stigma to health outcomes (Allen et al., 2019; Cuevas et al., 2020; Currie et al., 2020).

A widely-noted obstacle for this conceptual model is the fact that self-reports of stress (i.e., feeling "anxious," "upset," "worried, "wound up," etc.) often fail to correlate with the biomarkers of stress reactivity typically used to indicate allostatic load, such as elevated blood pressure or salivary cortisol (Campbell and Ehlert, 2012; Sommerfeldt et al., 2019; Volmer and Fritsche, 2016). If allostatic load represents the biological "toll" of psychological stress, then why do reports of emotional reactivity often fail to match biological reactivity? Scholars have offered multiple explanations for these mismatches, such as the multiply-determined nature of biological stress responses (Cacioppo et al., 2000), individual differences in self-awareness of affective states (Waldstein et al., 2002), and individual differences in correspondence and feedback between conscious emotional states and nonconscious biological processes (Sommerfeldt et al., 2019). The end result is that our *conscious awareness* of psychological stress provides only a partial perspective on the biological processes involved in stress reactivity and recovery.

For this reason, many researchers focus on biomarkers of stress responsivity (instead of self-reported stress) to model the health effects of stress exposure. However, most commonly assessed stress biomarkers (such as autonomous nervous system reactivity or secretion of salivary cortisol) do not reliably predict long-term physical health and disease (Cohen et al., 2012; Rohleder, 2019). For example, heightened salivary cortisol is a commonly assessed index of stress-related activation of the hypothalamic-pituitary-adrenocorticol (HPA) axis (for example, Iob & Steptoe, 2019; Somerville et al., 2020), but meta-analyses have found that it is *blunted* patterns of cortisol release (lower reactivity and "flattened" diurnal slopes) which more consistently predict poor physical health (Adam et al., 2017). Additionally, capturing transient reactivity in stress-related biomarkers has limited utility in identifying whether, why, and how distinct life circumstances (such as poverty versus job burnout versus sexual/gender stigma) have distinct physical health effects. For example, the magnitude of an individual's cortisol awakening response (another commonly assessed biomarker of stress-induced alterations in the functioning of the HPA axis) is positively related to subjective reports of job stress and general life stress, but *negatively* related to subjective reports of fatigue, burnout, and exhaustion (Chida and Steptoe, 2009).

Another limitation of the "cumulative burden" approach to minority stress is the assumption that the harmful health effects of stress are additive and equivalent, such that individuals with the greatest exposure to minority stress will have the poorest health outcomes (for a critique of this assumption in the context of childhood adversity, see Ellis et al., 2022). In short, if one discrimination event induces deleterious biological changes (such as elevated blood pressure), then two, three, four, or five events should be progressively worse. Such linear assumptions are certainly reasonable (and the easiest to statistically test), but they are not well-grounded in the psychobiology of stress and health. Allostatic load approaches are designed to *predict* stress-related health outcomes, not to explain their underlying mechanisms (Ellis and Del Giudice, 2014). Higher scores on conventional indices of allostatic load do not represent higher total biological stress responsivity, but simply the number of different biological domains in which high-risk patterns of functioning are observed (Evans et al., 2007; Karlamangla et al., 2002), for example elevated resting blood pressure *plus* elevated urinary catecholamines *plus* elevated blood glucose. Hence, although allostatic load

approaches are helpful for identifying the individuals at greatest risk for stress-related health problems, they do not actually provide a theoretical or empirical justification for expecting tidy linear associations between cumulative stress exposure and physical health problems. Perhaps, then, we should not be surprised by the inconsistent empirical associations between self-reported minority stress and biological/health outcomes (as in Flentje et al., 2020).

3.2. Links between racial/ethnic stigma and health

Inconsistent links between minority stress and biological/health outcomes have also emerged in research on ethnic/racial marginalization (Cuevas et al., 2020). For example, Krieger and colleagues (1996) found higher blood pressure among Black women who reported experiencing no race-related minority stressors versus occasional stressors (which were defined as "ever experiencing discrimination, being prevented from doing something, or being made to feel inferior in several situations based on gender, race or color, socioeconomic position or social class, sexual preference (heterosexual, bisexual, homosexual), and religion," p. 1371). In interpreting this finding (which runs directly counter to the minority stress model), the authors speculated that perhaps being able to name and describe discriminatory events as discriminatory is more health protective than internalizing them as a fact of life or attributing them to personal failings. These possibilities are difficult to test with self-report measures: When individuals report low levels of minority stress, we cannot tell whether they did not *experience* discrimination or whether they do not *attribute* these experiences to discrimination.

Interpretive problems have also emerged from studies finding links between self-reported discrimination and health outcomes in the "wrong" groups – i.e., those with social privilege rather than social stigma. For example, Grandner and colleagues (2012) analyzed data from the 2006 Behavioral Risk Factor Surveillance System, and found that individuals who reported "having experiences that are worse than those of other races" in health care settings had greater sleep disturbance; yet this effect was found in *both* Non-Hispanic White and Black/African-American individuals (Grandner et al., 2012), despite the fact that Black/African-Americans individuals were three times more likely to report discrimination than Non-Hispanic Whites. As with many such studies using questionnaire measures of discrimination, it is difficult to know exactly how to interpret Non-Hispanic White respondents' reports of being treated "worse than other races," and the authors noted that such reports may represent something entirely different when made by White individuals versus members of marginalized groups. An additional complication is the widespread societal conflation of race and ethnicity, which makes it difficult to know how respondents interpret questions that refer to race-based discrimination.

Another study of women with Type 2 diabetes investigated links between continuous blood glucose and women's reports of how often they "experienced discrimination because of race, ethnicity, or color in specific situations such as at school and getting service in a store or restaurant" (Wagner et al., 2015, p. 568). White women who reported more frequent discriminatory treatment had significantly higher blood glucose than White women reporting less frequent discrimination, whereas blood glucose was unassociated with self-reported discrimination among Black women (again, we retain the group names used by the authors). Yet notably, Black women's reports of race-related discrimination were more than 8 times higher than White women's reports, raising the possibility that the nonsignificant findings among Black women reflect a ceiling effect (Wagner et al., 2015). The authors indicated that they did *not* interpret their findings to mean that Black individuals are more "accustomed" to discrimination, and therefore find it less stressful. Rather, they argued (similar to Grandner et al., 2012) that White respondents' reports of discrimination may be driven by different factors than the reports of Black respondents, and may require a different interpretive approach.

Rodriguez and colleagues (Rodriguez et al., 2016) examined nocturnal blood pressure in a community sample of Latine/x participants. Blood pressure typically declines overnight, and the absence of this nocturnal decline (called "nondipping") is considered a cardiovascular risk factor. They found that "nondipping" was more likely among individuals reporting *lower* lifetime experiences of racial or ethnic discrimination (operationalized as lifetime experiences of social exclusion, workplace discrimination, stigmatization, and physical threat due to one's ethnicity or race). In interpreting this unexpected finding, the authors speculated that some individuals reporting low levels of discrimination might actually be *experiencing* differential and denigrating treatment, but may interpret it as a personal failing, rather than attributing it to racism (see also James, 1994). The findings of such studies highlight the importance of correctly defining and measuring "racism/sexism/heterosexism/cisgenderism" and distinguishing these constructs from overt discrimination. Racism, sexism, heterosexism, and cisgenderism are systemic power structures which grant unearned privileges to some individuals over others. Yet individuals are not always consciously aware of their own position within these systems. Experiencing differential treatment and identifying it as discrimination are separate phenomena, which may help to explain some of the mixed findings reviewed above. It is also important to note that openly naming and describing discriminatory treatment sometimes exposes marginalized individuals to additional risks, and many widely used self-report measures of discrimination do not adequately capture cultural processes that sometimes protect some marginalized groups from stigma-related health risks (e.g. the Latinx/Hispanic health paradox, as noted by Rodriguez and colleagues (Rodriguez et al., 2016).

Studies assessing the intersections between racial/ethnic stigma and sexual/gender stigma have also yielded inconsistent results. For example, one representative study of over 62,000 respondents to the 2013 and 2014 National Health Interview Study (Hsieh & Ruther, 2016) found that Black and Latine/x gay men – but not bisexual men – reported more limitations in physical functioning than Black and Latine/x heterosexual men, but there were no sexual identity differences in functional limitations among White men. A different pattern emerged for women: both White lesbians and White bisexuals had more functional limitations than White heterosexuals, but only Black and Latine/x bisexuals (and not Black and Latine/x lesbians) reported more functional limitations than Black and Latine/x heterosexuals. Another analysis of the same dataset (but including 2015 data, for a total of over 90,000 respondents, Trinh et al., 2017) found that White lesbian and bisexual women (combined) had higher rates of hypertension and stroke than White heterosexual women, but Black lesbian/bisexual women only differed from Black heterosexuals (as well as White heterosexuals) in the frequency of stroke. None of these differences were observed for Latine/x women, and Latine/x gay/bisexual men only differed from Latine/x heterosexuals in rates of hypertension (similar to the differences in hypertension between White gay/bisexual men and White heterosexual men). None of these disparities emerged among Black gay/bisexual men. Such patterns are difficult to reconcile with straightforward linear models positing that more stigma creates more stress, more biological stress reactivity, and more health problems.

4. The critical shift: from excess stress to insufficient safety

The studies reviewed above show that some marginalized individuals have poor health despite reporting infrequent minority stressors, whereas others have good health despite reporting frequent minority stressors. Measurement problems (such as heterogeneity across measures and overreliance on self-report) certainly contribute to these inconsistencies (Flentje et al., 2020; Krieger and Sidney, 1996; Rodriguez et al., 2016) but we propose an additional, more radical explanation: *That reactivity to stressors is not the primary mechanism through which stigma influences health.*

Minority stress theory – like the larger body of biomedical research on adversity and health – begins with the premise that excess stress reactivity leads to health problems, but this premise has been increasingly challenged by stress researchers and health psychologists (Amat et al., 2005; Brosschot et al., 2017, 2018; Carleton, 2016; Maier, 2015; van der Ploeg et al., 2017), who have puzzled over the same inconsistent links between stress exposure and health outcomes that have emerged in minority stress research (reviewed in Brosschot, 2017). In considering the inconsistent links between stress and health, Brosschot, Verkuil, and Thayer (2017, 2018) offered an evolutionary reframing of the problem. They noted that conventional models of stress implicitly presume that humans' default neurobiological state is calm homeostasis, which is disrupted by external stressors. Yet this assumption makes little evolutionary sense: A default state of calm would have been maladaptive in the human ancestral environment, which was replete with unexpected dangers. Humans constantly changed territories in search of food, shelter, and safety, all of which were inconsistent and unreliable. Accordingly, the most adaptive default state would have been *chronic wariness and threat-vigilance* – what Brosschot and colleagues call "generalized unsafety" (2017, 2018). As they argued, it is better to "flee 10 times too often than once too few" (p. 2).

If the default state of the human nervous system is chronic threat vigilance, then what *turns down* this vigilance enough for individuals to rest, explore, and function? In colloquial terms, what prompts individuals to "let their guard down?" The answer is *social safety*, defined as social connection, social inclusion, social protection, social recognition, and social acceptance (Brosschot et al., 2018, Slavich, 2020). Brosschot and colleagues' (2017, 2018) sweeping synthesis of the neurobiological architecture of the human stress response system demonstrates that neural stress reactions are not so much triggered by cues of threat as they are inhibited by cues of safety (Amat et al., 2005; Carleton, 2016; Maier, 2015), and *inclusion in a social group* is the most powerful of such cues. As an example of safety-related inhibition of neural threat-vigilance, imagine waiting alone at a dark and deserted bus stop, not knowing whether you missed the last bus and not having any other way to get safely home. Your brain and your senses will likely go into high alert for *any* sign of the approaching bus, temporarily hijacking all of your other thoughts and goals. Only when you detect the approaching bus (signaling that you are out of danger) will your nervous system down-regulate its threat-vigilance, flooding your brain and body with relief and allowing you to turn your attention to other things.

For human beings, social inclusion is a preeminent source of safety, and hence our brains evolved to constantly monitor its availability. Humans lived in small social groups throughout our evolutionary history, and depended on one another for basic survival (Kemeny, 2009; Slavich, 2020; Slavich and Irwin, 2014). As Coan and Maresh (2014) noted, "the dominant ecology to which humans are adapted is not any one terrain, diet, or climate, but rather *each other*" (p. 222), and hence the "need to belong" is a fundamental and primary human motivation (Baumeister and Leary, 1995; Bowlby, 1958). Exclusion from the social group was a life-threatening emergency for ancestral humans, and hence natural selection equipped our brains with exquisite sensitivity to cues of hostility, disgust, and disapproval from group members, along with powerfully aversive emotional responses to these cues (Cacioppo and Hawkley, 2009; Gruenewald et al., 2007; Kemeny et al., 2004). These adaptations fostered survival by helping humans detect the smallest hints of social disapproval and motivating them (through anxiety, fear, and shame) to regain the group's support and protection. Children start distinguishing between "ingroup" and "outgroup" members at a very early age, and show strong motivations to *stay* in their ingroup (Corenblum & Meissner, 2006; Essa et al., 2020; Meidenbauer et al., 2018).

The clearest example of social safety as primary inhibitor of the default human stress response is the infant-caregiver attachment system (Bowlby, 1958, 1973a, 1973b). Attachment is a safety-maintenance system: The human infant's basic drive to seek proximity to their caregivers, and to experience distress when removed from care, evolved to promote their basic survival (given that infants are born too

developmentally immature to survive without intense care). Over the course of infant development, the repeated process of infant distress followed by caregiver soothing gradually calibrates the infant's developing stress response systems and fosters the maturation of socially-regulated neural processes of stress inhibition (Schore, 2000). Although these regulatory systems undergo profound developmental change in the early years of life, humans' need for social safety to alleviate fear and distress continues from "the cradle to grave" (Bowlby, 1988, p. 62), which is why loneliness and social isolation pose such dire threats to human health (Cacioppo and Hawkley, 2009; Holt-Lunstad et al., 2015). When individuals have sufficient access to social safety (such as physical contact with a warm and supportive social partner, as in Coan et al., 2006), the prefrontal cortex suppresses neural systems responsible for threat vigilance (hence, *letting the guard down*). When individuals do not have sufficient access to social safety, their threat vigilance remains engaged, eating up their attention and energy even in the absence of direct threat.

4.1. Downstream effects of insufficient safety

In Fig. 1, we present a conceptual model of the downstream effects of social safety for individuals' cognition, affect, behavior, and well-being.

It is loosely based on Bowlby's "control system" model of infant/caregiver attachment (reviewed by Petters, 2019), which drew upon the notion of a thermostat. Just as a thermostat continuously monitors the environment and regulates heating and cooling to maintain an optimal state, the human brain continuously monitors the environment for cues of social inclusion and protection (such as the presence and behavior of social partners), and regulates cognition and behavior to maintain sufficient safety. Humans' continuous toggling between exploration and self-protection has been called the "explore-exploit" dilemma (Sutton and Barto, 1998): We can only explore our environments if our bodily integrity is secure, and so if bodily integrity is threatened, we immediately withdraw to protect ourselves. Hence, we must continuously monitor the environments to determine whether the local conditions are safe for exploration and engagement. This continuous, automatic environmental monitoring is widely observed among social primates (reviewed in Gomes and Semin, 2020; Sutton and Barto, 1998), and both observational and experimental research has found that humans increase or decrease their self-monitoring and other-monitoring behavior as a function of the presence and behavior of other people (Gomes and Semin, 2020; Rostosky et al., 2021). For example, individuals devote *more* cognitive effort to such monitoring processes when they are unsure of social partners' intentions or motives, and this extra cognitive load is
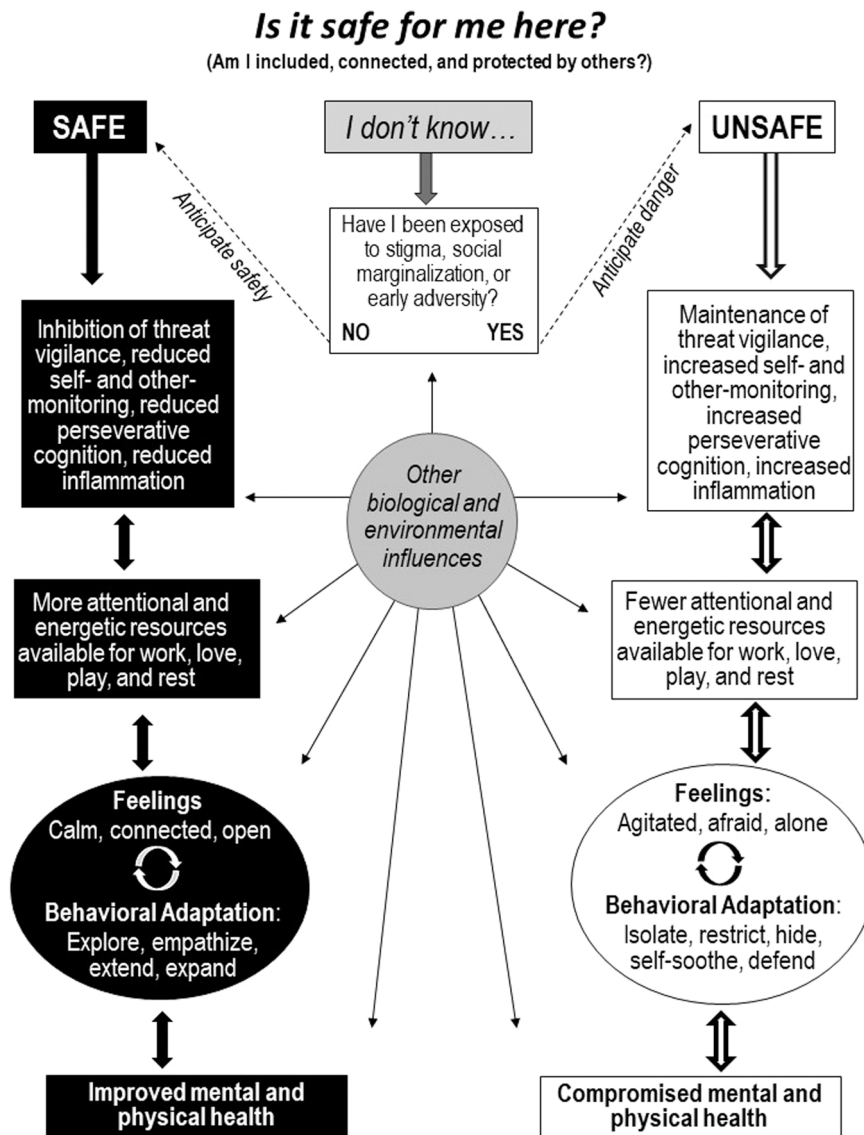

Fig. 1. Graphical representation of the potential consequences of perceiving low versus high social safety for multiple domains of functioning.

enough to deplete cognitive resources and impair performance on other cognitive tasks (reviewed in Salvatore and Shelton, 2007).

We represent this automatic monitoring with the question at the top of Fig. 1: "*Is it safe for me here?*" The word "*here*" clarifies that perceptions of safety depend on local conditions, and on the specific constellation of physical, auditory, visual, tactile, and symbolic cues of safety and threat that are perceivable in a particular setting (we review examples of these cues in the following section). The left side of Fig. 1 displays the sequence of events that occurs when individuals experience sufficient social safety (due to detecting sufficient evidence they are included, affirmed, recognized, and protected by others). In such cases, the local environment is rendered predictable and neutral, and neural threat-vigilance can be inhibited (Cornwell et al., 2017; Wieser et al., 2016). Safety-related inhibition of threat-vigilance allows for the down-regulation of perseverative cognition and continuous self- and other-monitoring (Evans et al., 1984; Richards et al., 2014), which frees up attentional and energetic resources for goal-directed, social, and restorative activity (Gomes and Semin, 2020; Richards et al., 2014). Paralleling Bowlby's control system (and consistent with Porges' Polyvagal Theory regarding the social nervous system, Porges, 2001) we posit that the emotional state associated with sufficient social safety includes emotional engagement, connectedness, and an openness to new experiences (*felt security,* in Bowlby's model) and that the behavioral adaptations fostered by social safety include exploration of the environment, extension and expansion of goals and activities, and empathic connections to others (we will address the effects of social safety on systemic inflammation, and inflammation-related health conditions, in the next section).

At first glance, the benefits of social safety may resemble "stress buffering" effects: Numerous studies suggest that the deleterious effects of psychological stress can be buffered by access to – or perceptions of – social support (Cohen and Wills, 1985; McQuaid et al., 2016), and similar processes have been found effective in SGD populations (Gower et al., 2018; Johns et al., 2018). Yet the stress buffering model requires *the presence of a stressor*, whose effects are ameliorated by social support (for example, being calmed by the presence of a friend while undergoing a stressful task). A social safety perspective suggests that insufficient social safety can affect health on its own, even in the absence of stressors. Another key difference between social safety and social support has to do with consistency and reliability. An extensive body of research by Uchino, Holt-Lunstad, and colleagues (Holt-Lunstad and Uchino, 2019; Uchino et al., 2016) documents that social support is not always beneficial when it is provided by *ambivalent* social ties – i.e., social ties that are both helpful and upsetting (for example, a spouse who provides comfort, but also provokes resentment; a friend who listens empathically to your problems, but always highlights what you did wrong; a parent who expresses concern, but never believes your version of events). Uchino and colleagues' work has shown that ambivalent social ties are widespread (especially within family relationships), and uniquely aversive: Studies using ambulatory blood pressure monitoring have found that interacting with ambivalent social ties provokes significant elevations in cardiovascular reactivity (Holt-Lunstad et al., 2003) and may be a significant contributor to stress-related health problems over the life course (Holt-Lunstad and Uchino, 2019). We interpret these findings as evidence for the critical difference between support and safety. Ambivalent social partners may be able to provide periodic support, but they are unlikely to be experienced as *safe* because of their unpredictability: A safety net with unseen holes provides no real safety.

The right side of Fig. 1 displays the sequence of events that occurs if sufficient safety signals are *not* detected, or if signals of threat are observed instead. In this case, neural threat-vigilance remains tonically engaged, and individuals must continue devoting attention and energy to monitoring their own and others' behavior to avoid danger (for example, "doublechecking" one's appearance and behavior in public, scrutinizing other people's words, demeanor, and facial expressions for

signs of acceptance or rejection, and repeatedly rehearsing and replaying previous and future social interactions to find reliable proof of one's acceptability). This hypervigilance leaves fewer attentional and energetic resources available for goal-directed, social, and restorative activity (Barnhart et al., 2019; Martin et al., 2022; Rivera-Rodriguez et al., 2021). Exposure to insufficient safety also fosters depressive symptoms, anxiety, agitation, fatigue, fear, and loneliness, via neuroimmune pathways aimed at self-protection (consistent with the Social Signal Transduction Theory of depression, Slavich and Irwin, 2014). Behavioral adaptations to insufficient safety include restricting one's activity to avoid harm, isolating one's self from potential dangers, defensive aggression, and engagement in self-soothing (via food, substances, media use, self-harm, exercise, etc., as in Bobadilla & Taylor, 2007; Marquez et al., 2021; Reife et al., 2020).

We are not the first to observe that SGD individuals show high levels of perseverative cognition, self- and other-monitoring, and rejection sensitivity (Feinstein, 2020; Hatzenbuehler, 2009; Pachankis et al., 2008; Pachankis et al., 2020). Yet whereas prior research has posited these phenomena as outcomes, mediators, or moderators of minority stress, we view them as *primary* effects of stigma, which develop as soon as stigmatized individuals become aware that they can no longer count on the protection of others. Karademas and colleagues (Karademas et al., 2013) coined the term "primal threat" to describe experiences in which individuals perceive their basic self-preservation to be jeopardized, drawing from Maslow's classic hierarchy of human needs (Maslow, 1943). Karademas and colleagues argued that whenever individuals perceive a primal threat, such as life-threatening illness or expulsion from the social group, their brains and bodies will do whatever is necessary for self-protection (2013). Their self-report measure of primal threat (which was designed for populations experiencing chronic illness) captures many of the everyday experiences of SGD individuals: feeling that your life and safety is threatened; feeling that you might lose basic sustenance; feeling that your relationships with others are threatened; feeling that your status in society is endangered; feeling that your plans and goals are threatened. Chan et al. (Chan and Fung, 2021) modified this measure for use with sexually-diverse populations, and found that perceptions of primal threat related to sexual orientation mediated the association between respondents' expectations of discrimination and their health (specifically, their sleep disturbance and their mental and physical health problems).

These findings support our view that stigma is not simply a source of stress, but a *primal threat* which triggers a series of self-protective processes (chronic threat vigilance, perseverative cognition, etc.) that harm long-term health, even when total exposure to minority stressors is low. The reason that chronic threat-vigilance has been preserved in our species as an adaptation to primal threat, despite its negative long-term health effects, is that it worked well-enough in ancestral environments to help individuals avoid immediate danger. But like many adaptations, it entails a tradeoff between short term benefits and long-term costs: Concealment, isolation, and chronic wariness may help individuals to avoid direct exposure to discrimination or harassment, but when sustained over time these processes exact a psychological and biological toll. Research on the effects of sexual identity concealment (colloquially called "closeting") provides a relevant example. Concealment is a paradigmatic example of safety-motivated threat vigilance, since it requires continuous self- and other-monitoring, aimed at preserving one's social acceptability and inclusion. Pachankis and colleagues (Pachankis et al., 2020) reviewed studies testing associations between concealment and mental health, and found a mixed pattern of findings. Overall, closeted individuals had lower mental health, but the effect was small and heterogeneous, and some studies paradoxically found *better* mental health outcomes among closeted individuals (for example, Ayala and Coleman, 2000). We think that this pattern reflects the tradeoffs involved in concealment: It may succeed in providing some degree of short-term safety, but over time the chronic vigilance required to maintain it provokes anxiety and depressive symptoms (Pachankis et al.,

2020). Hence, we think that behaviors such as concealment are better understood as *safety-maintenance strategies* than consequences of minority stress. Because the human brain evolved to prioritize immediate safety over other needs, stigmatized individuals may frequently engage in behaviors that temporarily exacerbate distress (such as concealment or isolation) in order to maintain a basic threshold of safety.

The long term effects of insufficient social safety are displayed at the bottom of the Fig. 1: The "safe" trajectory gives rise to a coordinated and flexible interplay of emotions, behaviors, neurological patterns, and immunological processes (reviewed in the next section) that fosters both short-term adaptations to environmental challenges and long-term physical and mental health. In contrast, the "unsafe" trajectory shifts the functioning of these coordinated domains in a manner that secures short-term survival at the expense of long-term mental and physical health risks (because of the emotional, attentional, behavioral, neurological, and biological tradeoffs associated with chronic hypervigilance). Notably, there is more empirical evidence (as cited earlier) regarding the neural, attentional, emotional, behavioral, and immunological processes associated with *threat* than with *safety*. In some cases we can extrapolate the findings of research on threat to speculate about the effects elicited by safety, but we do not view safety and threat as opposite ends of a single continuum. Rather, we view them as *two distinct continua* which require different assessment approaches and which may have different thresholds of conscious awareness. It is likely that ancestral humans regularly encountered different combinations of social threat and social safety in different environments (for example, low threat/high safety versus low threat/low safety), and these combinations may foster distinct biobehavioral adaptations (similar to the distinct profiles of stress responsivity thought to be calibrated by children's exposure to different rearing environments, Del Giudice et al., 2011). For example, threats encountered within socially safe settings might provide the foundation for stress-related growth and resilience (Park et al., 1996), and a minimal threshold of social safety might be a precondition for experiencing the stress-buffering benefits of social support.

Although threat and safety are different dimensions, experiences of threat can change individuals' expectations of future safety, "dialing up" the amount of safety that they require to inhibit future threat vigilance. Hence, an important insight deriving from social safety theory is that the effects of minority stressors are two-fold: Minority stressors provoke immediate stress reactivity while also signaling to the nervous system that *future* threats are likely. As elegantly outlined by Ellis and colleagues in the context of early life adversity (Ellis et al., 2022), extensive research on brain plasticity demonstrates that the human brain evolved to encode, learn from, and adapt to recurring and survival-relevant environmental conditions (Tooby and Cosmides, 1990). These encoding and learning mechanisms are enhanced for environmental experiences that directly influenced survival during our ancestral history, such as social rejection. In other words, the human brain evolved to *privilege* certain environmental inputs over others (Ellis et all, 2022), based on the types of survival challenges that ancestral humans were most likely to experience. Because social exclusion is one of the oldest and most consequential threats to human survival, environmental cues of social disapproval and rejection are treated by the evolved human brain as high-priority events calling for immediate adaptation (i.e., up-regulated threat-vigilance).

Hence, whereas the "cumulative stress" approach to minority stress suggests that individual stress events contribute incrementally and linearly to disease risk, a social safety perspective implies that a single event – if it is sufficient to "lift the brake" on neural vigilance and amplify future expectations of threat – may have dramatic and nonlinear effects. For example, finding out about a single instance in which bystanders stood by and failed to help an SGD individual undergoing physical attack (Byers, 2013) may create a sudden and profound sense of social vulnerability, akin to a "gestalt shift," even if one has never personally experienced victimization (similar processes are likely to

occur among racially- and ethnically-marginalized individuals who encounter repeated documentation of racist violence directed to others). A single stigma-related event – even if it happens to someone else – may rob marginalized individuals of their social safety, in the same way that a few drops of vinegar can ruin a glass of milk.

In recent years, scholars have increasingly used *dynamical systems* models to represent and measure such nonlinear processes (Butner et al., 2021), and such models may be similarly useful for research on social safety. Dynamical systems models are designed to capture and model instances in which single events trigger transformations in thought and behavior (such as rapid accelerations in suicidal ideation, as in Butner et al., 2021). Such an approach may help to clarify why single stigma-related events (such as encountering a health-care intake form that has only two options for gender) can provoke rapid and taxing shifts in cognition, affect, and behavior, whose effects may compound over time. Marginalized individuals are often dismissed as "oversensitive" when they notice and react to subtle cues of social exclusion (Sue et al., 2007), but there is no such thing as "rejection oversensitivity" from the perspective of the human nervous system, given that social exclusion was one of the most potent survival threats faced by ancestral humans. Our brains evolved to treat subtle cues of social disapproval, disgust, rejection, or judgment as emergencies demanding immediate attention, and the growing evidence for the catastrophic consequences of adolescent online bullying provides a powerful example (Dorol–Beauroy-Eustache and Mishara, 2021).

4.1.1. Variability in safety schemas

One of the most important elements of our model involves the sequence of events which transpires in cases of uncertainty, when the answer to "Is it safe?" is "*I don't know.*" In these circumstances, individuals' prior histories guide their responses. Slavich (2020) argued that individuals develop *social safety schemas* based on their previous experiences of threat and safety. Safety schemas are mental models of the general likelihood of encountering safety vs. danger, based on prior experiences and observations of one's environment (Slavich, 2020). Safety schemas are therefore similar (in their origin, content, and impact) to both attachment schemas (Bowlby, 1982) and "early maladaptive" schemas (Young, 1999), as we will revisit below, and also share similarities with Life History Strategies, which are thought to be coordinated developmental trajectories calibrated by early exposure to threat and nurturance (Ellis et al., 2022). We have represented these safety schemas with the dotted lines in Fig. 1 labeled "Anticipate danger" versus "Anticipate safety," which represent the moderating effects of prior threat exposure. Individuals who have been primed to expect threat, based on prior experiences of adversity or current awareness of their stigmatized status, will respond to environmental uncertainty by *anticipating danger*, shifting them toward the "unsafe" side of Fig. 1. Individuals without stigma or prior adversity, or who have social privileges that protect them from social harm (such as wealth or social status), can afford to *anticipate safety* within uncertain environments, shifting them toward the "safe" side of Fig. 1. Of course, this model is oversimplified – as with attachment schemas, safety schemas are likely to be dimensional rather than categorical, and individuals may develop multiple safety schemas over the course of development that are tailored to different settings (work versus home) and different types of input (auditory, tactile, visual). We simply mean to underscore that when environmental cues are ambiguous, individuals' previous histories of threat and their current awareness of stigma guide their responses.

One insight arising from this perspective is that a primary manifestation of social privilege (whether that privilege is conferred by skin color, income, physical ability, gender, marital status, etc.) is *being able to anticipate safety in uncertain environments*. Individuals who have moved through life with social privilege possess neural/emotional/ behavioral systems that have adapted to safe environmental contexts by unconsciously anticipating inclusion, belongingness, and protection unless confronted with evidence to the contrary. Social privilege allows

individuals to move through a range of different ambiguous environments (grocery stores, workplaces, schools, bus stops, government offices) without devoting any conscious or unconscious attention to the question, "*Is it safe for me here*?" In contrast, individuals without social privilege must re-ask this question (explicitly or implicitly) in every new or ambiguous environment. Marginalized, stigmatized, and adversity-exposed individuals possess nervous systems that have adapted to unsafe environments by continuously preparing for danger, disconnection, and exclusion. As noted earlier, when individuals are primed for danger, explicit *confirmation* of social danger may have a disproportionately negative impact (Downey et al., 1998), and may strengthen and reinforce the original negative expectation (as outlined in the context of rejection sensitivity by Feinstein, 2020). The common phrase "I *knew* this would happen" captures the distinctly aversive impact of a long-dreaded event.

Of course, just as there are intersectional forms of stigma, there are intersectional forms of privilege and inclusion. Some individuals may learn to expect safety within novel or ambiguous environments based on their skin color, but *not* based on their socioeconomic status, gender/sexual identity, or physical ability. Understanding the intersectional phenomenology of social safety, and how different configurations of social status, stigma, identity, and privilege shape experience of safety and threat in different settings, is a critical direction for future study. For individuals with multiple marginalized identities, the availability of safety may fluctuate abruptly and unpredictably depending on which identity is most visible or salient. Additionally, individuals may have different "safety thresholds" for different aspects of their identity, and may prioritize some forms of safety over others. For an SGD individual who is also an undocumented immigrant, avoiding deportation might be a higher "safety priority" than developing nurturant social ties. Yet the brain and body react to *all* social threats, and we need a better understanding of the full range of safety tradeoffs made by individuals experiencing intersectional marginalization.

In calling attention to the fact that all stigmas limit social safety, we do not mean to downplay differences between the phenomenology (and health effects) of different axes of marginalization, such as socioeconomic status, ethnicity, sexuality, etc. As outlined by Pachankis et al., 2018, each form of stigma has its own constellation of features (such as concealability, controllability, perceived origin, social disruptiveness, etc.) which must be taken into account when tracking its effects on health and well-being. We simply argue for greater attention to insufficient safety as one of the most health-relevant aspects of *all* forms of stigma and social marginalization, and one of the most important human needs that is jeopardized when different stigmas intersect to block access to social protection. Every distinct identity or social positionality that an individual possesses (as a function of their race, ethnicity, sexuality, gender, physical ability, social status, etc.) provides additional opportunities to *gain* social protection from similar others, but also additional opportunities to *lose* it.

4.2. Immunological effects of social safety

Perhaps the most important downstream effect of insufficient social safety involves the immune system. The evolved purpose of the immune system is to *keep the body safe from harm* (Slavich & Irwin, 2014), and it accomplishes this by responding to injury, infection, and invasion with inflammation. Inflammation is the immune system's response to, and is mediated by the release of "communication" molecules called pro-inflammatory cytokines, such as interleukin-1β (IL-1β), IL-6 and tumor necrosis factor-alpha, or TNF-α. Predominantly secreted by activated monocytes/macrophages, proinflammatory cytokines attract leukocytes (i.e., immune cells) to injury or infection to identify and clear pathogens and promote wound healing. An acute inflammatory response to infection or injury is adaptive, because it promotes healing. Yet chronic, low-grade systemic inflammation that is sustained over time can increase individuals' long-term susceptibility to infections and

tumors, reduce the effectiveness of vaccines, and directly damage tissues and organs throughout the body via oxidative stress (reviewed in Furman et al., 2019). These processes have been shown to make unique contributions to a broad range of disease processes and health outcomes, including fatigue, frailty, disability, type 2 diabetes, cardiovascular disease, Alzheimer's disease, asthma, osteoporosis, rheumatoid arthritis, periodontal disease, some forms of cancer, and all-cause mortality (Couzin-Frankel, 2010; Furman et al., 2019). The 2017 Global Burden of Disease survey found that inflammation-related diseases account for over 50% of deaths worldwide (GBD 2017, 2018).

Systemic inflammation is influenced by multiple biological and environmental factors, but one of its most notable triggers is *social threat* – i.e., experiences of rejection, isolation, denigration, exclusion, ostracization, and shame (reviewed in Chiang et al., 2012; Denson et al., 2009; Dickerson et al., 2004; Kemeny, 2009; Kiecolt-Glaser et al., 2010; Segerstrom and Miller, 2004; Slavich and Irwin, 2014; Slavich et al., 2010). Physical/sexual violence are also preeminent social threats (Castle et al., 2021; Finegood and Miller, 2021; Ghosh et al., 2018). Of course, social threats are precisely those which are disproportionately experienced by stigmatized individuals (in the form of minority stressors). Stigmatization often provokes feelings of shame, fear, threat, and shame, and studies have found that experimentally eliciting these emotional states (in the context of social evaluation and judgment) provokes increased inflammation (Carroll et al., 2011; Dickerson et al., 2009; Moons et al., 2010). Additionally, observational studies have found that individuals show elevations in inflammation after experiencing social rejection, the loss of close social ties, or negative/conflictual interactions with social partners (Chiang et al., 2012; Marin et al., 2009; Murphy et al., 2013; Schultze-Florey et al., 2012). For example, Chiang and colleagues (2012) found elevated proinflammatory cytokines in young adults who had experienced more negative and competitive social interactions in the 8 days prior to their laboratory assessment (assessed with daily diaries).

The ability of social threats to provoke an immune response in humans has been attributed to our evolved legacy as a fundamentally social species, and the potent survival threats posed by social rejection over the course of human history. In the human ancestral environment, social rejection and denigration was often followed by direct physical attack by hostile group members, and hence inflammatory responses to social threat served to prepare the body for impending tissue and organ damage, along with post-injury infection (Slavich, 2020). In essence, systemic inflammation represents an immunological *adaptation* to chronic unsafety, which is why inflammatory processes respond to cues of social threat before there is any actual physical danger. As Slavich (2020) noted, the immune system cannot directly sense imminent physical injury, so it relies on "the social brain" (Dunbar and Shultz, 2007) to sound the alarm about potential social rejection, via an interconnected neural network that helps us detect and interpret multimodal social signals and make inferences about others' feelings and intentions toward us (Kennedy and Adolphs, 2012). The extensive connections between the brain and the immune system ensure that inflammatory processes receive continuous "updates" on the relative balance of social threat and safety in one's immediate environment via autonomic nervous system activity, HPA activity, and even lymphatic vessels (Slavich, 2020). Importantly, symbolic threats have the same biological effects as actual threats (Slavich and Irwin, 2014), which indicates that "microaggressions" (such as having a colleague roll their eyes when you introduce your pronouns) are not so "micro" after all – from the perspective of the brain and the immune system, such events sound the alarm that *it is not safe here,* and threat vigilance re-engages. From the perspective of the social brain, social threats *are* physical treats.

It is because systemic inflammation is upregulated by both exposure to social threat and expectations of future threats that it poses such a potent threat to stigmatized populations (who experience both minority stressors and chronic expectations of future stressors). Stigmatized populations may also show enhanced risks for systemic inflammation

because of feedback processes that may exacerbate inflammatory reactivity to successive social threats. One study experimentally elicited inflammation by administering endotoxins, and found that increases in inflammation enhanced *subsequent* neurobiological reactivity to social threats (Inagaki et al., 2012). Compared to participants receiving placebo, those who received the endotoxin (and showed subsequent increases in pro-inflammatory cytokines) showed elevated amygdala reactivity (assessed via fMRI) to images of fear-inducing faces, but *not* to images of guns, happy faces, or household objects. Endotoxin-induced increases in inflammation also enhance feelings of social disconnection, depression, and sensitivity to negative social feedback (Eisenberger et al., 2010; Muscatell et al., 2016). These findings suggest that inflammatory processes triggered by social threat might magnify over time, given that inflammatory reactivity is provoked by social threat *and also* amplifies future reactivity to social threat. Such cascading processes play a critical role in Slavich and colleagues' model of the neurological and immunological pathways linking chronic social rejection to depression (Slavich et al., 2010). They highlighted the importance of rejection-related changes in endocrine functioning, sympathetic innervation of immune organs, and cellular aging in up-regulating inflammatory activity to exacerbate vulnerability to depression via "depressotypic" or "sickness" behaviors such as social withdrawal, anhedonia, and fatigue.

Evidence for the inflammatory consequences of chronic social threat has been observed for ethnically-marginalized populations as well as SGD populations (reviewed in Cuevas et al., 2020; Diamond et al., 2021). For example, one community sample of over 200 sexually-diverse men in Chicago found disproportionately high levels of CRP, and half of their participants had CRP levels high enough (over 3 mg/L) to suggest a three-fold increased risk of cardiovascular disease (Morgan et al., 2019). In a representative sample of over 2000 adults, self-identified gay, lesbian, and bisexual participants had significantly higher CRP and IL-6 than self-identified heterosexuals, and self-reported daily and lifetime discrimination partially mediated this effect (Wardecker et al., 2020). Yet some studies have failed to find elevated inflammation in sexually-diverse individuals when analyzed as a single, monolithic group (Mays et al., 2018), and other studies have found links between stigma and inflammation only among certain subsets of sexually-diverse individuals (Hatzenbuehler et al., 2013; Wood and Cook, 2019).

Inflammation is also known to directly contribute to the specific health conditions that disproportionately affect SGD populations, such as cardiovascular disease (Dregan et al., 2014; Ridker et al., 2000), asthma (Ayakannu et al., 2019; Bantulà et al., 2021), arthritis (Harth & Nielson, 2019; Süß et al., 2020), and functional physical limitations (Piazza et al., 2018; Runhaar et al., 2019). For example, biomarkers such as C-reactive protein (CRP), a protein that is synthesized *in response* to the release of pro-inflammatory cytokines, can predict cardiovascular risk even among healthy, asymptomatic adults (Pearson et al., 2004; Ridker, 2009). Concerning mental health, it is notable that systemic inflammation has been implicated in both depression (Dantzer et al., 2008; Ernst et al., 2021; Hashmi et al., 2013; Kiecolt-Glaser et al., 2015; Slavich and Irwin, 2014), and suicidal ideation and behavior (Batty et al., 2016; Bergmans et al., 2019; Mościcki and Umhau, 2019). Cohort studies have found that inflammatory markers predict the subsequent development of major depressive disorder (Haapakoski et al., 2015), and one prospective study of nearly 40,000 individuals found that serum levels of CRP, assessed multiple times between 1998 and 2007, predicted death by suicide over a 12 year period (assessed by matching study participants to cause-of-death registries), even after adjusting for histories of mental distress and mental illness (Batty et al., 2016). Specifically, individuals with the highest levels of CRP showed a four-fold increase in the risk of death by suicide, relative to those with the lowest levels of CRP. Prospective research has also found that among individuals with major depressive disorder, baseline inflammatory markers (in this case, tumor necrosis factor alpha) predict increases in the intensity of suicidal thoughts, independently of increases in

depressive symptoms (Choi et al., 2021). The question of whether inflammation is a cause or a consequence (or both) of psychiatric conditions remains a topic of active investigation, with some scholars positing causal contributions of inflammation based on its toxicity to the central nervous system once it crosses the blood-brain barrier (Lucas et al., 2006; Shalev et al., 2009; Webb et al., 2014).

Inflammation is also likely to be particularly important for SGD health because it is exacerbated by chronic substance use (Duivis et al., 2015; Gonçalves et al., 2011; Stokes et al., 2021). Population studies consistently show that SGD individuals have elevated rates of substance use and misuse (Eisenberg et al., 2017; Morgan et al., 2020; Newcomb et al., 2020), beginning in adolescence (Corliss et al., 2014; Day et al., 2017). For example, a recent analysis of over 630,000 California students in the 7th, 9th, and 11th grades (Fish et al., 2021) found that youths who self-identified as lesbian, gay, or bisexual had three times the prevalence of conventional cigarette use, and around twice the prevalence of e-cigarette use, alcohol use, episodic binge drinking, and cannabis use. Similarly, youths who self-identified as transgender had 3 times the rate of cigarette use (compared to cisgender heterosexual youths), and more than double the rates of e-cigarette use, alcohol use, episodic binge drinking, and cannabis use (Fish et al., 2021). Notably, analyses stratified by age found that these disparities were evident beginning at age 12 and persisted over time. Given that substance use is often used to cope with stress and negative affect (Rogers et al., 2020; Rogers et al., 2020; Turner et al., 2018; Wills, 1990), it is perhaps not surprising that this may be a common coping strategy for SGD individuals, especially during adolescence (Boyle et al., 2020; Felner et al., 2020). Over time, heightened substance use may exacerbate SGD individuals' risks for inflammation-related health conditions (as in Hiles et al., 2015). Similarly, stigma-related sleep disruptions may also contribute to SGD youths' and adults' risks for inflammation-related health problems. A growing number of studies suggest insufficient sleep duration and low sleep quality among SGD individuals, and these effects are partially mediated by exposure to stigma-related stressors (reviewed in Butler et al., 2020). Given evidence linking stress-vigilance to sleep disruption (Ricketts et al., 2018; Semler & Harvey, 2007), and linking sleep disruption to inflammation (reviewed in Irwin, 2019), stigma-related sleep problems might further amplify SGD individuals' susceptibility to inflammatory health problems over the course of adulthood.

The immune system is obviously not the only biological system implicated in the harmful health effects of discrimination (autonomic and neuroendocrine functioning also play key roles, as noted in Cuevas et al., 2020). Yet we emphasize immune functioning because it is a key endpoint of multiple stress-regulatory processes, because it plays a mechanistic role in the health conditions that disproportionately affect SGD populations (Diamond et al., 2021), and because it is fostered *both* by social threats *and* threat-vigilance. Much remains to be learned about the specific types of experiences (among SGD individuals) that are most strongly associated with systemic inflammation. For example, no published studies have examined whether levels of inflammation vary among gender-diverse individuals with different identities or different combinations of identities (for example, transgender, nonbinary, agender, genderqueer, two-spirit) and those who live full-time as their affirmed gender versus only part of the time. Additionally, we lack information on how the duration of exposure to sexual/gender stigma relates to inflammation. Given diversity in developmental trajectories of sexual and gender identity development, we need to investigate potential interactions between individuals' chronological age and the age at which they first identified (both privately and publicly) as gay, bisexual, nonbinary, transgender, etc. Also, given the range of social and behavioral factors linked to inflammation, we need more systematic assessments of interactions between sexual/gender stigma and other social factors related to inflammation, such as the presence of intersectional forms of marginalization (due to race/ethnicity, socioeconomic status, physical ability, etc.), exposure to childhood adversity, and health

Table 1
Examples of social threat and social safety.

	Objective Experiences	Subjective Experiences
Threat	Discriminatory laws or policies (laws restricting restroom access, denial of service to SGD individuals)	Fearing exclusion from, or mistreatment and violence in, public spaces
	Seeing or experiencing bullying at school or online	Fearing bullying at school or online
	Seeing or experiencing violence or harassment	Fearing violence or harassment
	Being openly rejected from family members	Fearing loss of connection with family members
	Loss of family financial support	Fearing loss of family financial support, and consequences
	Family members blocking access to affirmative medical care	Fearing lack of access to affirmative medical care
	Family members blocking access to SGD peers or community	Fearing loss of social support from SGD peers/community
	Being prevented from participating in faith community	Fearing the loss of connection with faith community
	Reading religious doctrine that prohibits SGD expression	Fearing for one's spiritual salvation
	Having people not use your name and pronouns correctly	Fearing that your identity will not be respected
	Hearing people make derogatory jokes/comments about SGD people	Fearing that you will be mistreated by those around you
	Losing custody of your children because of your identity	Fearing that you will lose contract with your children
	Not being able to adopt children because of your identity	Fearing that you will not be able to have children
	Being legally penalized because your ID lists the wrong gender	Fearing that you will be legally penalized due to your ID
	Undergoing reparative or conversion therapy	Fearing being sent to reparative/conversion therapy
	Objective Experiences	Subjective Experiences
Safety	Laws that punish hate crimes against SGD people, that prohibit discrimination against SGD people, and that prohibit "conversion therapy for minors	Knowing that people are not allowed to mistreat you, and that there are people ready to defend you if it happens
	Being able to interact with other SGD individuals, in person or online	Knowing that one can be with other people who understand your experiences and can offer support and protection
	and have staff members dedicated to supporting SGD youth	Knowing that your teachers and peers want SGD youth, to feel safe, knowing that there are other kids like you, and knowing that support and protection is available
	Seeing people (friends, peers, the media) condemn mistreatment or discrimination against SGD individuals	Knowing that those around you think SGD people are worthwhile, and should not be harmed or hurt
	Seeing SGD individuals and relationships portrayed realistically in television, movies, video games, literature, and other media	Knowing that you are not alone, and seeing that you can have any kind of life you want
	Having family members offer affection and reassurance, ask questions about your friends and life, and offer support and protection	Knowing that family members care about you and your life, and want to include, support, and protect you
	Having family members and friends make a point of welcoming SGD friends and partners	Knowing that your whole self, including your loved ones, is fully embraced by your family and friends
	Having family members use the right pronouns and names to describe you, even if they struggle at first	Knowing that your family takes you seriously and that they are actively doing their best to support you
	Seeing friends and family members on social media make explicit statements of support for gender and sexual diversity	Knowing that you have people around you that will protect you, even without you needing to ask
	Having someone introduce their own pronouns	Knowing that this person makes no assumptions about gender identity, and that if you introduce your pronouns, they'll understand and respect it
	Seeing that when public figures undergo a gender transition, news outlets immediately start using their chosen name and pronouns	Knowing that it's possible for the public world to respect and honor one's gender identity without equivocation
	Having one's faith community make it clear that they welcome SGD individuals and do not agree with doctrine that denigrates them.	Knowing that one's whole and authentic self will be affirmed and welcomed in one's faith community
	Seeing pride flags or SGD-affirmative statements at businesses or in government offices	Knowing that one does not have to worry about being treated differently or hiding one's identity in these places
	Seeing pride flags or SGD-affirmative symbols on billboards or cars	Knowing that you are not alone and that many different people in your local community embrace and support you
	Encountering inclusive language on standard forms (i.e., being able to correctly describe your gender, your family, etc.)	Knowing that the people in this office understand and respect diversity, and want to represent you accurately
	Seeing family members, friends, or colleagues speak up right away If someone makes hurtful comments about you or about other SGD individuals	Knowing that people around you are willing to step forward to protect you, and that you don't have to defend yourself all on your own
	Having people make room for you at a table, on a bus, in a car, etc.	Knowing that people are comfortable being physically near you.
	Having people ask you thoughtful questions about your life, interests, beliefs, and relationships.	Knowing that people are interested in your whole self.
	Having people check in with you before making assumptions about what might make you comfortable in social situations.	Knowing that people care about your comfort and safety, and respect your autonomy and judgment.
	Having access to gender-affirmative medical care.	Knowing that you have experts to turn to who will treat you with respect and dignity as they care for youe health.
	Receiving positive comments, likes, and shares when you reveal meaningful information about yourself on social media	Knowing that people – even those who don't know you personally – like and appreciate something about you.
	Having people come out to you as SGD	Knowing that you are not alone

behaviors related to inflammation, such as substance use, physical activity, and sleep.

5. Social safety in the lives of SGD individuals

To clarify the forms and expressions of social safety that may prove most relevant for SGD individuals, and how they differ from conventional forms of minority stress, we provide examples of both dimensions in Table 1. Following Meyer's framework (2003), we differentiate between objective and subjective experiences (for example, concrete experiences of mistreatment versus fears/expectations of potential mistreatment; concrete safety signals versus feelings of reassurance and inclusion). The term "subjective" simply denotes experiences that are manifested intrapsychically (as opposed to externally), and is not intended to convey that subjective experiences are less valid or reliable than objective ones. The "threat" section of the table was adapted directly from existing minority stress measures: It includes common manifestations of stigma such as discrimination and violence, along with subjective fears of discrimination, violence, and social rejection. The "safety" section of the table is altogether different. It makes no mention of any of the events typically considered "stressors" within the conventional minority stress model. Rather, it focuses on events that communicate safety, connectedness, inclusion, and protection to SGD individuals (such as seeing friends or family members make affirmative comments about SGD people), and also the subjective correlates of these experiences (reassurance that family members and friends will defend and support you without hesitation). Knowing whether an individual experiences low levels of threat does not tell us whether they also experience high levels of safety. For example, a transgender individual might work at a job where no one has ever made derogatory comments about them, but this does not provide any assurance that one's coworkers are unambiguously safe, supportive, and welcoming (and without the latter, chronic threat-vigilance will remain engaged). Safety signals operate by *removing uncertainty* about the local environment. Given that society systematically stigmatizes and marginalizes sexual and gender diversity, the most adaptive response to uncertainty is to prepare for danger, both consciously and unconsciously. The only way to interrupt this preparatory vigilance is through explicit indicators of social inclusion and protection.

The examples of threat and safety signals listed in Table 1 cut across multiple domains (family, peers, school, community), and we now address the specific relevance of social safety for some of these domains.

5.1. Social safety in the family

For sexually-diverse and gender-diverse individuals, the most fundamental and influential safety deficit may be *at home*. Extensive evidence indicates that SGD individuals frequently experience overt expressions of hostility, rejection, disbelief, disapproval, or intolerance from parents, along with a range of subtle behaviors that communicate a lack of safety, such as restricting their access to peers, transportation, medical care, or the internet, refusing to use their name and pronouns correctly, sending them to conversion therapists to "cure/change" their sexual/gender identity, refusing to pay for schooling, refusing to talk about sexual/gender identity, or blocking access to affirmative medical care (Heatherington and Lavner, 2008; Puckett et al., 2015; Ryan et al., 2009). Some studies indicate more frequent experiences of family rejection among SGD individuals who are also Black or Latine/x (Koken et al., 2009; Richter et al., 2017; Ryan et al., 2009), and those from highly religious communities (Dehlin et al., 2014; Ginicola et al., 2016; Hatzenbuehler et al., 2012). Family rejection has been implicated in a broad range of outcomes including suicidality, depression, sexual risk behavior, and substance use (Robinson, 2018; Ryan et al., 2009; Van-Bergen and Love, 2021), and a broad range of invalidating parental behaviors have been linked to negative outcomes ranging from depression to school misconduct to academic problems to substance use

(reviewed in Willoughby et al., 2008).

A social safety perspective is particularly valuable for understanding SGD youths' family experiences because of the complex and sometimes contradictory nature of parents' behavior toward SGD children. Parents often provide emblematic examples of social ambivalence, defined by Uchino and Holt-Lunstad (Holt-Lunstad and Uchino, 2019; Uchino et al., 2004) as the combination of high levels of positive characteristics combined with high levels of negative characteristics. In the context of sexual/gender stigma, studies have found that many parents engage in rejecting behaviors toward SGD children (such as asking children to hide their sexual/gender identity from extended family members) directly alongside expressions of love and warmth in other aspects of life (Roe, 2017). For this reason, studies have begun assessing parents' accepting and rejecting behaviors independently to capture these complexities (Kibrik et al., 2019). A social safety perspective calls our attention to the fact that a parent who expresses love toward their child in all areas *except* their child's sexual/gender identity is not a *safe* parent for that child. All forms of parental rejection are harmful to children, whether they are explicit (expelling their child from the family home) or implicit (such as showing disinterest and silence on the entire topic of sexual or gender identity, Rosario et al., 2009). Parents who communicate disconnection, disgust, or disinterest toward SGD children create a home climate in which the child does not feel reliably included and protected, and in which they can never fully disengage neural vigilance.

For an SGD child, a parent's disinterest and/or silence about their sexual/gender identity creates uncertainty, which translates directly into wariness, vigilance, and perseverative cognition (Brosschot et al., 2016; Carleton, 2016). When parents fail to provide explicit validation, reassurance of family inclusion, and recognition of their child's experiences, the child may experience *all* family interactions as uncertain and unsafe (What kind of mood are they in today? Is anyone going to talk about what happened to me at school last week? Are they looking at me? Am I allowed to talk about my friends?) and may believe that their parents' protection can no longer be assured (Kibrik et al., 2019). For this reason, intervention efforts advise parents to express their own worries, judgments, and fears *away from* their SGD child (ideally in an environment that allows them to process, understand, and work through their negative reactions), and to focus on making active, clear, verbal, and nonverbal demonstrations of inclusion, belonging, protection, and affection for their SGD child, even if they are still working through their questions and doubts (i.e., "do good before you feel good," Huebner et al., 2013, p. 362). Such recommendations exemplify a "*safety first*" approach to family intervention: Only after the child feels completely safe (i.e., fully included and protected by the family) can the family successfully navigate discussions and decisions about school, church, romantic relationships, health care, and the future. Such discussions are likely to be unproductive and stressful if the child remains in a state of chronic threat vigilance, and the child may be unable to suspend threat-vigilance if their parents' demonstrations of affection and support are inauthentic and untrustworthy.

Notably, studies suggest that the Covid-19 pandemic has exacerbated SGD youths' experiences of unsafety at home. The Trevor Project (2020) conducted a national survey in July of 2020 of over 1400 youth aged 13–24, half of whom were SGD. They found that approximately half of SGD youth reported that the pandemic had limited their ability to express their sexual/gender identity, and over one third said they were unable to be themselves at home. SGD youths were significantly more likely than cisgender/hetersosexual youths to report that they were currently experiencing significant anxiety, depression, and loneliness, but were three times more likely than cisgender/heterosexual youth to report that they were unable to receive the mental health care they wanted and needed. Gender-diverse youths appeared most vulnerable to the added burdens of the pandemic: They were the group most likely to *lose* access to medical care due to the pandemic, and were 3 times more likely than cisgender/heterosexual youth to say that they felt unsafe at home. This may help to explain why one-third of SGD youths

distrusted the information their family told them about Covid-19 (compared to approximately one-fifth of cisgender/heterosexual youth). Scholars have argued that because the pandemic exacerbated all of the challenges routinely faced by SGD youths, while limiting their access to care, we are likely to observe dramatic increases in the mental health problems of these youths (and other marginalized youths) over the next 5–10 years (Ehrensaft, 2021; Shen, 2021). The sudden withdrawal of social safety that many SGD youths experienced in 2020–2021 may manifest, in 2030, as chronic threat vigilance, anxiety, perseverative cognition, depressive symptoms, substance use, and systemic inflammation, even if the 2020 quarantine temporarily reduced their exposure to minority stress outside the home.

Parents can take active and immediate steps to foster their SGD child's social safety even if they do not presently understand their child's sexual/gender identity, by modifying their behavior (and the broader home environment) to remove uncertainty and replace it with explicit reassurance. Taking care to treat SGD children similarly to their siblings may play an important role: Rosario and colleagues (Rosario, Reisner, Corliss, Wypij, Frazier, et al., 2014) found that sexually-diverse youths reported lower feelings of emotional attachment to their mothers than did their heterosexual siblings, and *mothers* of sexually-diverse youth reported less affection for these youth, compared to their heterosexual siblings. These differences in mother-child warmth partially accounted for sexually-diverse youths' disproportionate rates of substance use and depression (Rosario, Reisner, Corliss, Wypij, Calzo, et al., 2014; Rosario, Reisner, Corliss, Wypij, Frazier, et al., 2014), suggesting the wide-ranging impact of feeling less loved and protected than one's siblings.

High levels of social safety in the family may be health-protective. Brody and colleagues (2013) found that African American youths in the rural South exposed to high levels of neighborhood poverty and life stress showed divergent developmental profiles in biological risk indicators (specifically, resting systolic and diastolic blood pressure, overnight secretion of cortisol, epinephrine, and norepinephrine, and BMI). Specifically, some youths with high cumulative levels of economic adversity (measured at ages 11 and 13) developed high levels of behavioral and biological risk factors, whereas others did not. Nurturant family support accounted for the difference, consistent with other research that has shown that family nurturance can buffer the effects of childhood adversity on multiple stress-related biological systems, including the expression of proinflammatory genes as well as metabolic and cardiovascular risk profiles (Carroll et al., 2013; Chen et al., 2011; Miller, Lachman, et al., 2011). Notably, when gender-diverse youths report high family connectedness and feelings of safety at home, they no longer show the elevated levels of depression and suicidality that are typically observed in gender-diverse youth (Gower et al., 2018). One population study of over 81,000 5th through 11th graders in Minnesota found that gender-diverse students who reported feeling that they could talk to their parents freely about their problems, and who strongly believed their parents cared about them, had significantly lower rates of non-suicidal self-injury, even after adjusting for rates of depression, bullying, and for feelings of connectedness with peers and other adults (Taliaferro et al., 2018). Such findings concur with numerous systematic reviews demonstrating that in addition to community-level support, consistently nurturant family relationships are health-protective for sexually-diverse youth (Johns et al., 2018).

An emphasis on safety might also provide a more effective intervention approach for parents who subscribe to religious beliefs that condemn sexual or gender diversity. Numerous studies have found that SGD individuals raised in socially conservative religious traditions often struggle with self-acceptance because of the negative messages about SGD individuals conveyed in religious doctrine (reviewed in Gibbs & Goldbach, 2015). Urging religious parents to *accept* their child's sexual or gender identity may prove ineffective if parents view acceptance as contradicting their core spiritual beliefs and potentially imperiling their own (and their child's) salvation. This may help to explain why many

religious individuals view affirmative therapeutic approaches to sexual/gender diversity (i.e., approaches which view such diversity as normal rather than pathological) as dismissive of religious faith (reviewed in APA Task Force on Appropriate Therapeutic Responses to Sexual Orientation, 2009). Intervention approaches that focus on social safety may prove more effective for such families. Even parents with strict religious objections to sexual and gender diversity would probably agree that their first responsibility, as parents, is the safety of their children. As noted earlier, parents can adopt concrete behavioral and verbal strategies for fostering their child's safety even if their core beliefs about sexual and gender identity do not change. That said, children are often closely attuned to their parents' beliefs and intentions, and safety signals that are not accompanied by authentic validation may fail to provide true safety. The safest environment for SGD children is one in which parents' affection and support is coupled with sincere validation and affirmation.

5.2. Social safety at school

A social safety perspective has extensive support from research investigating the specific conditions which foster SGD health, and much of this evidence comes from research on "safe schools" (for example Russell et al., 2016). School advocates have sought to create safe school environments through numerous strategies, such as the establishment of GSAs (Gay-Straight Alliances, increasingly referred to as Gender and Sexualities Alliances, Day et al., 2019) anti-harassment and anti-bullying policies, teacher and staff professional development regarding gender and sexual identity, sex education curricula that are inclusive of sexual and gender diversity, policies that encourage teachers and staff to intervene and interrupt bullying and harassment, the availability of school counselors to address the specific needs of SGD students, and the creation of "Safe Zones" where students can be assured of affirmation and protection by trained and knowledgeable staff and faculty. In schools with these policies, sexually-diverse youth show better outcomes across a wide range of measures, including lower truancy, lower bullying, higher grades, higher school belongingness, and lower substance use (De Pedro et al., 2018; Proulx et al., 2019; Singh and Kosciw, 2017). Similar results have been found for studies of school safety and gender-diverse youth (De Pedro et al., 2018; Pistella et al., 2020).

Studies suggest that school safety policies are most effective when students report *knowing* (rather than hoping or suspecting) that they belong at school, *knowing* where to find trustworthy teachers, peers, and staff to protect and affirm them; *knowing* they can walk down school corridors without a sense of wariness or hypervigilance; *knowing* that they are valued and included by their schoolmates (Katz et al., 2016). One student described his school's Gay-Straight Alliance as a branch on the side of a rushing river—holding on to it kept him from feeling swept away (Lee, 2002, p. 17). Another student in the same study said that the Gay-Straight alliance boosted his comfort and confidence during routine social interactions with other students (p. 18), whereas another noted that he had stopped ruminating about what other students thought of him, since he knew that his friends in the GSA "like me for who I am" (p. 19). Providing youth with socially safe school environments as early as possible – before they may be aware of their sexual or gender identity – may help to prevent future distress. One sexually-diverse teenager reported to the Huffington Post that one of the reasons he felt comfortable coming out to his schoolmates was that one of his teachers regularly wore rainbow socks every day to signal affirmation and acceptance for SGD youth. The teenager reported that this simple, powerful message of acceptance made him feel safer at school than at home (Lang, 2022).

Collectively, such findings underscore that the absence of victimization, on any particular day or during any particular month, is not enough to foster healthy development. Because the fear of potential victimization is enough to up-regulate chronic threat-vigilance, students must know they are safe in order to thrive. Lack of safety at school has

harmful economic as well as psychological impacts. For example, one study calculated that California school districts forfeit over $60 million a year due to sexual-orientation-based bullying. This is because the state of California allocates school funding according to student attendance, and student attendance *drops* when students worry about bullying (Baams et al., 2017). The authors pointed out that the number of California students who reported having skipped school because they felt unsafe was *double* the number of students who had experienced bullying personally. This finding shows that individuals do not need to experience social threats directly to feel unsafe. To increase students' safety, we need to reduce rates of school victimization while simultaneously amplifying students' access to safety at every possible level of school engagement (the bus, the lunch counter, the sports teams, the disciplinary system, etc.). The most successful school safety policies are multifaceted, and create a comprehensive safety net at each and every level of a student's experience (for example, the establishment of a GSA along with consistently affirmative school policies and comprehensive training for all staff, Ioverno et al., 2016; Russell et al., 2016). As described by Chesir-Teran and Hughes (2009), the interaction among multiple components of social safety may operate by altering a school's overall "environmental press" (Moos and Lemke, 1983). This notion is supported by research indicating that students in schools with inclusive SGD policies show mental health benefits even when they are not aware of these policies (Szalacha, 2003). Such findings suggest that these policies and procedures operate by changing the underlying fabric of a school's climate of safety, create an unambiguous and consistent atmosphere of safety that allows marginalized students to "turn off" their chronic threat vigilance.

Yet many schools are moving in the opposite direction: The 2022 Florida legislature passed a law prohibiting any classroom discussion of sexual or gender identity in Florida public school classrooms prior to the 3rd grade (colloquially known as the "Don't Say Gay" bill, Goldstein, 2022), and many states prohibit explicit discussion of sexual and gender diversity in the context of sex education (Santelli et al., 2017), despite the fact that the Society for Adolescent Medicine, the American Public Health Association, and the American Medical Association have called for specific and sensitive discussion of sexual and gender diversity in sexuality curricula (American Public Health Association, 2014; Council on Scientific Affairs, 1999; Santelli et al., 2006). Laws and policies preventing schools from providing accurate scientific information about sexual and gender diversity erode SGD youths' social safety by reinforcing the notion that there is something unacceptable, unnatural, and abnormal about them (Lang, 2022). Even for youths who have not yet started identifying as sexually- or gender-diverse during their school years, replacing negative stereotypes about SGD individuals – or total silence about their existence – with accurate and affirmative information may prove critical to providing SGD youths with the safety they need to engage, learn, and thrive at school. All stigmatized and marginalized children deserve to attend school in a place where they *know* they are fully included, recognized, and protected by those around them.

5.3. Social safety in the community

As noted earlier, stigmatized individuals lack many of the ubiquitous cues of social safety in the broader social world that non-stigmatized individuals typically take for granted, such as basic courtesy and helpfulness from strangers. For example, numerous studies have found that individuals are less likely to offer help to a "wrong number" caller if they perceive the caller to be gay/lesbian (Ellis and Fox, 2001; Gabriel and Banse, 2006; Gore et al., 1997). Other studies have found that shopkeepers and passersby are less likely to help an individual make change if the individual wears a t-shirt with a pro-gay slogans (Gray et al., 1991; Hendren and Blank, 2009). Other cues of social safety that are often unavailable to SGD individuals (and other marginalized and stigmatized groups) include respectful treatment at local businesses; having strangers make eye contact when you pass them on the street; having

one's children invited to playdates and sleepovers. Such cues may be so ubiquitous to most individuals that they go entirely unnoticed, yet they represent part of the unconscious safety net available to privileged or non-stigmatized individuals. McIntosh's groundbreaking essay on the "invisible knapsack" of privileges afforded to White individuals (McIntosh, 1998) provides a useful analog: Her analysis mentions many forms of invisible privilege directly related to social safety: Being able to identify and socialize with other people who resemble you; seeing your experiences represented in textbooks, television shows, and novels; being confident that your neighbors will be neutral or pleasant to you; speaking up about mistreatment without having to worry that people will disbelieve you or accuse you of being oversensitive; getting dressed in the morning without worrying that people will look for shortcomings in your appearance.

When such experiences are chronically absent, everyday activities such as changing clothes at the gym, talking to one's boss about your weekend, and posting photos on social media are accompanied by persistent, neural hypervigilance that may remain entirely outside of conscious awareness (and hence not reliably captured by measures assessing the frequency of minority stress events). As noted earlier, uncertainty is inherently threatening, and hence *not knowing* where one might encounter rejection is sufficient to lift the "brake" on threat vigilance and allow threat-related inflammation to persist, even in the absence of discrete, identifiable stressors. Because many people with negative attitudes toward sexual and gender diversity do not express them openly (Schope and Eliason, 2000), many SGD individuals move through daily life with chronic uncertainty. The growing social acceptance of SGD individuals does not reliably remove this uncertainty, given that many contemporary manifestations of sexual/gender prejudice have simply become more subtle and ambiguous than in the past (Morrison and Morrison, 2011; Morrison et al., 2009). Individuals with anti-gay prejudice often actively conceal their prejudice (Jewell and Morrison, 2010), and individuals without explicit prejudicial attitudes still report negative emotional reactions to SGD individuals (Bishop, 2015), which can be detected with subtle facial cues (Morrison et al., 2019). Hence, contemporary SGD individuals face a range of complex and contradictory social cues across multiple domains (visual, verbal, behavioral) that expose them to chronic social ambivalence and uncertainty. These signals may prove even more contradictory and unreliable for SGD individuals who experience additional, intersectional forms marginalization due to their race, ethnicity, socioeconomic status, citizenship, physical ability, etc. Such individuals often receive social cues of solidarity or affirmation for some social identities alongside cues of threat for others (for example, racial solidarity experienced alongside homophobia within some African-American churches in the US, Ward, 2005). Such experiences muddy the information value of routine social cues such as kindness or courtesy. Every friendly smile may mask a frown, depending on which of one's stigmas are visible or salient to the person one is interacting with. Over time, these experiences may create a form of "social gaslighting" in which individuals start doubting their own ability to distinguish safety from danger and allies from enemies, fostering escalating and stochastic experiences of self-consciousness, self-silencing, distrust, confusion, watchfulness, and erasure. Greater attention to the complex attentional, emotional, and neurological demands posed by intersectional marginalization, in different settings and at different stages of life, should be a key priority for research on social safety and health.

5.4. Social safety provided by laws and policies

In the same way that affirmative and inclusive school policies can create a climate of safety for SGA students, affirmative and inclusive laws and social policies can create a climate of safety at the community level that fosters SGD health (Blake and Hatzenbuehler, 2019; Hatzenbuehler et al., 2009; Reisner et al., 2015). Numerous studies have documented the positive health benefits of such climates. For example,

Hatzenbuehler and colleagues (Hatzenbuehler et al., 2020) examined how longitudinal changes in state-level policy support for sexual diversity related to HIV diagnoses and outcomes over a 7 year period across 38 states. They found that regions located in states with *increasing* policy support for sexual diversity (laws prohibiting sexual orientation discrimination in housing, employment, or public accommodations, hate-crime laws including sexual orientation, anti-bullying policies at the school level, etc.) showed *declines* in HIV outcomes (diagnoses, late diagnoses, and AIDS-related mortality) over the 7-year assessment period, relative to regions with consistently low policy support. Additionally, the best HIV outcomes were observed in states with consistently high policy support for sexual diversity, suggesting a "dose-response" relationship between policy support and health outcomes. In speculating about the mechanisms underlying their results, Hatzenbuehler and colleagues noted that in regions with high policy support for sexual diversity, individuals may be more willing to disclose their sexual orientation and to seek HIV testing and care, underscoring that *insufficient social safety* is a significant barrier to basic health care. Similar findings are echoed by research on stigma within health care settings, which indicates that SGD individuals – especially gender-diverse individuals – do not perceive doctors and hospitals as safe environments, based on persistent hostility, misunderstanding, and disrespect (Elliott et al., 2015; Kattari and Hasche, 2016; National Center for Transgender Equality and the National Gay and Lesbian Task Force, 2010; Romanelli et al., 2018).

Another study examined how state-level policies protecting gender-diverse individuals (such as laws and policies protecting relationship/marriage or parenting rights, nondiscrimination laws, protection of gender-diverse youth, hate-crime laws, and policies allowing individuals to change their gender identity on legal documentation) related to the health of gender-diverse individuals in 26 states, using data from the Behavioral Risk Factor Surveillance System (Du Bois et al., 2018). They found that in states with higher levels of policy support, transgender and gender-nonconforming individuals reported fewer recent days with poor mental health, lower alcohol use, and more recent health care checkups. Laws and policies regarding identity documents may be particularly important for gender-diverse individuals: One national study found that gender-diverse individuals who have their chosen name and gender listed across all of their identity documents report lower psychological distress and suicidality than those with inconsistencies across documents (Scheim et al., 2020). Having consistent identity documents may foster a sense of safety by reducing the risk that individuals will be "outed" and mistreated upon discovery of inconsistent documentation.

Raifman and colleagues (Raifman et al., 2018) used data from the Behavioral Risk Factor Surveillance system to examine links between state laws permitting denials of service to sexually-diverse individuals (such as laws permitting bakers to refuse to provide cakes for same-gender weddings) and subsequent changes in mental health among sexually-diverse individuals. Three states (Utah, Michigan, and North Carolina) passed "denial of service" laws in 2015. In the year after these laws were passed, there was a 46% increase in mental distress among sexually-diverse individuals living in these states, whereas no changes were observed for heterosexuals. In discussing potential mechanisms underlying these effects, the authors point out that direct experiences with "denials of service" are unlikely to account for the increased mental distress, given that changes in mental distress unfolded in the first year after the laws were passed. Rather, they noted that the existence and widespread media coverage of the laws may have affected other citizens' perceptions of sexually-diverse individuals (i.e., whether they were viewed as equal citizens) and sexually-diverse individuals' *own* perceptions of their standing within their communities. Using Uchino and Holt-Lunstad's notion of social ambivalence (Holt-Lunstad and Uchino, 2019; Uchino et al., 2004), one might argue that "denial of service" laws – even in cases where they are eventually struck down – alter the climate of social safety by turning routine interpersonal transactions (the purchase of an anniversary cake) from positive to *ambivalent*, introducing chronic uncertainty about whether a business owner's pleasant smile is actually disguising intense disgust. Discriminatory laws and policies may have a stronger effect on the overall climate of safety in a community than on the specific individuals targeted by the legislation. In 2022, Utah became the 12th US state to pass a law restricting transgender girls' participation in girls' sports teams (Associated Press, 2022). Of the 75,000 Utah children and adolescents registered to play school sports in 2022, only four identified as transgender in 2022 (Bojorquez, 2022). Hence, the net impact of this legislation on *all* Utah youths' perceptions of belongingness and inclusion at school (particularly given the widespread national media coverage of the legislation) is likely to exceed its impact on any specific child in a given year. This point was explicitly made by Utah's governor when explaining his veto of the legislation: "I don't understand what [transgender youth] are going through or why they feel the way they do. But I want them to live. And all the research shows that even a little acceptance and connection can reduce suicidality significantly" (Richards, 2022).

The diverse harms of discriminatory legislation and the diverse benefits of affirmative legislation underscore Barron and Hebl's argument (Barron and Hebl, 2010) that laws regarding marginalized groups are important not simply for instrumental reasons, but because they have symbolic meaning, communicating moral values regarding all citizens' worth and belongingness. This is supported by research showing that in regions of the US with anti-discrimination employment laws, sexually-diverse individuals are viewed as more "hirable" by managers, are more open about their sexual identity at work, and report less organizational discrimination (Barron, 2009; Barron and Hebl, 2013; Griffith and Hebl, 2002). Some of the symbolic benefits of institutional protections may be mediated by health behaviors: Hatzenbuehler and colleagues (Hatzenbuehler et al., 2015) examined how substance use disparities in sexually-diverse individuals related to structural indices of stigma, such as state-level density of same-gender couples, proportion of public high schools with gay-straight alliances, existence of state-level policies protecting against discrimination based on sexual identity, and state-level attitudes about sexual orientation (as assessed with national polls). They found that sexual identity disparities in illicit drug use were between 24% and 28% higher in states with high rather than low levels of structural stigma, controlling for both individual and environmental confounds.

To some extent, the benefits associated with affirmative laws and policies may reflect the fact that communities which value sexual and gender diversity are more likely to establish such laws and policies to begin with. Yet evidence suggests that affirmative laws and policies *also* promote increases in social acceptance. Studies of racial/ethnic prejudice have found that simply learning about anti-prejudicial attitudes among other community members can influence individuals' own attitudes (Blanchard et al., 1994; Monteith et al., 1996; Zitek and Hebl, 2007). Accordingly, legal protections for SGD individuals may serve to foster and enhance a broader norm upholding the dignity and worth of such individuals, fostering a climate of community safety. The importance of local attitudes has also been confirmed by studies linking affirmative attitudes to better SGD health outcomes. Hatzenbuehler and colleagues (Hatzenbuehler et al., 2014a,b) found that sexually-diverse individuals living in cities, municipalities, and countries with more favorable attitudes about sexual diversity (assessed independently with survey data) have lower all-cause mortality, and a similar study found similar effects for life satisfaction (van der Star et al., 2021). These effects may operate through the availability of social safety cues in neighborhoods and municipalities with more positive attitudes toward SGD individuals. As with school safety policies, it is likely that living in a region with multifaceted, comprehensive indicators of affirmation affords a more consistent experience of psychological safety.

Before leaving the topic of laws and policies, we want to underscore that a social safety perspective highlights the importance of *adding* and *creating* laws and policies that specifically affirm the experiences and

safety of SGD individuals, in addition to removing laws and policies that denigrate and disadvantage SGD individuals. Removing discriminatory policies is important for reducing sources of threat, but such removal is not sufficient for amplifying access to (and awareness of) social safety. For this goal, we need concrete social and legislative reforms that make the value, worth, and rights of SGD individuals unambiguously clear.

5.5. Social safety and suicide

Additional evidence for the unique importance of safety comes from population studies of suicidal ideation, suicide attempts, and completed suicides. We devote particular attention to the relevance of social safety for suicide because SGD disparities in this domain are among the largest and most reliable in SGD health, and have well-documented links to systemic inflammation (Bergmans et al., 2019; Choi et al., 2021; Keaton et al., 2019; Mościcki and Umhau, 2019; Serafini et al., 2020). For example, a recent representative study of Swedish citizens (Bränström et al., 2020) found that rates of suicidal ideation over the past 12 months were between 2 and 4 times higher among those who identified as lesbian/gay/bisexual versus heterosexual, and suicide attempts over the past 12 months were between 5 and 7 times higher among lesbian/gay/bisexual individuals than heterosexuals. Notably, they found that *barriers to social integration* mediated both effects. They defined "barriers to social integration" according to Durkheim's foundational work on this concept (Durkheim, 1951), which emphasized the role of social attachments and commitments in providing individuals with social support and guidance. Although Durkheim's model emphasized social attachment *to* society (i.e., feeling that you share common cause and interconnectedness with societal norms and values), another way to interpret social attachment is through the lens of social safety. For individuals who are "untethered" from society at large, their lack of social connections leaves them with insufficient access to social safety.

A key component of Durkheim's model of societal disintegration was a lack of social trust, which directly invokes the notion of social safety. In the same study, participants were asked whether they thought that "people can generally rely on other people." Gay, lesbian, and bisexual individuals were significantly more likely to answer "No" to this question than were heterosexuals (38% versus 25%). This item, along with three other "barriers to integration" (not married or living with a partner, not having children, and being unemployed), explained 36% of the variance in suicidal ideation and 26% of the variance in suicide attempts. Of these four "social integration" variables, lack of social trust had the strongest association with suicidal ideation and attempts, similar to previous studies pinpointing "low social trust" as a contributor to SGD disparities in mental health (Axelsson et al., 2013).

These patterns support the interpersonal theory of suicide (Van Orden et al., 2010) which posits that a fundamental driver of suicidal ideation is an unmet "need to belong" (Baumeister and Leary, 1995). The interpersonal model posits that when this fundamental need is thwarted, the result is loneliness, disconnection, and the lack of reciprocally caring relationships, which are potent risk factors for suicide attempts. For SGD adolescents and adults, perceptions of safety in their immediate environment can help to prevent suicidal ideation by fostering a sense of belongingness. Supporting this view, data from the 2005 and 2007 Youth Risk Behavior Surveillance Surveys found that sexually-diverse youths living in states and cities with more protective school climates (i.e, having GSAs, inclusive programs and procedures, etc.) showed significantly lower suicidal ideation; in fact, within the states and cities that had the *most* protective climates, there was *no difference* between sexually-diverse and heterosexual youths in suicidal ideation (Hatzenbuehler, Birkett, et al., 2014).

One recent study of over 28,000 gender-diverse individuals assessed whether implementation of laws banning health care discrimination based on gender identity predicted declines in suicidal ideation and suicide attempts over a 12-year period (McDowell et al., 2020). Between 2012 and 2018, a total of 20 US States and the District of Columbia

passed laws mandating that health insurance providers could not deny coverage to gender-diverse citizens. They found that states with such laws showed significant declines in suicidal ideation and attempts among gender-diverse youths and adults, but this effect did not transpire immediately: Rather, declines in suicidality emerged one or more years *after* the nondiscrimination policies went into effect, consistent with the notion that some of the benefits of such laws involve changes to the *broader social climate*, rather than immediate access to needed health care. This is further supported by the fact that mental health hospitalizations among gender-diverse individuals *also* declined after nondiscrimination policies went into effect, despite the fact that these policies made more gender-diverse individuals eligible for insurance coverage of such hospitalizations. Although studies such as this one cannot establish causal associations, one potential interpretation is that social climates which provide more cues of safety and protection promote better SGD health.

Plöderl and colleagues (Plöderl et al., 2014) specifically contrasted the interpersonal model of suicide with a minority stress perspective, and found that low levels of belongingness and social support clustered together to predict suicidal ideation and attempts in a community sample of sexually-diverse adults. Notably, belongingness/social support predicted suicidal ideation and attempts more strongly than other minority stress experiences such as internalized homophobia, exposure to victimization, and degree of openness. This provides further evidence that social safety is a critical contributor to mental health among stigmatized individuals. Another notable finding of this study was that involvement in the SGD community was *not* associated with greater perceptions of social support (or lower risk for suicide). One potential interpretation of this finding is that local community involvement (for example, taking part in social events geared specifically to SGD individuals) may not be sufficient to provide the deeper sense of social safety and trust that is critical for mental well-being.

An important direction for future research involves disentangling the specific influence of social safety on different aspects of self-injurious thought and behavior. Notably, a recent systematic review of research on the inflammatory profiles of individuals at risk for suicide found stronger associations between systemic inflammation and suicidal *attempts* than suicidal *ideation* (Vasupanrajit et al., 2022), suggesting that experiences of safety and threat may play different roles for individuals with different manifestations of self-harm. As noted by Silverman and colleagues (Silverman et al., 2007), these manifestations are complex and highly differentiated according to modality, intent, intensity, frequency, etc. A recent review of research related to the Interpersonal Theory of Suicide (Chu et al., 2017) found that thwarted belongingness (combined with perceived burdensomeness) was a stronger predictor of suicidal ideation than suicide attempts, further suggesting the importance of testing whether social safety has differential significance for specific suicide risk factors. Additionally, recent research suggests the value of applying dynamical systems models to suicidal ideation and behavior (Butner et al., 2021), given that these phenomena often show abrupt and stochastic variation over short and long time scales (Bryan & Rudd, 2018). Previous research has found that small environmental perturbations often feed forward rapidly to produce dramatic escalations in suicide risk (de Beurs et al., 2021), and we need to investigate whether targeted environmental enhancements of social safety can potentially interrupt such cascades.

6. Moderators of social safety effects

Up until now, we have discussed the general relevance of social safety for *all* SGD individuals. Yet obviously, not all SGD individuals are alike: Some may be more susceptible to the negative health effects of social threat, due to having multiple, intersecting stigmas, or because they live in environments that are particularly hostile to SGD individuals (such as countries in which same-gender sexual activity is punishable with imprisonment or death, Throckmorten, 2013). Others may have

personality traits, life experiences, and biological predispositions that exacerbate the negative health effects of stigma (for example Livingston, Heck, et al., 2015; Livingston, Oost, et al., 2015). Scholars have called for greater attention to individual differences that moderate minority stress effects (Downey and Daniels, 2020; Feinstein, 2020; London et al., 2020), and the same approach is relevant to social safety. Slavich (2020) argued that individual differences in "safety schemas," based on individuals' prior exposure to threat and safety, shape individuals' thresholds for safety-related inhibition of threat-vigilance. In many ways, Slavich's notion of social safety schemas resembles Bowlby's notion of *internal working models* of attachment (Bowlby, 1973a, 1982), which he defined as internalized representations of the social world that are based on the infant's history of interactions with the caregiver (specifically, how reliably the caregiver responds to and regulates the child's distress). Children who did not experience consistent and reliable safety with their caregivers internalize an attachment schema that casts the larger social world as unreliable, untrustworthy, and potentially threatening, and they adapt by maintaining chronic vigilance for cues of social rejection and abandonment (Ainsworth et al., 1978). Over the course of adulthood, experiences of interpersonal loss, trauma, rejection, and threat can exacerbate attachment insecurity (Stern et al., 2018; Theisen et al., 2018), altering future social perceptions and behaviors. For example, adults with insecure attachment schemas show heightened neural and attentional reactivity to negative facial expressions (Fraley et al., 2006; Niedenthal et al., 2002), to images of individuals in danger and distress (Chavis and Kisley, 2012), and to cues related to punishment versus reward (reviewed in Buck et al., 2013). Such perceptual biases also shape reactions to stigma-related stressors: gay-identified men with insecure attachment schemas show heightened awareness of discrimination (Zakalik and Wei, 2006) and heightened emotional reactivity to everyday experiences of heterosexism, such as encountering people who assume that they are heterosexual (Mohr, 2016). Such findings undergird Feinstein's (2020) emphasis on individual differences in rejection sensitivity as a critical contributor to the health effects of sexual/gender stigma.

Slavich's model (2020) suggests that we view both attachment insecurity and rejection sensitivity as factors which additionally affect individuals' vulnerability to the negative effects of insufficient safety and their sensitivity to safety cues. Supporting this view, research has found that individuals with insecure attachment schemas show heightened levels of systemic inflammation (Ehrlich et al., 2019), heightened inflammatory reactivity when undergoing naturalistic social challenges (in this case, moving to a new country and acculturating over a 5-month period, Gouin and MacNeil, 2019), and even heightened inflammatory reactivity to experimentally-administered endotoxins (Moieni et al., 2015). More extreme effects on inflammation have been observed among individuals who have suffered direct childhood exposure to threat, such as physical abuse, sexual abuse, emotional abuse, or neglect. Such experiences have been observed to promote the development of a "pro-inflammatory" developmental trajectory that confers long-term disease risk (Baldwin et al., 2018; Cho et al., 2012; Danese et al., 2009; Hostinar et al., 2015; Miller and Chen, 2010; Slopen et al., 2015). The dangers of such experiences compound over time, because children exposed to early experiences of social threat show heightened inflammatory reactivity to post-childhood stressors (Chiang et al., 2017; Gouin et al., 2012; Simons et al., 2019). These processes may partially explain the extensive cross-cultural documentation of links between childhood adversity and compromised adult health (Kessler et al., 2010; Peltzer and Pengpid, 2018; Slopen et al., 2010), across a wide range of outcomes including psychiatric conditions, health behaviors, obesity, asthma, and cardiovascular risk (Laditka and Laditka, 2018; Robson et al., 2020; Sheikh, 2018).

6.1. Early adversity

Childhood adversity is among the most important potential

moderators of links between stigma and health, given that such experiences are substantially more common among SGD populations than in heterosexual/cisgender individuals (Baams, 2018; McLaughlin et al., 2012; Merrick et al., 2018; Schnarrs et al., 2019; Thoma et al., 2021; Tobin and Delaney, 2019). For example, as reviewed by Diamond at al. (2021), data from the 2011–2013 Behavioral Risk Factor Surveillance System (Merrick et al., 2018) found that retrospectively reported rates of childhood and adolescent emotional abuse, sexual abuse, and physical abuse among sexually-diverse individuals were 46%, 29%, and 21% (compared to 35%, 17%, and 12%, respectively, among heterosexuals). Using the 2011 and 2012 North Carolina and Wisconsin Behavioral Risk Factor Surveillance System, Austin and colleagues (Austin et al., 2016) found that sexually-diverse individuals were more likely than self-identified heterosexuals to report childhood or adolescent physical abuse (30% vs. 17%), sexual abuse (29% vs. 12%), and emotional abuse (44% vs. 28%). There were also differences in the number of adverse childhood events reported: Only 27% of sexually-diverse individuals reported having experienced no forms of childhood adversity, compared with 40% of self-identified heterosexuals. Further, 42% of sexually-diverse individuals reported 3 or more forms of childhood adversity, compared with 24% of self-identified heterosexuals.

Some parents may mistreat their children *because* of the child's unfolding expression of sexual diversity or gender atypicality (reviewed in Corliss et al., 2002), which is supported by twin studies indicating that sexually-diverse individuals report poorer relations with parents, and greater maltreatment, than their heterosexual siblings (Zietsch et al., 2012). In their systematic review of studies investigating family victimization and sexual identity, McGeough and colleagues (McGeough and Sterzing, 2018) found that sexually-diverse individuals who reported earlier awareness and disclosure of their sexual identity experienced greater levels of familial victimization prior to age 18, suggesting that their expression of same-gender attraction, same-gender behavior, or gender nonconforming behavior/expression may have elicited maltreatment by family members. Several studies have found that sexual identity disparities in adult mental health are partially mediated by differential exposure to childhood adversity (McLaughlin et al., 2012; Zietsch et al., 2012).

Early life adversity that is *not* explicitly due to a child's sexual or gender diversity also shows robust associations with multiple adult health outcomes (Dube et al., 2003; McCrory et al., 2015), including substance use (Dube et al., 2006; Duffy et al., 2018), cardiovascular and cardiometabolic disease (Jakubowski et al., 2018; Lim, 2020), chronic obstructive pulmonary disease (Anda et al., 2008), multiple forms of cancer (Brown et al., 2010; Kelly-Irving et al., 2013), premature and all-cause mortality (Johnson et al., 2020; Montez and Hayward, 2014; Rod et al., 2020), chronic adult disease (Cubbin et al., 2019; Gilbert et al., 2015), liver disease (Dong et al., 2003), and suicide attempts (Dube et al., 2001). Evidence for a critical role for early adversity in SGD mental health has been provided by studies finding that SGD individuals with histories of childhood sexual abuse have significantly greater rates of substance problems, perceived stress, depressive symptoms, PTSD, and suicidal ideation and behavior than those without such histories (Boroughs et al., 2015; Mattera et al., 2018; Schneeberger et al., 2014). Notably, there are many different forms of childhood adversity (such as household unpredictability, parental substance use, food insecurity, etc.), and scholars have posited several organizational frameworks for understanding their distinct consequences (for a review and synthesis, see Ellis et al., 2022). Some have emphasized the timing of exposure (for example Gard et al., 2020; Sheehan et al., 2020; Sicorello et al., 2020; Xu et al., 2019) and others have focused on dimensions of *unpredictability* versus *harshness* (Belsky et al., 2012; Simpson et al., 2012) or *deprivation* versus *threat* (Colich et al., 2020; McLaughlin et al., 2014; Vogel et al., 2021). Social safety theory suggests that early experiences of *threat* (i.e., in which one's physical body is violated, physical safety is uncertain, or caregivers show explicit rejection) should be particularly important for augmenting future psychobiological responses to safety deficits. For

example, whereas early deprivation influences the development of language and executive functioning, early experiences of threat are thought to augment the development of brain regions related to fear and emotional learning, such as the amygdala, hippocampus, and ventral medial prefrontal cortex (McLaughlin et al., 2014). These changes may play a role in the multifaceted cognitive, emotional, attentional, and behavioral symptoms of complex PTSD that have been observed in individuals exposed to chronic and uncontrollable threat (Maercker, 2021).

6.1.1. Biological embedding of threat sensitivity

The fact that early experiences with threat create lasting changes in neurological threat reactivity is consistent with "biological embedding" models which hypothesize that childhood stress exposure has long-standing, "programming" effects on dysregulation that are independent of (but may interact with) cumulative life stress (Heim et al., 2019; Miller, Chen, et al., 2011; Shonkoff et al., 2009). These programming effects are thought to reflect evolved adaptations to diverse human environments: The Adaptive Calibration Model, or ACM (Del Giudice et al., 2011) posits that early exposure to specific types of environments calibrates neurological stress responsivity in a manner that fosters adaptation to similar environments in the future. For example, early cues of threat stimulate patterns of development that promote adaptation under conditions of threat, whereas early nurturance promotes patterns of development that promote adaptation under conditions of nurturance.

Importantly, the ACM model does not posit that early adversity promotes uniform hypersensitivity to future threat. Rather, it hypothesizes four different profiles of stress responsivity (sensitive, buffered, vigilant and unemotional), each characterized by different sensitivities to environmental stimuli and fostered by the interaction between genetic predispositions for stress responsivity and characteristics of the child's early environment. Consistently safe and nurturant environments are thought to produce sensitive profiles, characterized by high sensitivity to future environmental threat and future opportunities for safety and nurturance. Early environments with moderate stress are thought to produce a buffered profile, characterized by moderate reactivity to environmental input. Consistently threatening environments are thought to produce vigilant profiles, characterized by heightened sensitivity to environmental threat (but also potentially high sensitivity to reparative nurturance). Severe and traumatic childhood environments are thought to engender the unemotional profile, characterized by blunted reactivity to both positive and negative environmental input. As noted earlier, blunted patterns of cortisol release are disproportionately associated with poor health outcomes (Adam et al., 2017), and extensive evidence suggests a role for childhood abuse and adversity in such patterns (Busso et al., 2017; Carpenter et al., 2011; Engert et al., 2010). Adolescent adversity may also play a role: Hatzenbuehler and colleagues (Hatzenbuehler and McLaughlin, 2014) found blunted cortisol reactivity to stress among sexually-diverse individuals who had been exposed to high levels of structural stigma during adolescence.

Such patterns are directly relevant to a social safety perspective on health and inflammation because of the extensive co-regulation between the HPA axis and the immune system (reviewed in Reilly and Gunnar, 2019; Silverman and Sternberg, 2012). Specifically, stress-related increases in proinflammatory cytokines stimulate the release of cortisol, which subsequently functions to help down-regulate cytokine production (Elenkov and Chrousos, 2002; Silverman and Sternberg, 2012). It is thought that the chronic "press" on the HPA axis provided by consistent stress-related inflammatory reactivity could lead to adrenal dysregulation, producing the blunted patterns of cortisol release observed in situations of severe abuse and neglect (Reilly and Gunnar, 2019). Hence, both the vigilant and unemotional patterns proposed by the ACM (blunted HPA, as described earlier, or heightened HPA activity, as in Marusak et al., 2015; McCrory et al., 2011) should be characterized by systemic inflammation, and existing research suggests dynamic mediating and moderating relationships between the HPA axis and the

immune system in the context of early adversity (Reilly & Gunnar, 2019) and acute stress (Chen et al., 2017).

Importantly, the "biologically embedded" effects of childhood stress are thought to sensitize individuals to future stress exposure, such that the greatest biological dysregulation will be observed among individuals with both early adversity and cumulative stress (Daskalakis et al., 2013; Tang et al., 2020). Sensitization processes may occur on multiple levels: In addition to the fact that early adversity may lower the threshold for threat-responding in specific stress-response systems (such as the HPA or the immune system), early adversity may also have permanent effects on brain regions associated with emotional processing and threat responding (McLaughlin et al., 2014; Mirman et al., 2021; Puetz et al., 2020; Teicher et al., 2016), which may contribute to the likelihood of psychiatric conditions such as depression (Patten, 2013; Slavich et al., 2011). Adverse experiences during adolescence may play additional roles in recalibrating individuals' responses to safety and threat cues. For example, Xavier Hall and colleagues Xavier et al., (2021) found that forced sexual touching during the teen years (by an adult or someone 5 years older) was associated with twice the odds of recent suicidal ideation among sexually-diverse and gender-diverse men, whereas this was not the case for forced touching in childhood (which was associated only with elevated depression and alcohol use). Numerous scholars (Blakemore and Mills, 2014; Fuhrmann et al., 2015) have argued that the specific structural and functional changes in "the social brain" that occur during adolescence (related to face processing, mentalizing, social emotion, social influence, and social evaluation) render youths particularly sensitive to social signals and experiences during this period of life. Hence, youths that first begin to experience sexual/gender harassment and victimization during the teenage years may show lasting psychological and biological vulnerability to subsequent experiences of stigma-related social threats.

A social safety perspective offers several promising directions for future research on the mechanisms through which early experiences interact with subsequent stigma to shape health outcomes. Most studies of minority stress exposure capture single moments in time, but due to the importance of early adversity in shaping neuropsychological stress processing, we need more longitudinal research that assesses not only individuals' histories of threat and safety exposure, but the ongoing dynamics of threat and safety exposure throughout adulthood (echoing dynamical systems approaches to suicide risk, Butner et al., 2021). Extensive research on stress and health supports cascade models in which sequences of stressful and supportive experiences continuously feed forward to shape the unfolding of individuals' behavioral, cognitive, and social skills and deficits (Ettekal et al., 2019; Figueredo et al., 2020; Golm et al., 2020; Handley et al., 2019; Murray et al., 2021). In such dynamic systems, the effects of early influences become magnified over time, such that it becomes increasingly difficult to separate the original event from its unfolding consequences.

Cascade models are well-suited to the dynamic course and consequences of stigma-related variations in social threat and safety across time: Each instance of psychological and biological reactivity to threat is both an "output" of previous experiences and an "input" into subsequent safety schemas, and hence the impact of any particular event cannot be reliably modeled without a full accounting of the developmental and psychosocial underpinnings of that event. Dynamic cascade models may be particularly relevant for understanding developmental trajectories of threat-related inflammation (and inflammation-related health problems) among SGD individuals because of the research showing that inflammatory reactivity is provoked by social threat and also amplifies future reactivity to social threat (Inagaki et al., 2012). As reviewed earlier, endotoxin-induced increases in inflammation have been found to enhance feelings of social disconnection, depression, and sensitivity to negative social feedback (Eisenberger et al., 2010; Muscatell et al., 2016). These findings collectively suggest that SGD individuals may become increasingly vulnerable and reactive to cues of high social threat and low social safety, as their psychological and immunological

reactions to these experiences synergistically interact. Such processes underscore the importance of intervening early in the lives of SGD individuals to interrupt these developmental cascades by amplifying the availability of social safety.

6.2. Genetic and epigenetic influences

The cascading effects of early experience suggest that we should extend the developmental window as early as possible to capture all of the relevant influences on the long-term health consequences of stigma, and this is another promising direction for future research. The developmental window actually includes the prenatal environment: For example, a birth parent's prenatal levels of psychological stress, substance use, and quality of social relationships shape their *child's* pattern of stress reactivity and brain development (Giesbrecht et al., 2017; Thomas et al., 2017), through epigenetic mechanisms (Conradt et al., 2019; Lester et al., 2018). Such findings suggest that a birth parent's exposure to stress may be a key factor moderating SGD individuals' reactivity to sexual/gender stigma, and its downstream health consequences. Such prenatal and early life factors interact with the child's *genetic* predispositions to shape patterns of later stress reactivity and stress-related biological dysregulation. Both the ACM (Del Giudice et al., 2011) and the cascade model of PTSD (Alarcon et al., 1999) acknowledge the importance of genetic predispositions in stress and safety perception in early life, and several scholars have called for greater attention to genetic contributions to mental health disparities among SGD adults (Bailey, 2020; Frisell et al., 2010).

One potential genetic moderator involves the serotonin transporter gene (5-HTTLPR), given its relevance to individual differences in perceptions of social threat and susceptibility to affective disorders (Caspi et al., 2003; Collier et al., 1996). Previous research has found that this gene relates to the processing of threat-related social cues in the amygdala and insula (Klumpp et al., 2014; Kroes et al., 2019; Osinsky et al., 2008), and numerous studies have found that the short (s) allele of this gene augments individuals' experiences of anxiety (Lesch et al., 1996), emotional and behavioral reactivity to peer rejection (Kretschmer et al., 2014), responses to parental support and rejection (Nishikawa et al., 2012; van Roekel et al., 2010), experimental mood inductions (Beevers, Scott, et al., 2009), reaction to cues of punishment (Battaglia et al., 2005; Hariri et al., 2005), attention to emotional stimuli (Beevers et al., 2011), and ability to disengage from emotionally negative information (Beevers, Wells, et al., 2009) and down-regulate rumination (Canli et al., 2006). In total, these vulnerabilities may render some individuals more attentive to social threats emanating from family, peers, and the broader community (Brody et al., 2013; Munafò et al., 2008), which may augment their susceptibility to depressive and anxiety disorders (Caspi et al., 2003). As summarized by Canli and colleagues (Canli et al., 2006), interactions between this polymorphism and exposure to life stress "may constitute a neural mechanism for epigenetic vulnerability to depression in carriers of the short variant, by upregulating resting activation in key regions associated with affect and stress" (p. 1106).

Notably, individuals with the short allele show greater inflammatory activity both at rest and during experimental stress (Fredericks et al., 2010; Yamakawa et al., 2015). Individuals possessing the short allele also show heightened cortisol reactivity to emotionally negative (but not emotionally neutral) experimental stressors (reviewed in Agüero-Tejado, 2014). Notably, this polymorphism may also help explain the fact that some individuals exposed to early adversity develop blunted profiles of cortisol secretion, whereas others develop heightened profiles: In an ethnically-diverse sample of Medicaid-eligible youth (as defined by researchers on the basis of parental income), cumulative risk exposure was associated with flattened diurnal cortisol slopes among those with the long allele of 5-HTTLPR, but higher overall cortisol production among those with the short allele (Willner et al., 2014). The age at which adversity is experienced also plays a role: Mueller and

colleagues (Mueller et al., 2011) found that young adults with the short allele showed heightened cortisol reactivity to stress if they had *high* levels of adversity during the first 5 years of life, but dampened cortisol reactivity if they had *low* levels of adversity during the first 5 years of life. They interpreted this finding to suggest that the short allele should not be interpreted as a risk factor, but rather a sensitivity or "plasticity" factor (Belsky and Pluess, 2009) which actually confers protection from mental health problems among those with supportive and nurturant environments (Taylor et al., 2006).

Although a focus on genetic factors is often viewed as a direct challenge to the minority stress model (Bailey, 2021; Meyer et al., 2021), this need not be the case, at least from perspectives that consider genetic influences as probabilistic rather than deterministic. Genetic risk factors are not alternative explanations for SGD health disparities, but *contributors and moderators*. Greater attention to genetic influences (and particularly, genetic influences that overlap with genetic influences on same-gender sexual expression, as discussed in Diamond, 2021) may help us understand why some SGD subgroups show different health risks and outcomes than others.

7. Implications and future directions

7.1. Testing links between social safety, threat-vigilance, and downstream consequences

A social safety perspective offers a number of promising directions for future research on the mechanisms through which stigma impairs mental and physical health, and strategies for mitigating these effects. As noted earlier, there is currently greater empirical evidence for the detrimental consequences of threat exposure and threat vigilance (outlined on the "unsafe" side of Fig. 1) than for the short-term and long-term consequences of social safety on these processes (as outlined on the "safe" side). Hence, a critical research priority is to test the specific and unique contribution of social safety, across multiple domains of life, to each of the processes outlined in Fig. 1 (neural threat-vigilance, self- and other-monitoring, perseverative cognition, allocation of attention and energy, ability to pursue goal-directed activity) as well as the ultimate "endpoints" of physical and mental health (depression, anxiety, suicidal ideation, self-harming behavior, substance use, inflammation, and inflammation-related diseases). The bidirectional associations among the different processes outlined in Fig. 1 also require empirical validation.

For example, considerable research has documented that individuals exposed to childhood sexual or physical victimization often experience *revictimization* in adolescence or adulthood, which may exacerbate the negative consequences of such experiences (Widom et al., 2008). If early abuse heightens a child's threat-vigilance, then why does this heightened vigilance fail to protect them from subsequent victimization, and in some cases *increase* the likelihood of revictimization? The attentional and behavioral sequelae of neural threat-vigilance may play a role: Some research suggests that the fearful social appraisals of threat-vigilant children may predispose them to hostile and defensive behavior even within neutral environments, increasing their vulnerability to social aggression and mistreatment (Balsam et al., 2011; Miron and Orcutt, 2014; Papalia et al., 2017; Ulloa et al., 2009; Widom et al., 2008). Importantly, this does not imply that victimized children "invite" further victimization, but that their cognitive and behavioral *adaptations* to chronic unsafety (such as hostile attributions of others' motives or self-protective responses to interpersonal conflict) may increase the likelihood of *escalation* during interpersonal conflict and might make it difficult for individuals to discern when the level of danger in a particular situation dramatically increases. Finally, heightened threat-vigilance may foster a sense of inevitability, helplessness, and hopelessness in the face of fear, such that submission to aggression (in the form of "freezing" or "fawning" behavior, Walker 2014) becomes a survival strategy. Some evidence suggests that SGD individuals may

have disproportionate rates of polyvictimization (Balsam et al., 2011), and hence a greater understanding of the cascading consequences of childhood victimization is critical for efforts to promote SGD health.

Additionally, although we have emphasized systemic inflammation as a primary driver of SGD health disparities, we need greater investigation of the consequences of social safety (and the processes outlined in Fig. 1) for multiple, interconnected biological domains of stress regulation. Autonomic and neuroendocrine stress responsivity have received extensive investigation as potential mediators of race/ethnicity-related health disparities, and have extensive interconnections with immune functioning. For example, research increasingly suggests a role for the parasympathetic nervous system in regulating the "inflammatory reflex" (Pereira and Leite, 2016) suggesting that individual differences in vagal cardiac control may moderate the inflammatory consequences of social safety deficits. Notably, individual differences in cardiac vagal control have been found to moderate individuals' emotional reactivity to interpersonal interactions with romantic partners and family members (Diamond et al., 2012; Diamond et al., 2011), which supports the possibility that such individual differences might also relate to individuals' responsivity to cues of social safety. Individual differences in cardiac sympathetic control (Uchino, 1995) and the balance of vagal-sympathetic activation in response to stress (Berntson et al., 1994) also likely contribute to individual differences in inflammatory responses to stigma, given research linking sympathetic control and autonomic balance to inflammation (Elenkov et al., 2000; Fonkoue et al., 2020; Haskó, 2001). Finally, the neuropeptides oxytocin and vasopressin have been implicated in a wide range of social behaviors that are directly related to experiences of safety and threat (reviewed in Ellis et al., 2021; Pedersen, 2004), and deserve closer scrutiny, particularly given their associations with immune system functioning (Bordt et al., 2019; Karelina et al., 2011; Yuan et al., 2016).

7.2. How do we measure social safety?

We have defined social safety as reliable social connectedness, inclusion, belonging, recognition, and protection. But what exactly does that *mean*, both phenomenologically and operationally? How do individuals know when they are safe, and how do researchers measure this experience? What sorts of changes in cognition, affect, perception, sensation, and physiology take place when individuals enter or exit a safe setting, and how long do these changes last? Which environmental features characterize settings that are experienced as safe? What types of interpersonal or institutional safety signals are most effective? How often do they need to be encountered for individuals to maintain a reliable sense of safety? Does it matter whether safety signals are encountered online versus in-person? The experiences listed as examples of "objective" safety in Table 1 provide a starting point for designing measures aimed at tracking individuals' exposure to safety signals (perhaps in real-time, using ecological momentary assessments), yet it is only a start, and it focuses only on safety signals regarding sexual/ gender identity. To gain a full picture of an individuals' access to safety in their everyday life (and hence their need for threat-vigilance), we must simultaneously measure the availability of safety signals for other axes of marginalization, such as ethnicity, culture, immigration status, physical ability, socioeconomic status, religion, etc. Safety signals for one identity might prove ineffective if they are perceived as "conditional" on other identities or privileges (for example, if safety signals are only available within physically inaccessible spaces, or only in one language, then this will further entrench the marginalization of some groups). Hence, one of the most important steps for future research involves systematically assessing the distribution and impact of a *diverse range* of interpersonal and institutional safety signals in the lives of SGD and other marginalized individuals.

To do so, we need more comprehensive information from a diverse range of marginalized individuals about how and where and why they experience safety. Because it is not yet clear which types of signals are

most important, preliminary research efforts should make use of ethnographic approaches for analyzing the "hidden structure" of diverse types of environments (both online and in-person), and partnering with marginalized individuals and communities to discover and articulate the most relevant indicators of social safety and social threat. A relevant example is that of Dehlin (2022), who designed an assessment of self-reported social safety that specifically included settings that are uniquely relevant to gender-diverse individuals (such as airports and public restrooms) along with more general settings (family, home, work). Experiencing social safety was defined as feeling secure enough that individuals could be their full and authentic self, without needing to devote thought or energy to how they might be perceived and treated. This operationalization is likely applicable to multiple forms of marginalization, but we must elicit comprehensive information *from* individuals experiencing different forms of stigma about their own experiences of high and low safety in different settings in order to design measures that can capture this experience across all of its different manifestations.

Another critical question for future research is whether safety signals need to be consciously perceived and acknowledged to yield benefits. In this regard, previous research using "signal detection" paradigms may prove useful: In these designs (used frequently with couples, but easily adaptable for other dyads or groups), one person's report of behavior (such as "I did something supportive for my partner" or "I said something critical") is compared to their *partner's* perceptions ("My partner did something supportive;" "My partner said something critical"). Research using these paradigms has found that individuals benefit (in terms of end-of-day mood and well-being) from a partner's socially supportive acts even when they do not consciously perceive these acts, and they also suffer negative effects of critical or unsupportive behaviors even when they do not consciously perceive them (Bolger et al., 2000; Gable et al., 2003). One promising avenue for future research is to examine the degree to which conscious versus nonconscious experiences of safety and threat have different implications for inflammatory reactivity over time. Similarly, individual differences in safety schemas (a topic we revisit below) may influence whether individuals can derive sufficient safety from implicit versus explicit cues.

The "subjective" side of Table 1 attempts to capture the phenomenological aspect of social safety, which presents similar measurement challenges. A reasonable first step is to ask individuals whether they endorse the sorts of statements that are listed on the "subjective" side of Table 1, but it may also be fruitful to ask individuals about some of the hypothesized downstream effects of safety, such as the *interruption* of self-consciousness, self-monitoring, and other-monitoring, and a full engagement with the present moment (such as "flow," Csikszentmihalyi and Csikszentmihalyi, 1988; Gold & Ciorciari, 2021). The behavioral and emotional correlates of safety and unsafety (outlined in Fig. 1) also provide promising targets for assessment. We should also explore implicit measures of safety and unsafety, perhaps using cognitive paradigms that can detect unconscious and automatic responsivity to safety-relevant cues, such as facial expressions of anger, disgust, or empathy (for example Morrison et al., 2019; Rossignol et al., 2007). Eye tracking and pupil dilation paradigms may also be useful for assessing attentional biases toward different types of visual cues (Rieger and Savin-Williams, 2012; Rupp and Wallen, 2007), and implicit association paradigms can be used to assess the degree to which different people, contexts, or physical locations are automatically associated with different cognitions (Snowden et al., 2020; Zayas and Shoda, 2005).

Once we develop reliable and valid measures of objective and subjective safety, we will likely find that some individuals' subjective experiences of safety do not correspond to their "objective" levels of safety (or the availability of observable safety signals). Similar mismatches have a long history within stress research (as reviewed earlier), and have raised ongoing questions about the specific relationship between objective events and their phenomenological impact. Meyer's original model (Meyer, 2003) argued that subjective manifestations of minority

stress (such as internalized homophobia or fears of disclosure) *result* from individuals' direct encounters with the external, environmental consequences of stigma (such as workplace discrimination or interpersonal harassment). As he summarized, "distal social experiences gain psychological importance through cognitive appraisal and become proximal concepts with psychological importance to the individual (2003, p. 676). This view is supported by extensive research showing that our brains serve as the primary mediators of environmental challenges (Barrett and Simmons, 2015; Slavich, 2020). Yet the pathway from environmental exposure to psychological experience shows tremendous variation, often due to individual differences in how individuals perceive and interpret the external world. Extensive evidence suggests that our cognitive appraisals of stress events strongly influence how we respond to these events, both psychologically and biologically (Denson et al., 2009; Fontana and McLaughlin, 1998; Gramer, 2003; Lazarus and Folkman, 1984; Taylor and Aspinwall, 1996). For example, numerous studies have documented differences between the psychological and physiological sequelae of stressors appraised as *challenges* versus *threats* (Blascovich and Mendes, 2000; Sapolsky et al., 2000). Such findings support Feinstein's (2020) call for greater attention to the role of perception and appraisal processes (such as a trait-like predisposition to perceive cues of social rejection) in shaping the experiences and consequences of minority stress, and these processes are equally relevant to social safety (in the form of "safety schemas").

Whether SGD individuals' long-term health is more strongly influenced by "objective" versus "experienced" social safety is an empirical question, but we should remain mindful of Meyer's caution (Meyer, 2020) to avoid "blaming the victims of prejudice for being too sensitive to prejudice" (p. 2289). He argued for a continued emphasis on the objective adaptational demands posed by stigma-related stressors, and we completely agree: We simply argue that *chronic threat-vigilance* should be considered one of these adaptational demands, despite the fact that it often goes unnoticed and unrecorded. It is the total *constellation* of subjective and objective features of stigma which confer their impact. As reviewed earlier, one of the most powerful (and easily measured) objective indicators of social safety is the existence of laws and policies that either protect or discriminate against SGD individuals, and the studies reviewed above suggest that such laws, by altering the environmental "press" regarding safety, may influence the minds and bodies of SGD individuals *regardless* of whether they are consciously perceived (for example, Szalacha, 2003). Such findings confirm the value of assessing objective stressors *and* their subjective manifestations, which is why many measures of minority stress assess retrospective exposure to stress events as well as worries about the future (Downey and Feldman, 1996; Hidalgo et al., 2019; Pachankis et al., 2008).

Similar approaches should be adopted with respect to social safety. For example, to assess an SGD individuals' access to, and experience of, social safety in a particular setting (home, workplace, health care), we might consider assessing (1) the presence of overt safety signals, such as the presence of other openly SGD individuals or visible cues of affirmation, such as rainbow flags, (2) the existence of local policies and laws relevant to SGD individuals' within that setting, (3) individuals' subjective experiences of inclusion and belonging in the setting, and (4) the amount of cognitive effort and attention that individuals devote to monitoring their own and others' behavior when they occupy that setting. Perhaps the most important point regarding differences between objective and subjective experiences of safety and threat is that *the immune system responds to both* (Slavich, 2020). Navigating the social world as an SGD individual (especially during adolescence) is akin to walking alone down a dark, unfamiliar street – there might be no objective danger, and in fact a safe and well-lit restaurant might be right around the corner, but until you *detect* it, threat-vigilance will remain engaged. Increasing the availability of social safety for all marginalized individuals – alongside efforts to reduce minority stressors – may yield powerful benefits for public health. One testable possibility is that increasing the *number of minutes per day* that marginalized individuals

spend in safe environments – environments where they can completely disengage threat vigilance, express their authentic selves, and experience a bedrock of trust – might help to mitigate some of the long-term health effects of stigma. Yet to test this hypothesis, we need accurate measurement of the degree of safety in different environments and accurate measurement of *how the brain and body responds* to safety. Brosschot and colleagues (2016) argued that some of the well-documented health benefits of spending time outdoors in nature may derive from the fact that certain aspects of natural environments (the availability of fresh air and water, the perception of open space) may function as evolved safety signals for the human nervous system, prompting disengagement of threat vigilance. A growing body of research has documented diverse benefits from immersion in nature, including restorative patterns of autonomic, endocrine, and immune functioning (Li, 2010; Roe et al., 2013; Scott et al., 2021), and these patterns provide a promising starting point for detecting the types of multi-system changes in psychological and biological functioning that occur when individuals transition from a state of vigilance to a state of safety, and determining whether increasing one's exposure to safety yields demonstrable health benefits.

A final critical question for measurement involves *safety schemas*, which Slavich (2020) described as stable beliefs/expectations regarding one's vulnerability to threat, based on prior experiences, which shape individuals' thresholds for perceiving and responding to safety cues, and potentially the psychological/biological impact of these cues. As reviewed above, safety schemas may share many characteristics with cognitive schemas related to attachment (Ainsworth et al., 1978; Hesse, 1999), social rejection (Downey and Daniels, 2020), and the satisfaction of basic emotional needs (Young, 1999; Young et al., 2006), all of which are thought to derive from childhood experiences. Many of the self-report items in Young's measure of "Early Maladaptive Schemas" appear directly relevant to social safety, such as "I often feel that I have to protect myself from other people." "I'm fundamentally different from other people." "I have rarely had a strong person to give me advice when I don't know what to do." "I can't really be myself or express what I really feel, or people will leave me." "In the end, I will be alone." Future research should seek to refine the measurement of social safety schemas, examine their relationship to other early-developing cognitive schemas and individual difference dimensions, and measure their impact on individuals' psychological and biological responses to safety and threat. Toward this end, Bayesian approaches to human cognition and learning (Kording, 2014; Trommershauser et al., 2011) may prove useful for modeling how early experiences with safety and threat coalesce into robust schemas that guide future perceptions and experiences (for an application of this perspective to pain perception, see Tabor and Burr, 2019). Bayesian perspectives on the human brain seek to describe the processes through which the brain automatically, continuously, and unconsciously tries to predict the future through "weighted integration of prior experience and current (potentially multisensory) information, represented using probability distributions that reflect the agent's subjective uncertainty. It is through the inherent encoding of the learner's uncertainty that Bayesian models can shift. towards a learning account that is both predictive and active" (Tabor and Burr, 2019, p. 55). It is the Bayesian emphasis on *centering and modeling experiences of uncertainty* that makes this approach particularly applicable to safety schemas, given that uncertainty lies at the heart of "generalized unsafety" (Brosschot et al., 2016) and provides the motivational force for sustained threat-vigilance. The "goal" of chronic threat vigilance (from the perspective of the brain) is not to find evidence of safety *or* evidence of threat: The goal is to *resolve uncertainty* so that you can predict the future and prepare accordingly. Bayesian approaches seek to mathematically represent the fact that different types of "inputs" (a teacher's rainbow socks, a co-worker's inappropriate joke, a news story about hate crimes legislation, a neighbor's reluctance to make eye contact) may have dramatically different implications for an SGD individual's experience of social safety depending on *how much uncertainty* the individual

experienced prior to receiving that input, and whether the new input supports or disconfirms previous expectations ("the teachers at my school support me;" "my neighbor disapproves of me").

Medical diagnosis provides an apt analogy, given that this process requires physicians to grapple directly with uncertainty, to take account of their expectations and assumptions, and to make high-stakes predictions about the future based on limited information. One's interpretation of a negative at-home Covid test depends on whether you *expected* to test negative (based on the presence/absence of Covid symptoms and whether you think you have been exposed), the reliability of the at-home test, your *confidence* in your own judgment, and the *stakes* of making a mistake (what is the worst thing that could happen if you *think* you are uninfected, but it turns out that you are wrong?). Bayesian approaches turn these subtle complexities into probability distributions, seeking to make explicit the degree to which any one of these elements changes the interaction between the others, and hence the likelihood of different "diagnoses" (*Is it safe for me here?*). Bayesian approaches have yielded notable advancements in the diagnosis of cardiovascular disease by quantitatively modeling the fact that the predictive value of different diagnostic tests (for example, a cardiac stress test or an angiogram) depends on the *reliability* of the test, the physician's *prior expectation* about the patient's likelihood of disease (based on other risk factors), the physician's *confidence* in this particular diagnosis, and the *stakes* of making a mistake – in this case, failing to predict and prevent an impending heart attack (G.A. Diamond and Forrester, 1979). Similarly, the "diagnostic value" of a specific safety cue or a specific minority stress event for predicting rejection within a certain environment depends on the individuals' *prior expectations* of rejection, the *reliability* of the safety/threat cue, one's *confidence* in this particular judgment, and the *stakes* of making a mistake (letting one's guard down too soon and suffering mistreatment). Bayesian approaches are well-suited to modeling the types of complexities in human judgment that underlie the human phenomenology of social safety.

7.3. Unique issues for gender-diverse individuals

We have discussed sexually-diverse and gender-diverse individuals collectively during this discussion, given the similarities in their exposure to stigma and social threat. Yet as we noted at the outset, these populations have different health disparities and different experiences of stigma. A social safety perspective might be particularly useful for understanding the consequences of these differences. Public attitudes toward gender-diverse individuals are more negative than public attitudes toward sexually-diverse individuals (Doan et al., 2019; Flores, 2014; Lewis et al., 2017). Although attitudes toward both groups have become more positive over the past several decades, this change is less pronounced for gender-diverse individuals. Public support for sexually-diverse individuals has doubled over the past several decades, whereas public support for gender-diverse individuals has increased only 40% since 2005 (Flores, 2014). A 2019 Gallup report found that 93% of US adults thought that sexually-diverse individuals (described as "gays and lesbians" in the survey) should have equal employment opportunities (McCarthy, 2019), yet a recent national survey found that only 46% of US adults strongly support laws protecting transgender individuals from discrimination. Approximately 35% of US adults do not view transgender individuals as "natural," 32% think they have a form of mental illness, and 43% do not think they should be able to use the public restroom of their choice (Luhur et al., 2019). Some of the disparities in public attitudes may stem from disparities in individuals' personal familiarity with gender-diverse versus sexually-diverse people. Presently, US adults are up to three-times more likely to personally know a sexually-diverse person than a gender-diverse person (Doan et al., 2019), and individuals with less personal familiarity with gender-diverse individuals are less likely to support public laws and policies that protect and affirm their rights (Luhur et al., 2019). Importantly, a key weakness of existing national survey data is the failure to distinguish between attitudes toward transgender men and women versus a broader range of gender-diverse individuals, such as nonbinary and gender-fluid individuals, and scholars have begun updating existing survey materials to better capture such differences (Billard, 2018).

One unique dimension of stigma directed toward gender-diverse individuals is invalidation. When a sexually-diverse individual mentions to a colleague that they have a same-gender spouse, the colleague might disapprove, but they are unlikely to respond "That's not true" (except in the case of some parents of adolescents, VanBergen and Love, 2021). Yet invalidation is a common experience for gender-diverse individuals. One study using a national survey found that the majority of US adults report that they would classify a transgender person's gender as their birth-assigned gender, regardless of that person's gender expression or identity (Doan et al., 2019). Invalidation of one's identity is particularly common among individuals with nonbinary and gender-fluid forms of identity, who frequently encounter confusion, suspicion, and distrust from parents, peers, and doctors (reviewed in Diamond, 2020). Such experiences may help to explain why some studies find poorer health outcomes among nonbinary and gender-fluid individuals than among transgender individuals (Downing and Przedworski, 2018; Poquiz et al., 2021).

Constant pressures to conform to societal norms for gender presentation provide another unique pressure for gender-diverse individuals (although these pressures also affect some sexually-diverse individuals as well). The national survey by Doan and colleagues (2019) found that US adults were more likely to accept a transgender person's self-described gender identity if their identity closely matched their physical appearance: In other words, US adults only considered a transwoman to be a woman if they thought she "passed" as a woman. As the authors noted, "the public's emphasis on gender conformity suggests that people are most willing to accept those who they perceive as 'like them'" (Doan et al., 2019, p. 13). Yet the entire premise of gender diversity is that not all individuals are alike with respect to gender expression: Gender-diverse individuals who feel chronically compelled to modulate their gender expression or presentation in order to secure social safety will not be able to disengage the threat-detection systems threatening their long-term health. Acceptance of gender and sexual diversity which is conditional on *obscuring* all signs of diversity is not authentic acceptance (underscored by research showing the negative psychological consequences of concealing one's identity and/or "paying to belong" Pachankis et al., 2020; Romero-Canyas et al., 2010).

Gender-diverse individuals also encounter particularly pernicious forms of stigma and discrimination because many individuals react to them with overt disgust (Hill & Willoughby, 2005; Vanaman and Chapman, 2020). Disgust is considered to be a universal human emotion that is easily detected (cross-culturally) with subtle facial cues (Elwood and Olatunji, 2009). Notably, socially anxious individuals appear more neurologically sensitive to cues of facial disgust than others (Yuan et al., 2021), suggesting that individual differences in anxiety and rejection sensitivity may render some gender-diverse individuals disproportionately reactive to the subtle cues of disgust they may encounter in everyday life. Disgust reactions are often associated with hostility and aggression (Bondü and Richter, 2016), and hence gender-diverse individuals may become chronically aware that disgust reactions pose a warning sign for potential violence and abuse. Disgust reactions also figure into legislative efforts to deny basic workplace protections for gender-diverse individuals. In an affidavit present to the Supreme Court opposing such protections, the Alliance Defending Freedom described transgender individuals as disruptive, distracting, bewildering, and incomprehensible, in what commentators have called "the politics of disgust" (Tobin, 2018). Notably, disgust responses to gender-diverse individuals have been found to predict opposition to transgender individuals' restroom access (Vanaman and Chapman, 2020). Knowing that colleagues, acquaintances, and strangers may view you with *disgust*, and not simply disapproval, can substantially undermine gender-diverse

individuals' social safety.

Disgust is not the only component of stigma that is heightened for gender-diverse individuals: Pachankis and colleagues (Pachankis et al., 2018) recently compiled a sweeping taxonomy of different forms of stigma (including race/ethnicity, economic status, physical disability, sexual orientation, gender identity, mental illness, etc.), seeking to chart their dimensional features in order to better understand their implications for well-being. Based on the work of Jones and colleagues (Jones et al., 1984), they categorized stigmas according to five key dimensions: (1) concealability – whether the stigma is visible; (2) course – whether it persists over time; (3) disruptiveness – whether it disrupts the normal flow of social interaction; (4) aesthetics – whether it provokes disgust in others; (2) peril – whether other people view the stigmatized individual as posing a threat. Notably, gender-diverse individuals can have up to *all five* of these characteristics, making them particularly vulnerable to the negative consequences of stigma: If they are visibly identifiable as gender-diverse, their exposure to stigma endures over time, their experiences of interpersonal acceptance and inclusion are chronically disrupted, they are treated with disgust by others, and they are viewed by others as a threat. On the last point, it is notable that public opposition to transgender access to public restrooms often focuses on the unfounded fear that transgender individuals will harm other individuals using the restroom (Hasenbush et al., 2019; Moreau, 2018), despite the fact that it is transgender (and other gender-diverse) individuals who face the greatest risk of physical violence when they enter public restrooms (Murchison et al., 2019).

Gender-diverse individuals may also face unique issues for social safety in health care contexts, given that many seek medical intervention to affirm their gender presentation. The most common medical interventions involve hormonal treatment, such as pre-pubertal administration of gonadotropin-releasing hormone analogues to delay the onset of puberty (Cohen-Kettenis et al., 2008; de Vries et al., 2014), or the administration of estrogen or testosterone to alter physical characteristics (reviewed in Chen et al., 2018). Although the number of clinics and physicians that provide sensitive and affirming medical care has grown in recent years (Chen et al., 2018), lack of medical training on affirmative practices and standards of care for gender-diverse individuals can make it difficult for gender-diverse individuals (especially those without high incomes) to find health care providers and settings that feel safe. An additional hurdle is that many gender-affirmative practice guidelines for physicians were developed to address the needs of transgender youth and adults, and maintain a binary view of gender that does not address the unique issues facing nonbinary or gender-fluid individuals. For example, many practice guidelines focus on the process of a binary gender transition (i.e., transitioning from one binary gender category to another), but many gender-diverse individuals do not seek a binary transition, because they do not view themselves as embodying a single or binary gender (Bilodeau, 2005). In order for gender-diverse individuals to experience social safety in medical settings, medical professionals must adopt approaches that include *all* forms of gender diversity, including those that expand beyond binary notions of gender.

7.4. Interventions to amplify social safety

If social safety is basic human need with direct relevance for health, how can we *increase* it for marginalized populations? Many of the examples of social safety provided in Table 1 provide promising and feasible targets for intervention. Simply adopting inclusive language and inclusive institutional policies (for example, making sure that health care forms provide inclusive assessments of gender) can make a difference For some SGD individuals, opportunities to identify *other* SGD individuals can enhance social safety, which helps to explain why there is a thriving market of t-shirts, hats, bumper stickers, jewelry, and other items that reveal one's gender/sexual identity (or other marginalized identities) to others, and why advocates for SGD youth have emphasized

the importance of visible and accessible role models (Bird et al., 2012; Gomillion and Giuliano, 2011). Interacting with other SGD individuals at community events is associated with mental health and resilience (McConnell et al., 2018; M. L. Rogers et al., 2020), and this may be because such gatherings provide direct confirmation that one is not alone, and authentically accepted. Supportive friends, family members, mentors, and teachers can also provide the same function, which explains why fostering affirmative social ties – even with a *single* supportive teacher or counselor – has been critical to the success of school safety programs (Black et al., 2012; Katz et al., 2016). In many schools and workplaces, the availability of one reliable "pocket" of safety, such as an ongoing social group of fellow SGD individuals, is associated with numerous mental health benefits (Poteat et al., 2013; Toomey et al., 2011), and might arguably be one of the most effective and feasible health promotion strategies for SGD youth and adults. A number of colleges and universities have created "Safe Zones," demarcated with stickers and signs, to designate offices and spaces where SGD individuals can find faculty and staff who are educated and supportive regarding issues of sexual and gender diversity (Evans, 2002; Finkel et al., 2003; Gacita et al., 2017; Katz et al., 2016). Such cues operate by *removing uncertainty* about the type of environment one is entering, and replacing it with unambiguous affirmation.

However, if safety signals are deployed inauthentically, they may erode rather than enhance safety. The term "virtue signaling" entered popular discourse around 2015 (see Bartholomew, 2015; Coaston, 2017), and is used to describe public displays of moral outrage or moral support (for example, social media posts denouncing discrimination) that are primarily motivated by the desire to appear virtuous to others (Westra, 2021). Such performative, status-seeking motivations do not necessarily invalidate messages of support for marginalized groups, but they undermine the *signal value* of such messages. As noted by Coaston (2017), virtue signaling reinforces social cynicism and distrust by introducing doubts about the authenticity of *all* public displays of support for marginalized groups. Hence, one negative outcome of virtue signaling is that it makes it more difficult for marginalized individuals to know where true safety can be found. The very existence of the term "virtue signaling" indicates that individuals have learned to take a skeptical approach to public expressions of inclusiveness or support for marginalized groups, especially when those public expressions come from individuals who are not members of these groups. For marginalized individuals, any doubt about the authenticity of a safety signal is likely to re-engages the very same threat-vigilance mechanisms that authentic safety is supposed to interrupt.

Adopting inclusive language and inclusive institutional policies provide other potential intervention targets. Even in the absence of explicit harassment or victimization, many SGD individuals become aware from an early age that they are different from their peers (Savin-Williams, 1998), and this message is reinforced in the everyday language used by parents, friends, teachers, and the media. As described by Lee, heterosexuality "is as compulsory as math and science" in high school (Lee, 2002, p. 20). Students in her study pointed out that "Teachers are always making comments about 'taking their wives someplace' or 'what they did with their husbands' over the weekend" (p. 20). Another student noted "We are nowhere in textbooks, and there is nothing in the school to suggest that we exist" (p. 20). Simply filling out standardized health intake forms that ask individuals to check a box for "male" or "female" can reinforce feelings of exclusion and introduce uncertainty about how one is likely to be treated. Advocates have published guides showing how to redesign such forms (and assessment procedures) to be inclusive of sexual and gender diversity (National LGBT Health Education Center, 2017), and these approaches provide simple and effective approaches to amplifying social safety. Researchers have also begun to advocate for more inclusive practices regarding the assessment and analysis of sex/gender in biomedical research more broadly (Ritz & Greaves, 2022), and over time these changes may help to normalize sexual and gender diversity more broadly.

Increasingly, social media and the internet provide additional sources of safety (Austin et al., 2020; Baams et al., 2011; Gerke et al., 2020; Selkie et al., 2020), which may prove critical for individuals living in rural areas with smaller SGD populations. Contemporarily, many SGD youth and adults post short videos on TikTok on days when they have been misgendered, felt excluded, came out to someone new, or felt nervous about their appearance, explicitly asking for support from "the alphabet mafia" (a codeword for the LGBTQIA+ community). Typically within 24 h, strangers begin responding with affirmative messages of support and sometimes direct offers of friendship and assistance. One such video posted on January 24, 2021 by jacesjourney01 elicited 465 affirmative comments, such as "You're amazing and strong…you're valid;" "You are meant to be seen and heard. You have the support and love from your TikTok family;" "I don't know you but I'm proud of you." "Honey you are not alone, u r gorgeous;" "Always be proud of who you are;" "You're an inspiration to those of us who aren't as strong as you, please keep shining;" "I am a father. You are perfect and wanted. Never doubt it. You are loved;" "I love seeing beautiful trans faces!" "Stand tall and be strong!!!! I'll stand in your corner and cheer for you;" "I just found you and want to cover you in love and hugs." The creator of the original video expressed heartfelt surprise and gratitude for the hundreds of comments, especially to those who came from self-described surrogate parents. In response to one such comment, he wrote "I promised myself that in my next life, I'd have the mom I so badly needed. Thanks for coming early."

In sum, while advocates for SGD health should continue working to dismantle structural discrimination and reduce SGD individuals' exposure to victimization, we should also work to amplify SGD individuals' access to – and awareness of – social safety across as many settings as possible. Such initiatives are likely to be most successful when they are multifaceted and integrated across multiple levels (affirmative laws and policies at the state and municipal level, easy access to SGD local communities, affirmative school and workplace environments, and ubiquitous community cues of support, connectedness, belongingness, and visibility). The CDC advocates a social-ecological approach to health promotion more generally (Centers for Disease Control and Prevention, 2017), defined as an approach which integrates prevention efforts across four different levels: societal, community, relational, and individual. This strategy has been fruitfully applied to the prevention of suicide (Cramer and Kapusta, 2017), and it offers a promising framework for identifying *gaps* in social safety across multiple levels that can be intervention targets. The best way to consistently downregulate chronic threat-vigilance (and its health consequences) among SGD youth and adults is to provide a *consistent, multilevel* safety net that offers reliable protection wherever they go – at home, at school, and on the street.

One advantage of a social safety approach to intervention is that it provides a rationale for such intervention based on *public health*, rather than societal attitudes and values. Public health is secured through numerous laws and policies (such as regulations governing water quality, or mask mandates in the wake of the Covid-19 pandemic). Such policies are enforced regardless of individual moral or political objections because of their role in preventing disease, which is considered a community priority. Similarly, interventions to foster social safety for SGD individuals should be premised on *society-wide public health*, given the extensive evidence (reviewed above) that insufficient social safety creates a community-wide burden of disease and needless suffering.

8. Conclusion

Meyer's original paper on minority stress included a striking quote from Allport's *Nature of Prejudice* (Allport, 1954): "One's reputation, whether false or true, cannot be hammered, hammered, hammered into one's head without doing something to one's character" (p. 142). Meyer correctly identified minority stress as one result of this hammering. Yet it is not the only one. The human brain is both probabilistic and plastic: We evolved sophisticated brain mechanisms that learn to prepare for

threat within dangerous environments and to prepare for safety within nurturant ones (Ellis et al., 2022). Although one's "safety threshold" is initially set by childhood conditions, childhood is not the only sensitive period for safety: Developmental psychologists suggest that humans have *multiple windows* of heightened sensitivity to environmental conditions (Ellis et al., 2022), and social safety is arguably one the most important and salient environmental conditions of all. There is no age at which individuals "grow out" of their need for social safety, and hence changes in social safety may improve health at any age. In order to reduce the levels of cardiovascular disease, arthritis, asthma, depression, and other inflammatory conditions that SGD individuals develop by age 70, we need to dramatically and pervasively increase their access to social safety (social connection, inclusion, protection) as early and as consistently as possible.

Many scholars adopt a *fundamental cause* perspective on social inequality and health (Bränström et al., 2016; Khan et al., 2017; Link and Phelan, 1995), which argues that health disparities stem from the fact that high-status groups have access to more health-protective resources than members of lower-status groups, including financial resources, access to preventive health care, and also "knowledge, prestige, power, and supportive social connections" (Bränström et al., 2016, p. 1113). We argue that *social safety* is one of these health-relevant resources, and its absence in the daily lives of SGD individuals is a fundamental cause of their mental and physical health disparities. Human beings' social nature accounts for the power of social support and social connectedness to foster psychological and physical well-being, but also the power of disconnection, isolation, and rejection to be experienced as primal survival threats that trigger powerful self-protective biobehavioral processes that impair our health over time (Coan et al., 2006; Holt-Lunstad et al., 2015; Holt-Lunstad et al., 2010). In order to foster SGD well-being, we need to devote as much attention to what is *missing* in the lives of SGD individuals as we have devoted to the extra burdens they face. As noted by Ryff and colleagues (Ryff et al., 2006), positive health and flourishing are not simply the "reverse" of disease and dysfunction, but have distinct drivers and mechanisms. Social safety is among the most powerful foundations for human thriving, and broader attention to its biopsychological consequences has the potential to dramatically enhance well-being across the spectrum of sexual and gender diversity.

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