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Review Article

Social Determinants and Consequences of Pain: Toward Multilevel, Intersectional, and Life Course Perspectives



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Abstract: Despite wide endorsement of a biopsychosocial framework for pain, *social* aspects of pain remain rarely addressed in the context of pain prevention and management. In this review, we aim to 1) examine the broad scope of social determinants and consequences of pain and their interactions across multiple levels of organization, and 2) provide a framework synthesizing existing concepts and potential areas for future work on social aspects of pain, drawing upon socioecological, intersectional, and life course approaches. Integrating interdisciplinary theory and evidence, we outline pathways through which multilevel social factors and pain may affect each other over time. We also provide a brief summary of intrapersonal aspects of pain, which are thought to operate at the interface between individuals and the social context. Progressing from micro- to macrolevel factors, we illustrate how social determinants of pain can directly or indirectly contribute to pain experiences, expression, risk, prognosis, and impact across populations. We consider 1) at the interpersonal level, the roles of social comparison, social relatedness, social support, social exclusion, empathy, and interpersonal conflict; 2) at the group or community level, the roles of intimacy groups, task groups, social categories, and loose associations; and 3) at the societal level, the roles of political, economic, and cultural systems, as well as their policies and practices. We present examples of multilevel consequences of pain across these levels and discuss opportunities to reduce the burden and inequities of pain by expanding multilevel social approaches in pain research and practice.

Perspective: *Despite wide endorsement of a biopsychosocial framework for pain, social aspects of pain are often unclearly defined, hindering their use in pain prevention, management, and research.*

We summarize the scope of social aspects of pain and provide a framework synthesizing existing concepts and potential areas for future work.

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Key words: Social structure, social determinants of health, health equity, life course perspective, intersectional framework

For over a hundred years, a person's social context has been recognized by some as a key determinant of variability in pain experiences,¹ contributing to the now-substantial body of interdisciplinary evidence supporting a biopsychosocial understanding of pain risk, perception, expression, and prognosis.²⁻⁶ Yet, the social determinants and consequences of pain remain relatively rarely considered in the context of acute or chronic pain prevention and management. Instead, pain assessment, research, education, and care have been overwhelmingly directed toward intrapersonal biological and psychological determinants and consequences of pain.⁷ This may be due, in part, to a lack of clarity over what constitutes social and psychological factors in the biopsychosocial model.⁷ For example, social aspects of pain are often conflated with psychological aspects under the term "psychosocial." While this term pays homage to the important links between psychological and social factors, it does not otherwise do justice to the unique contributions of social contexts to pain.⁷

Recognizing that biomedical and psychological approaches alone are not enough to fully understand pain, much less to effectively address its personal and societal burden and inequities, there have been several recent calls for greater attention to social aspects of pain.⁷⁻¹² Despite growing awareness of social foundations of pain, different disciplines often have produced theory and evidence focused on 1 or 2 levels of organization (eg, psychology and behavioral neuroscience focused on intrapersonal level, social psychology focused on interpersonal level). This fragmentation may have limited appreciation of the overall breadth of social aspects of pain and how they shape pain experiences and pain outcomes. The purpose of this review is, therefore, to address such limitations by illustrating how social factors at multiple levels can influence and be influenced by pain and enhance the biopsychosocial framework of pain to inform novel pain research and practice.

In this theory-informed review, we aim to 1) examine and illustrate the broad scope of social determinants and consequences of pain and their interactions across multiple levels of organization, and 2) provide a framework to situate current research across disciplinary boundaries and highlight areas for future work on social aspects of pain. We do this by drawing upon socioecological, intersectional, and life course approaches. Specifically, by "theory-informed," we mean that the paper aims to provide theory to support existing evidence and proposed future directions. We begin with a brief account of how social factors may affect pain through biological and psychological mechanisms. Then, we examine higher levels of organization beyond the individual, describing potential interpersonal, group, and societal-level social determinants of pain, as

well as social consequences of pain at each of these levels. Integrating theory with evidence, we outline pathways through which multilevel social factors and pain may affect each other over time. Last, we discuss how improved conceptualization of multilevel social aspects of pain creates opportunities to enhance pain research, care, advocacy, and policy, thus maximizing the potential effectiveness and equity of pain prevention and management.

Toward a Multilevel, Intersectional, and Life Course Framework of Pain Etiology and Impact: An Overview

The original application of the biopsychosocial framework conceptualized the person in a hierarchically arranged continuum of natural systems nested within each other (Fig 1).¹³ Socioecological frameworks have been widely used to contextualize individual-level factors and investigate how the many layers of social context constrain or facilitate health and disease.¹⁴ We build upon this multilevel conceptual approach by providing a specific structural emphasis on social aspects of pain, described in more detail in the sections below.

In addition to the different organizational levels, from individual to societal factors, we consider the evidence within 2 cross-level elements: a life course perspective¹⁵ and an intersectional systems approach to inequity^{16,17} (Fig 2). The life course perspective emphasizes the role of time and timing in the study of health and disease, over the lifespan of individuals, and historically time across generations.¹⁵ This approach has been underexplored in pain research,¹⁸⁻²² yet informs investigations of etiological processes and optimal timing for deployment of preventive and treatment measures.²³ The life course approach elicits reflection on the dynamic nature of interactions among biopsychosocial aspects of pain over time.¹⁸ For instance, it calls attention to how social factors differentially affect pain vulnerability or resilience at different stages of development (eg, critical or sensitive periods) and how social determinants and consequences of pain can accumulate and interact over an individual's lifespan and influence the distribution of risk and impact of pain across generations.

We also highlight intersectional systems of inequity (eg, racism, sexism, classism, etc), which shape, according to people's social positions, the distribution of salutary and harmful circumstances across levels of organization. Pain inequities are defined as differences in pain experiences that result from these systematically and socially produced unequal conditions between social groups.²⁴ Moreover, the concept of intersectionality is key to explaining how people's experiences are simultaneously influenced by different systems of inequity in ways that are not sufficiently

Continuum of Natural Systems

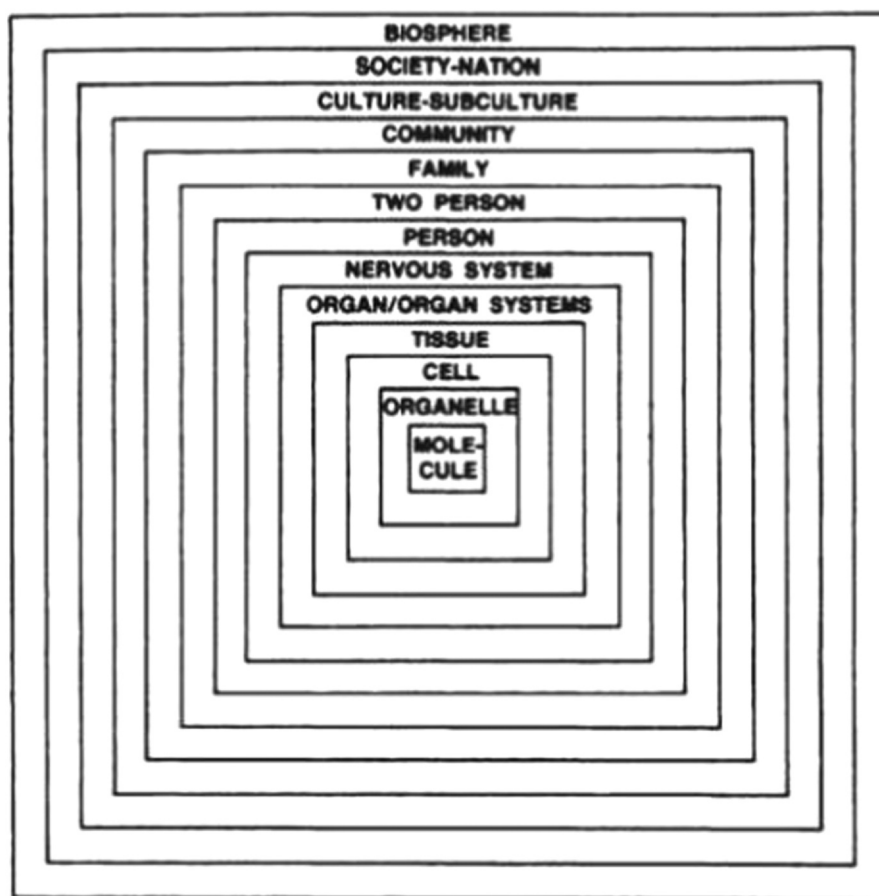


Figure 1. Continuum of natural systems. Reproduced with permission from Engel.¹³

understood by narrowly focusing on the impact of each of these systems individually.¹⁷ Social determinants and social consequences of pain can be conceptualized as contributing to systems of inequity when they systematically confer more favorable conditions to people in intersectional positions of greater social status and power.

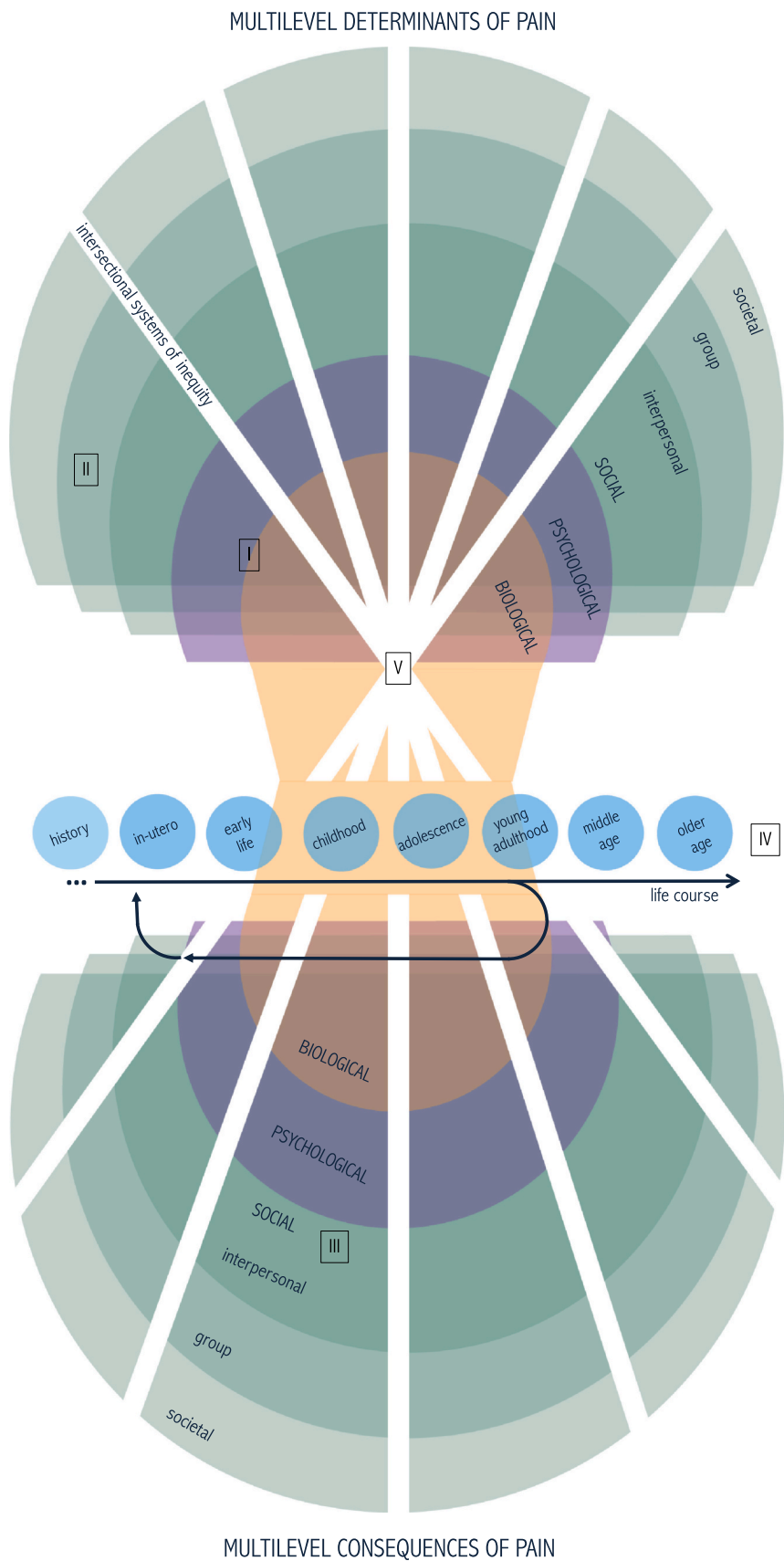
In our proposed framework, multilevel determinants and consequences of pain are represented by overlapping and nested shapes, across biological, psychological, and social domains (including the multiple levels of social aspects of pain discussed in this paper: interpersonal, group, and societal). Blank bars are overlaid over all levels of organization, representing intersectional systems of inequity and the influence of their multilevel structures. The arrow from left to right represents the direction of time over the life course, the blue circles represent different life stages and phases of development, and the recurring arrows represent intergenerational influences within families and populations (Fig 2). Together, socioecological, intersectional, and life course perspectives support the understanding of complex, dynamic, and multifactorial determinants and consequences of pain.

Complex bidirectional relationships exist within and between the biological, psychological, and social

domains relevant to the pain experience. In the intrapersonal and interpersonal sections below, we focus on multilevel *determinants* of pain. After that, we examine multilevel *consequences* of pain, noting that social consequences of pain are, in turn, contributors to later pain in many instances. We examine social determinants and consequences of pain from micro to macro levels of organization, starting with a summary of biological and psychological determinants of pain, which may be influenced by social factors at higher (eg, interpersonal, group, and societal) levels. While, unfortunately, there was no direct “patient and public involvement” in this project to date, it will be essential for determining the most critical priorities for different groups, as well as developing and implementing adequate interventions, disseminating, and critiquing this work.

Intrapersonal Determinants of Pain: How the Social Context “Gets Under the Skin”

We conceptualize intrapersonal determinants of pain as the biological and psychological systems that shape pain at the individual level. In this section, we describe key examples of cognitive, affective, behavioral, and



(caption on next page)

Figure 2. Toward a multilevel, intersectional, and life course framework of determinants and consequences of pain. I. Intrapersonal Determinants of Pain: Pain experiences and expression are modulated by cognitive, affective, behavioral, and sensory processes that allow for learning and adaptation to social cues about threats to integrity. Individual psychological and biological determinants of pain are the result of historical and ongoing interactions between genetic, epigenetic, and environmental conditions, which are embedded in and shaped by multilevel social factors. II. Multilevel Social Determinants of Pain: Across nested levels of organization (eg, interpersonal, group, and societal), social positions, processes, and systems shape the conditions in which people are born, develop, play, work, and age. These social factors determine experiences, resources, and opportunities to prevent and manage pain, which contribute to the distribution of pain across populations. III. Multilevel Consequences of Pain: Especially when chronic, pain is consequential to biological, psychological, and social well-being. Pain may impact individual self-perception, interpersonal relationships, and participation in valued social groups, with a substantial impact on social systems and the population burden of disability. IV. Life Course and Intergenerational Dimensions: Life stages are associated with changes in biopsychosocial functions relevant to exposure to pain, stress reactivity, as well as pain sensitivity, meaning appraisal, and coping. Critical and/or sensitive periods may present optimal points for interventions to prevent and manage chronic pain. The effects of multilevel determinants of pain may accumulate and interact over the life course, potentially contributing to intergenerational transmission of pain and its consequences. V. Intersectional Systems of Inequity: Systems of inequity are human-made to create and maintain social stratification and inequitable hierarchies (eg, racism, sexism, classism, ableism, ageism, nativism, heterosexism, and gender binarism). These systems jointly produce effects beyond their separate influences and, thus, are called intersectional. They manifest across all levels of determinants and consequences of pain (eg, institutional, interpersonal, and internalized inequities), creating generally more favorable conditions for people in positions of greater power and status.

physiological processes that are thought to be directly influenced by social context, thus mediating the impact of multilevel social factors on individual pain experience and expression.

Cognition

Cognitive processes often represent some of the earliest mechanisms connecting social context to pain. Pain, as a sign of potential harm, is an intrinsically salient experience as it captures attention when fulfilling its role as an embodied defense.^{25,26} Humans, as well as other species, often display exquisite sensitivity to the immediate social context, including an appreciation of information about the environment provided by conspecifics, such as reactions and consequences of pain-related displays.²⁷ It is not unusual for people to suppress reports of pain out of concern about the loss of social roles or the impact on others.²⁸ Social context can alter the salience and meaning of a noxious stimulus and shift the attention of the individual in pain.²⁹ For example, social partners can contribute to reinterpretation of noxious events as relatively innocuous, leading to higher pain tolerance and lower pain ratings.^{30,31} Opposite effects were observed when social partners amplified the perceived threat of noxious events.³²

Beliefs about the causes and consequences of pain have also been found to modulate appraisals of pain. For example, within some religious systems, beliefs in an external or divine locus of control of pain have been associated with increased pain and disability in both Western^{33,34} and Eastern populations.³⁵ In contrast, belief in an internal locus of control of pain is associated with higher self-efficacy and lower pain.³⁶⁻³⁹ A spiritual sense of meaning and purpose in life has been associated with lower pain catastrophizing and higher pain self-efficacy.⁴⁰

Affect

Social factors may also influence pain by modulating affective mechanisms. The relationship between pain and emotion is characterized by both overlapping and distinct neural pathways.⁴¹⁻⁴³ Thus, social factors may influence pain by eliciting emotional states implicated

in pain modulation, such as fear⁴⁴ and anxiety.⁴⁵ For example, social contexts that increase the perceived threat of pain are associated with increased pain report.^{44,46,47} Pain can also be perceived as more intense and unpleasant when intentionally caused by others.⁴⁸ Perceived injustice associated with the causes of pain may contribute to suffering through mechanisms such as anger⁴⁹ and depression,⁵⁰ with detrimental effects on pain, disability, and mental health.⁵¹

In contrast, social contexts that elicit positive emotions may help reduce pain. Emotionally positive social interactions, such as holding the hand of a romantic partner, are associated with reduced pain unpleasantness,⁵² reduced skin conductance,⁵³ and reduced brain activity in regions underlying threat responses⁵⁴ and somatic pain.⁵⁵ Similarly, the positive affective experience of social laughter has been found to trigger endogenous opioid release⁵⁶ and increase pain threshold.⁵⁷

Behavior

Pain behaviors are expressed at the individual (ie, intrapersonal) level and often connect social context to pain experience and expression. For example, pain behaviors (eg, activity patterns and coping strategies) can be reinforced or punished through social interactions with significant others, or through cultural context.⁵⁸⁻⁶⁰ People's perceptions about pain and harm associated with an activity can also be influenced by social observation of others' pain behaviors, especially in the presence of pain-related fear.⁶¹ Passive pain coping strategies, such as restricting or canceling social activities, are associated with increased disability, sick leave, and pain-related psychological distress.^{62,63} Prayer and meditation, among the most common pain coping strategies, have mixed evidence of effectiveness,⁶⁴⁻⁷⁰ possibly dependent on their active versus passive nature.⁷¹

Pain expression via verbal or nonverbal pain behaviors may elicit social support, harm, or avoidance from others.⁷² The amplification or suppression of pain behaviors may have evolved specifically to communicate pain depending on potential social benefits or risks.⁷³ For example, when social support is present and considered satisfactory, pain behaviors may increase.^{74,75} In

contrast, when in the presence of someone who is potentially threatening, pain expressions can be suppressed.^{47,76,77} This mechanism is thought to explain why social learning and reward system activation may play a role in pain chronification.^{78,79} For example, neural systems involved in behavioral control and response monitoring have been implicated as mediators between facial expressions of others in a social context and pain reports in patients with chronic pain, but not in healthy controls.⁸⁰

Physiology

Social context is also thought to affect pain through facilitation or inhibition of physiological responses to acute and chronic stress.^{81,82} Exposure to early-life adversity, including family violence or loss, lower socioeconomic status, and deprivation, is associated with detrimental impacts on stress reactivity and pain.⁸³⁻⁸⁵ Negative social experiences across the lifespan, such as persistent discrimination, have also been found to affect nociceptive processing via stress pathways.⁸⁶⁻⁸⁹ Acute threat perception can be adaptive: Stress elicits a cascade of central and peripheral physiological changes, including increased cortisol secretion by the hypothalamic-pituitary-adrenal axis, which can enhance pain and aid the consolidation of fear-based emotional memories that protect the individual from future harms.⁸¹ In contrast, chronic stress ultimately reduces cortisol secretion, increasing the production of proinflammatory cytokines, which have been found to increase pain through both peripheral and central sensitization.⁹⁰ Accordingly, hypocortisolism has been associated with the development of a variety of chronic conditions, including fibromyalgia and chronic fatigue syndrome.^{81,91}

Chronic stress can also result in even longer-term effects on pain sensitivity through epigenetic (eg, DNA methylation) upregulation of proinflammatory genes and downregulation of antiviral genes through the conserved transcriptional response to adversity.⁹²⁻⁹⁴ These neuroendocrine and immune-functional changes in response to environmental stress may contribute to the life course and intergenerational effects of social adversity on pain.⁹⁵ Social support may also decrease pain through similar physiological pathways, highlighting the dynamic nature of physiological mechanisms connecting social context to pain.⁹⁶

Multilevel Social Determinants of Pain

In this section, we describe potential social determinants of pain at different levels of organization *beyond the individual level*, going from micro to macro scales, proximal to distal relative to individuals. We define social factors as systems (eg, institutions, organizations, groupings, and their norms and policies), processes (eg, relationships, interactions), and/or positions (eg, group membership, roles) that emerge from or are modified by the engagement of individuals with each other. People experience different combinations of these factors over their life course, which may shape their pain

perception and expression, as well as vulnerability and resilience to pain.

Interpersonal-Level Determinants of Pain

Interpersonal interactions and the relationships people have with others, both past and ongoing, shape their experiences of pain—for better and for worse. We summarize some of the main research at this level, exploring how social comparison, social relatedness, social support, social exclusion, empathy, and interpersonal conflict may influence individuals' experiences of pain and distress, their expectations of pain, and pain behavior.

Social Comparison and Social Relatedness. Social comparison theory⁹⁷ highlights the importance of others in providing normative standards. The potential threat to quality of life posed by illness, including pain, can bring uncertainty that leads to self-other comparisons on dimensions, including symptom severity and symptom management.^{98,99} Cognitive appraisals of the interpersonal social context, such as upward contrast ("other people are able to cope so much better than me") and downward identification ("people suffering from chronic pain like me never get better") comparisons are accompanied by greater pain and worse psychological outcomes.¹⁰⁰⁻¹⁰³ The reverse pattern with better outcomes holds for those making upward identification ("most people get better") and downward contrast ("my problem isn't as bad as theirs") comparisons.^{103,104} Social modeling and expectation mirroring can also impact pain. For example, observation of others going through a potentially painful experience without significant distress has been shown to reduce perceived pain¹⁰⁵ and physiological reactivity¹⁰⁶ when the observer undergoes the same procedure. Low levels of anxiety or fear about medical procedures displayed by care providers have also been associated with lower patient pain and distress.¹⁰⁷⁻¹⁰⁹

Studies of neurodiversity also provide insights into the importance of interpersonal factors in pain. Autism, for example, is characterized by differences in interpersonal social relatedness and is associated with altered sensory¹¹⁰ and social responses to pain.^{111,112} Despite there being no evidence for altered psychophysical response to noxious stimuli,^{113,114} autistic children display greater overall facial response to venipuncture,¹¹⁵ and greater and persisting nonverbal behaviors following venipuncture,¹¹⁶ as well as elevated pain anxiety compared with neurotypical controls.^{117,118} Autistic children use less social referencing in ambiguous situations,¹¹⁹ which in turn may alter social learning about threat and pain, as well as impact on caregiving behavior. For example, tendencies to engage in adaptive morphing¹²⁰ (sometimes also called camouflage or masking) of autistic symptoms or affective states can reduce access to medical care or lead care providers to underestimate pain or perceive malinger behavior.^{121,122}

Social Support. Perceived or received social support can exacerbate or attenuate the experience of pain. Social support may include the provision of pain relief, for example, by administering medication or facilitating the use of adaptive coping strategies.¹²³ It can also improve chronic pain adjustment by facilitating well behaviors^{124,125} and promoting functional autonomy.^{126,127} Social support may also modulate individual pain experience by influencing attention to and evaluation of noxious stimuli, as well as through validation of the unpleasantness of sensations and associated feelings of distress.^{29,128,129} For example, when parents or health care providers distract children during a painful procedure, the child experiences less pain and less fear of pain in the future.¹³⁰ Parent-led pain reframing after surgery may also help children remember postsurgical pain more accurately or positively, with potential impact on future pain experiences.¹³¹ To the extent that the presence of a care provider is comforting and reassuring (as opposed to threatening), distress and pain are lessened.^{44,46,132,133}

While generally considered salutary, certain pain-related social support responses can also have detrimental effects. For example, solicitous responses to another's pain, such as taking over their tasks or responsibilities, can lead to increased pain, distress, and disability.¹³⁴⁻¹³⁷ In addition, expressions of extreme alarm or fear from a care provider can lead to greater pain and distress.¹³⁸⁻¹⁴² It is also possible that pain may increase in response to encouragement or positive reinforcement. For example, to the extent that experiences of sympathy and care from another person are contingent upon the expression of pain, care from others may be associated with increased pain behavior.¹⁴³ McMurtry and colleagues¹⁴¹ found that efforts to reassure children that their pain will soon dissipate ("it's ok," "you're ok") may lead to increasing distress if children perceive these attempts at reassurance as a sign of parental fear.

Social Exclusion. Social exclusion and isolation are associated with increased pain behaviors and disability. For example, patient-reported social isolation has been found to predict worse pain interference and disability in persons with chronic pain.^{144,145} Consistent with these findings, a large cross-sectional study of UK Biobank participants found that social exclusion (a composite of social isolation and deprivation) and loneliness were associated with increased prevalence of acute and chronic pain.¹⁴⁶ Experimental evidence suggested levels of distress caused by social exclusion are associated with reported pain unpleasantness.¹⁴⁷ In contrast, there are mixed results with respect to the impact of social exclusion on pain sensitivity.¹⁴⁸ While social exclusion experiences are associated with activation of somatosensory brain regions linked with physical pain,¹⁴⁹ reduced pain sensitivity (eg, "numbing") responses to social exclusion are also reported.¹⁵⁰

Empathy. Empathy can occur when an observer demonstrates (and the individual perceives) a shared understanding of another person's experiences at emotional and cognitive levels.¹⁵¹ Pain empathy can

manifest as concern, nonjudgmental acceptance, perspective-taking, and a desire to help relieve discomfort.¹⁵² Observers can convey empathy verbally through explicit acknowledgment and/or validation and instrumentally through the provision of support. Empathy can also be conveyed nonverbally through touch, listening without interruption, eye gaze, mirroring of emotional expressions or behaviors, and affective synchrony. The receipt of empathy from others can shape individuals' pain experience for better or worse depending on previous experiences and the disposition or traits of the individual experiencing pain. In general, when people receive empathy for pain from others (family, friends, strangers, or care providers), they experience comfort (reduced distress), pain is experienced as less threatening, and consequently, pain is more tolerable, and noxious stimuli may even be experienced as less painful.¹⁵³⁻¹⁵⁶

Given experimental evidence that racial ingroup bias can limit empathic response to the pain of others,^{157,158} approaches such as perspective-taking have been shown as potentially useful in medical contexts. For example, a virtual perspective-taking intervention for health care providers reduced racial and socioeconomic bias in pain care decision-making.¹⁵⁹ Enhancing perspective-taking in an observing partner also led to lower pain severity and higher pain tolerance in their partner receiving experimental noxious stimuli.¹⁶⁰ However, the perception of empathic concern from others may also exacerbate pain if the receiver or person with pain has an insecure (avoidant) attachment style (ie, experiences discomfort when receiving care and concern from others),^{139,161,162} is high in trait anxiety, or has difficulties with emotion regulation.^{163,164}

Interpersonal Conflict. Interpersonal conflict can also influence the experience of pain. Conflict may be experienced in a variety of interpersonal contexts, including intimate, health care, and workplace relationships. In the context of close relationships, punitive (hostile, invalidating, or dismissing) responses to the expression of pain have been associated with additional physical and psychosocial impairment in the person with pain.^{60,165} Domestic abuse is particularly detrimental—people who are injured by a close-relationship partner are significantly more likely to develop chronic pain than those injured outside of the home.¹⁶⁶ Workplace bullying has also been found to prospectively predict chronic pain onset.^{167,168} Health care professionals may also be implicated by those with long-term painful conditions as having unjustly contributed to injury or provided inadequate care.^{169,170} While fraudulent misrepresentations of pain are rare, there can be suspicion of the credibility of pain among health care professionals, caregivers, employers, insurance adjusters, or others.^{171,172} Such invalidating perceptions and responses, which may lead to underassessment and undertreatment of pain, have been documented to be disproportionately common toward women,^{173,174} people of diverse gender identities, people who are racialized, and/or people perceived to be of lower socioeconomic status.^{175,176}

Group-Level Determinants of Pain

People are born to, acquire membership to, or are perceived to belong to different groups, which play central roles in various aspects of their lives, with potential implications for pain. According to a well-established socio-cognitive taxonomy,¹⁷⁷ individuals are affiliated with 4 group types: 1) intimacy groups, such as family or friends; 2) task groups, such as work-related organizations or vocational associations; 3) social categories, such as gender, social class, race/ethnicity, and religion; and 4) loose associations, such as people living in the same neighborhood or people attending a social event. Several types of group membership are thought to shape interpersonal dynamics as well as aspects of individual pain experiences and their expression.

Intimacy Groups. Individuals' intimacy groups (eg, friends or family) are complex, dynamic systems whose characteristics and resources may influence the development, maintenance, and management of pain.¹⁷⁸ Families—for example, caregivers and partners—are a primary source of information about pain, influencing individuals' pain beliefs, emotional responses to pain (eg, fear, distress), and behavioral coping strategies (eg, avoidance of activity, support-seeking).¹⁷⁹ Families are also a primary source of attachment and social support. Having a family who represents a “safe haven” has been associated with lower distress and increased tolerance to a painful experimental procedure, while inconsistent or distant family relationships with anxious or insecure attachments are associated with an increased prevalence of pain and pain-related disability.^{180,181} Additionally, having a family member with chronic pain is associated with higher odds of chronic pain.¹⁸² Ethnocultural variation in pain experience and expression is often transmitted through family influence. Pathways of intergenerational transmission of pain may include social learning (eg, modeling and reinforcement),¹⁸³ adverse childhood experiences (eg, uncertainty associated with parental illness or, in extreme cases, neglect), and elevated risk of child depression.¹⁸⁴⁻¹⁸⁶ Family social and economic deprivation is strongly associated with both adverse childhood experiences¹⁸⁷ and attachment style,^{188,189} as well as with the prevalence of high-impact chronic pain among adults.¹⁹⁰

Task Groups. Work-related environments can impact development and adjustment to chronic pain.¹⁹¹ Workers have a higher likelihood of developing musculoskeletal (neck and low back) chronic pain with longer recovery time and delayed return to work¹⁹² when 1) their workload and ergonomic demands are high¹⁹³⁻¹⁹⁶; 2) they have low job control or decision authority,^{193,195} high job demands,¹⁹⁵ and, hence, high job strain¹⁹⁷; 3) they have low satisfaction with the workplace¹⁹⁶; and 4) they have lower levels of peer and supervisor social support.^{193,195}

Social Categories. Social group membership can be subject to discrimination, and differential access to

resources and opportunities, which can affect the pain experience.¹⁹⁸ For example, there is growing evidence of the impact of racism on pain—although much of the literature to date has been framed as examining “racial/ethnic differences” in pain and pain management. For instance, among African Americans, there is a consistent relationship between perceived discrimination and both chronic pain and evoked pain, as well as neurobiological correlates of pain,^{89,199} above and beyond socioeconomic and health-related factors.^{86-88,200} Similar associations have also been found for indigenous (Sami) populations in rural Norway,²⁰¹ Vietnamese-Americans, Filipino-Americans, and Chinese-Americans.²⁰² Multiple dimensions of racialized discrimination (but not all²⁰³), as well as decreases in objective and subjective life course social status, have also been found to be associated with enhanced temporal summation of pain among Latinx Americans,^{203,204} while perceived discrimination has been identified as a potential mediator of both impaired descending pain inhibition and chronic pain onset among Native Americans.²⁰⁵ While most of the research on racial pain inequities has been produced in the United States, there is growing awareness of the global need to recognize and address racism in pain science, policy, and practice.²⁰⁶ It should also be noted that, while the majority of research into the association between minority group membership and pain outcomes measures perceived discrimination, it is important to recognize that discrimination cannot be eliminated by interventions aimed at changing people with minoritized affiliation attention to or perceptions. Rather, it is the people, groups, institutions, and systems themselves that must change in order to repair the experiences of people from marginalized groups.

Discrimination and bias,²⁰⁷ based on other social identities, have also been linked to pain, including gender,^{198,208-210} education, employment status, age, place of birth,²¹¹ and other marginalized identities.²¹² Inappropriate pain care and invalidating judgments due to social group membership may also contribute to disparities in pain and suffering. For example, recent experimental studies have shown classism in pain assessment and management.^{159,213-215} Several studies have also shown that, despite equivalent health care needs, compared with men, women's chronic pain is less often perceived as legitimate and deserving of effective pain relief. Women's pain is more mistrusted, psychologized, and they receive less opioids, more antidepressants, and more mental health referrals (for reviews, see^{210,216}). The previous discussion of perceived discrimination is not meant to imply that agents of change should focus exclusively (or primarily) on eliminating racism and bias in the clinical arena. Structural systems of inequity and exclusion (ie, see the section on Societal-Level Determinants of Pain below) that dehumanize people of marginalized social categories are at the root of these expressions of and are impossible to disentangle from discrimination at the interpersonal and group levels.

Group-level normative standards of masculinity and femininity are thought to play a role in differences in pain by gender.²¹⁶⁻²¹⁸ Patterns of gender norms about pain are consistent with the concepts of hegemonic

masculinity and andronormativity, in which individuals are evaluated against standards of stereotypically masculine attributes and behaviors (eg, stoicism, strength, and independence) that are considered prevailing and normative over stereotypically feminine ones (eg, emotional, caring, and sociable).^{210,219} These stereotypic perspectives are thought to impact socialization of pain experiences and pain expression during early childhood.^{175,218,220} Gender is also considered to have a situationally specific effect on pain.²¹⁸ For example, experimental manipulation of information about gender roles affects pain and how it is reported.²²¹⁻²²³ Taken together, evidence suggests that some gender differences in pain are not fixed or inherent, but partly learned, flexible, and dependent on social context.^{175,216,218,220} Emerging research also emphasizes the need to advance our understanding of the roles of gender beyond binary woman/man categories on pain, with implications for care equity.^{175,216,224}

People are not singly defined by 1 social category at a time (eg, race, gender, class, ableness, immigration status, age, and sexual orientation), with their experiences and health shaped by the combination of their social positions and the relative value attributed to them in a given context and historical moment. It follows that social categories are not static and monolithic. Interactions between social categories such as race and socioeconomic status,²²⁵ age and socioeconomic status,^{226,227} as well as race and gender¹⁷⁶ have also been found to result in different burdens of pain, biases in pain care, and pain-related stigma. People may live at uniquely oppressive or invisible intersections between multiple marginalized positions or simultaneously benefit from privilege due to other aspects of their social positions.^{17,228} These complex intersectional positions may have implications on wellness and pain by socially determining exposure to risks and access to resources to stay healthy or manage symptoms that may arise. To date, few studies have used intersectional frameworks to consider heterogeneity of pain phenomena across multidimensional social positions.^{176,225,229-233}

Loose Associations. Measures of social group integration and connection have also been found to impact pain. Higher neighborhood social cohesion—or the degree to which neighborhood members feel they can trust and rely on one another to cooperate and help each other when in need—may be protective against chronic pain and disability, for example, through higher levels of physical activity.²³⁴ Similarly, higher social capital (eg, participation in local community, feeling of trust, and neighborhood connections) has been found to be associated with lower pain in persons with fibromyalgia and lower odds of having dental pain, musculoskeletal pain, depression, and somatic symptoms in population-based studies.²³⁵⁻²³⁷ In experimental studies, synchronized group activities (eg, choir singing, rowing, and dancing) have been shown to increase social bonding and increase pain thresholds, even when group members are not known to each other.²³⁸⁻²⁴⁰

Societal and systemic factors often differentially impact people in different social categories or intersectional social positions, shaping the environments where they live, work, and play, often creating a disadvantage for marginalized groups.

Societal-Level Determinants of Pain

Political, economic, and cultural systems and institutions—societal determinants—are thought to regulate social relations of groups and individuals, defining rights and responsibilities, as well as shaping the distribution of power and resources within and between social groups, within and between countries.²⁴¹ The resulting conditions of living, development, and opportunities that influence health differ between social groups across place and time. Such differential access to health resources has been recognized since at least the mid-1800s.²⁴² Under the assumption of health as a universal human right, critical approaches to the social determinants of health have sought to expose the societal mechanisms responsible for health inequities.

Inequity-Generating Mechanisms. Chronic pain has been widely documented to disproportionately impact persons in socially marginalized positions.^{190,212,243-245} Moreover, the fundamental social causes of pain inequities have also been increasingly interrogated in the literature.^{206,246-248} For instance, health (including pain) inequities have been theorized to derive from broader systems of beliefs and practices rooted in unjust ideas of superiority of certain groups, which are used to motivate and justify the control, domination, and exploitation of other groups for their benefit (eg, racism and white supremacy, sexism and patriarchy, classism, gender binarism, heterosexism, ableism, ageism, nationalism, imperialism, etc).^{16,249} These systems of power and inequity are assumed to create and maintain social stratification or fail to undo structures and dynamics that provide unearned privileges to dominant groups (ie, institutionalized or structural inequities).²⁵⁰⁻²⁵²

Upstream Social Systems as Root Causes of Pain. Societal factors may influence pain through effects on group-level, interpersonal, and individual life experiences, shaping access to resources and conditions to prevent and manage pain over the life course. For example, political, economic, and cultural systems often shape participation of people from different social groups in spaces of power (eg, knowledge production, voting rights, representation in government, policymaking, and communication). Norms, policies, and values produced in these spaces may reinforce unequal access to goods, services, and opportunities for different social groups (eg, quality education, safe housing, nutritious food, leisure time, adequate employment and working conditions, wealth, and health care).²⁴¹ In turn, group membership and the resulting life trajectories may influence risk and protective factors for pain at the interpersonal (eg, social support, interpersonal conflict,

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and interpersonally mediated discrimination²⁵¹) and individual levels (eg, internalized stigma, assumptions about own abilities, and worth²⁵¹). For example, although different aspects of socioeconomic position—that have some of the most consistent evidence as social determinants of pain^{11,253}—are often measured in research as individual-level characteristics, their impact on pain depends on differences in social circumstances and resources determined by inequitable sociopolitical contexts²⁵⁴ (ie, systematically worse life conditions for people with lower income, education, occupation, wealth, etc). Furthermore, higher societal inequities (eg, Gini Index, Gender Inequality Index) are associated with higher country-level prevalence of pain overall, not only among disadvantaged groups.²⁵⁵

Neighborhoods and Local Environment. Societal factors are thought to influence access to neighborhood-built and social environments according to people's social positions.²⁵⁶⁻²⁵⁹ Access to these different social contexts may influence pain outcomes, for example, through exposure to crime, injury, conduciveness to physical activity, and psychosocial distress.²⁶⁰ Walkability and proximity to parks have been associated with lower levels of pain, pain-related disability, and better physical functioning in adolescents, net of select family socioeconomic characteristics and pain history.²⁶¹ Neighborhood disadvantage has also been associated with a variety of negative pain outcomes, such as higher pain intensity and interference during the first year after a motor vehicle collision,²⁶² higher onset of pain interference in adults aged 50 and over,²⁶³ higher pain disability in adults with chronic pain,²⁶⁴ and lower health-related quality of life in children with sickle cell disease pain.²⁶⁵

Policies That Shape Resources and Opportunities for Well-being and Pain Relief. As recognized by the Health in All Policies approach,²⁶⁶ health is influenced not only by health care and public health policies, but by policies across sectors such as labor, fiscal, housing, transportation, food and agriculture, trade and industry, land use, education, media, military, environment, electoral, criminal justice, and welfare.²⁴¹ Ultimately, the multilevel social context may influence individuals' exposure to pain and stressors (eg, injury, violence, trauma, and illness) over the life course and across generations.²⁶⁷ Importantly, multilevel social factors may also constrain the range of lifestyle "choices"^{268,269} that can act as predisposing, precipitating, and perpetuating factors for pain, as well as shape pain sensitivity and impact. Individual (lack of) material and social resources, which depends on one's intersectional social positions, may then determine options for pain prevention, management, coping, and mitigation of its impact.²¹²

Contextualizing Resilience and Risk Factors for Pain. Societal-level determinants may help to explain the unequal distribution of more proximal risk factors for illness across social groups and social gradients in

Social Determinants and Consequences of Pain

health.²⁴⁹ Furthermore, awareness of societal determinants challenges biological essentialism and narratives that normalize health inequities (ie, claims of inherent superiority and/or normality of dominant groups). Importantly, a better understanding of higher-level or upstream social determinants and inequity-generating mechanisms may help to identify paths for accountability, social change, and population health interventions toward equity,¹⁶ in addition to individual-level approaches for pain management.

Multilevel Consequences of Pain

The consequences of pain are also multilevel, adversely affecting 1) individual sense of self in relation to others, 2) interpersonal relationships, 3) group (including family, work, and community) cohesion and integration, and 4) participation in social systems. Like in the section on social determinants of pain, we consider here the *consequences* of pain at the individual, interpersonal, group, and societal levels of organization, from micro to macro scales. While presented separately for didactic purposes, these different levels are also interrelated. Higher-level consequences (eg, societal) depend on the consequences that occur at lower levels but may be "more than the sum of its parts," potentially becoming part of the inequitable systems that influence pain. Conversely, while individual-level consequences may seem isolated at first look, they contribute to reinforcing higher-level social consequences of pain too.

Individual-Level Consequences of Pain

Experiences of chronic pain influence how individuals think about themselves in relation to others, with impacts on social outcomes. Chronic pain can affect one's self-concept ("I am a chronic pain sufferer"),²⁷⁰ threaten identities (eg, gender²⁷¹), and frustrate progress toward long-held goals and aspirations.²⁷² Consequently, living with chronic pain can threaten one's sense of belonging in the world. Patients with chronic pain report feeling "different" from their peers who live relatively pain-free.²⁷³ Waugh and colleagues²⁷⁴ found that 38% of surveyed adults with chronic pain affirmed negative self-stereotypes (eg, "people with chronic pain often exaggerate for secondary gain" and "I can't achieve much in life because I have pain") and anticipated negative social responses from others. Consequently, rather than seeking out social connection in response to feelings of estrangement, individuals may be more likely to withdraw further from social roles and relationships (the "why try" effect).²⁷⁵ The burden of chronic pain has also been found to have a detrimental impact on educational, vocational, and economic outcomes over the life course.^{276,277}

Interpersonal-Level Consequences of Pain

Individuals with chronic pain often have fewer and lower-quality peer relationships, lower-quality romantic relationships, and less social support than individuals

without chronic pain.²⁷⁷⁻²⁸¹ A confluence of factors may contribute to the paucity and deterioration of interpersonal relationships in people living with chronic pain. The experience of pain and associated negative sequelae (eg, fatigue, anhedonia) can limit one's ability and motivation to participate in many social activities.²⁸² Additionally, lack of engagement in social activities could be precipitated by negative self-beliefs²⁷⁴ or negative emotions such as irritability, stress, or feelings of anger that often accompany persistent pain.²⁸³⁻²⁸⁵ These negative emotions can, in turn, have a detrimental impact on one's ability to initiate and maintain interpersonal relationships.²⁸²

The onus of responsibility for poor relations with others does not necessarily sit with the people living with chronic pain, who often experience stigmatization, social exclusion, and discrimination owing to others' mistrust of the legitimacy of chronic pain.²⁸⁶⁻²⁸⁸ Experimental studies have found that people showing pain behavior (eg, guarding, limping, groaning, wincing, or holding) are evaluated as being lower in warmth (trustworthiness, sincerity, and kindness), competence (intelligence, skill, and capability), dependability, and readiness to work than people who do not show pain behaviors.^{289,290} Judgments of a person's warmth and competence reliably predict how people feel and behave toward others.²⁹¹ The finding that expression of pain is sufficient to elicit negative evaluations may help to explain why people with chronic pain have more difficulty forming and maintaining relationships, over and above pain-related physical restrictions to socialization.

Group-Level Consequences of Pain

Chronic pain can present challenges, such as within the workplace and family unit, interfering with one's ability to perform valued roles within social groups (eg, as "caregiver," "provider," or "colleague"). Some people with chronic pain report that employers and work colleagues judge them as lazy and unreliable team members.²⁸⁶ Such pain-related prejudice is consequential. Byrne and Hochwarter²⁹² conducted a series of studies of injured workers and found that high levels of chronic pain were associated with lower workplace performance only among workers who reported low organizational support (ie, perceived stigma). Hence, they suggest it is not the experience of chronic pain, per se, that determines return-to-work performance among injured workers, but rather it is the quality of organizational support.

The impact of chronic pain on families is also complex and highly variable. A meta-analysis of 3 studies indicated that family functioning (eg, cohesion, marital satisfaction) was poorer in families with parental chronic pain compared with healthy control families.²⁹³ Conversely, some families describe having a family member with chronic pain as an opportunity to develop compassion, independence, and empathy for others.²⁹⁴ Caregivers of family members with chronic pain report experiencing emotional, physical, and often financial

strain, with the affected family members' negative mood, reduced participation in leisure activities, sleep disturbances, and health care costs having the greatest impact on the family.²⁹⁵ The impact of living with chronic pain and its comorbidities among adults also shapes the social environment of children and adolescents around them, influencing the risk of intergenerational transmission of pain.^{296,297} Caring for, supporting, and observing the suffering of a family member with chronic pain can also be overwhelming. Suffering can also be felt by family members, who often experience depression or anxiety themselves.²⁹⁸⁻³⁰⁰

Societal-Level Consequences of Pain

Chronic pain has a substantial impact on social systems, such as through direct and indirect costs to health care systems and economies.^{301,302} Pain is one of the main reasons for medical appointments^{303,304} and health care utilization.^{305,306} For example, in one study from 15 European countries and Israel, 60% of chronic pain patients reported between 2 and 9 doctor visits in the 6 months prior to the study, and 11% had done so at least 10 times.³⁰⁷ It is estimated that, within the United States alone, the annual cost of pain, including health care and loss of productivity, ranged from \$560 to \$635 billion dollars in 2010—greater than the annual costs of heart disease, cancer, and diabetes.³⁰⁸ More recent studies estimated the annual costs of pain to be in the order of tens of billions in Canada and in Australia.^{309,310} Part of the high health care costs of pain may stem from inefficient care pathways, primarily focused on biomedical targets (eg, diagnostic tests and procedures). Sidelining psychological and social determinants and consequences of pain likely contributes to pain being inadequately assessed and addressed.^{305,311-314} Despite astronomical expenditures, access to adequate pain care is not universal in high-income countries; even more complex challenges pose barriers to pain equity in low- and middle-income countries, which will require multisector solutions.³¹⁵

Discussion

Filling the Social Gaps in the Biopsychosocial Framework of Pain. A multilevel conceptualization of pain acknowledges the contribution of intersectional social context and socioecological factors that may contribute to individual pain experiences and expression, as well as the prevalence, prognosis, and consequences of pain within and across populations. The broad biopsychosocial framework provides a useful counterpoint to a narrower biomedical model of pain.^{2,3,316} However, biological and psychological contributors to pain have historically been prioritized over social factors in pain research, education, assessment, and management.³¹⁷ This focus on biological and psychological factors may be due, in part, to the fact that pain has long been defined as a sensory and affective experience,^{318,319} largely omitting explicit recognition of its social aspects.³²⁰ This narrower

emphasis corresponds to how the model has been translated to pain treatment settings,¹² predominantly relying on pharmaceutical, biomedical, and sometimes psychological approaches. This review attempts to clarify how and why a multilevel social approach is also needed to fully understand and address pain.

Opportunities for Improved Pain Prevention and Management. In failing to systematically measure and address social aspects of pain—and their multilevel, intersectional, and life course processes—we are surely missing opportunities to prevent pain, as well as opportunities to improve acute and chronic pain management. As noted by Sir Michael Marmot, “Why treat people and send them back to the conditions that make them sick?”³²¹ Better understanding of social aspects of pain within the biopsychosocial framework can help to improve the consideration of social outcomes in pain treatment and guide future intervention development.⁸ Likewise, by increasing the precision of what constitutes a social determinant or consequence of pain, a multilevel social approach will enable more precise treatments that target or are modified by social aspects of pain. People with pain do not live in a vacuum, but are immersed in social roles, relationships, community dynamics, and societal systems, all of which can act as barriers and facilitators to pain relief, function, and quality of life. Pain prevention and management strategies will likely be more successful if they address these social contributing factors at the interpersonal, group, and societal levels.

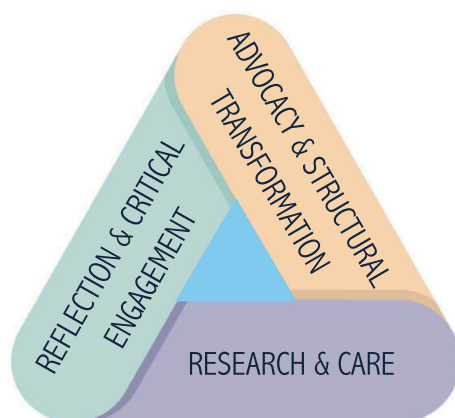
Building Evidence to Address the Social Determinants and Consequences of Pain. In support of these much-needed advances to reduce the burden of pain, causal thinking and methods used in pain research need to evolve to reflect the contemporary conceptualization of pain, including social factors. For example, better understanding of the multilevel, intersectional, and life course pathways through which the social context may affect pain informs the use of novel analytic approaches³²² and intentional selection of covariates to be included or omitted from statistical models.^{323,324} Because social determinants are often distal causes of many other pain risk factors measured in research (ie, social determinants are “risk factors to the risk factors” or “causes of causes”³²⁵), studies of the impact of social factors on pain are particularly vulnerable to overadjustment bias.³²⁶ It is important to avoid adjusting for potential mediators (ie, intermediary factors along a hypothesized causal pathway or part of how the exposure/independent variable is thought to influence the outcome/dependent variable), as this will prevent underestimation of the total effect of social factors on pain. For example, adjustment for socioeconomic status should be avoided when estimating the overall impact of racism on pain, because socioeconomic inequities are influenced by racism and are part of how racism may influence pain.³²⁷

Additionally, improved measurement of multilevel social factors is also needed to advance the understanding of social determinants and consequences of

pain. For example, pain studies have yet to widely use inclusive assessment of gender (eg, a 2-step question that separately ascertains sex assigned at birth and current gender identity, including nonbinary gender categories and write-in gender options, in addition to woman and man³²⁸). In-depth understanding can also be gained from rigorous qualitative or mixed-methods approaches. Additionally, measures of structural inequities are also an active area of progress,¹⁶ which can benefit multilevel studies of pain. Design and testing of social interventions for pain is rapidly developing through diverse approaches ranging from virtual human and computer-simulated environments,¹⁵⁹ to community-engaged research,³²⁹ and workplace systems programs.³³⁰

Action-Oriented Approaches Toward Pain Equity. By pointing to fundamental social mechanisms such as historical and systemic power relations that drive social stratification,³³¹ multilevel, intersectional, and life course approaches can support pain research to advance past merely describing social gradients in pain as if they were natural, inevitable, or nonmodifiable. Without a clear understanding of how social systems of inequity shape multilevel determinants and consequences of pain, research will be limited to merely documenting the existence of pain inequities. Or worse, unequal pain outcomes resulting from unequal social privilege and disadvantage may be essentialized, that is, incorrectly attributed to inherent or nonmodifiable differences. We see this manifest when, for example, individual biological and psychological risk factors for pain among people in socially marginalized groups are framed as natural “vulnerabilities” of those groups, despite evidence that individual risk factors are themselves shaped by social inequities. To avoid reinforcing biased stereotypes in pain research and care, careful consideration of potential fundamental social causes³³² is warranted to inform the interpretation of pain findings among different socially defined groups, even when measures of higher-level social factors are not readily available. Furthermore, due to systemic inequities (eg, access to education, research, and health care), advances in pain prevention and management are unlikely to automatically translate to equal benefit across social groups; they may even further worsen pain inequities.³³³ Intentional policies and practices are needed to ensure the inclusion of marginalized populations, such as through principles of proportionate universalism.³³⁴

Moving Forward Through Multilevel Collaborations. We have collated key examples from the existing literature and provided a starting point for the study of multilevel and intersectional causal pathways and mechanisms through which the social context may affect pain over the life course and across generations. Large and persistent social differences in pain share fundamental social causes with a plethora of other health conditions (eg, mental health, sleep, and substance use disorders). Together, pain and these often comorbid conditions have extensive detrimental effects on individuals and society.



<ul style="list-style-type: none"> • Challenge discourse and practices that prioritize the legitimacy of "biological pain", given that pain is always biopsychosocial. • Consider who benefits from the perpetuation of a predominantly biomedical approach to the conceptualization and management of pain [227]. • Eliminate narratives of onset and persistence of pain as a personal deficit, in recognition of the social underpinnings of biological and psychological contributors to pain. • Listen to and amplify the voices of people with pain [287], especially those at intersections of multiple marginalizing social positions [319], to improve all aspects of pain prevention and management. 	<ul style="list-style-type: none"> • Improve study designs, measurement, and reporting of social determinants and consequences of pain at all levels of organization [144; 200; 238]. • Avoid (or be intentional about) adjusting for potential mediators between social factors and pain in statistical models, to prevent underestimation of total effects of social determinants on pain [18; 228]. • Develop and disseminate pain management strategies that account for multilevel social conditions that contribute to pain prognosis and treatment success [145; 152]. • Identify and harness interpersonal-, community-, and societal-level strengths, resources, and resilience to prevent and mitigate the impact of pain [69; 305]. 	<ul style="list-style-type: none"> • Support equitable education, hiring, and advancement practices for better pain science and care through consideration of diversity, inclusion, and representation [8; 153]. • Demand accountability from systems that contribute to the inadequate prevention and management of pain, and to the widening of social inequities in pain [227]. • Contribute towards "pain" interventions beyond biomedical settings, such as by advocating for policies and programs that reduce social inequities and promote health across social groups [262]. • Re-envision, enhance, and transform social systems (e.g., welfare, workers' compensation, healthcare) to reduce the burden of pain for all [211; 250].
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Figure 3. Potential avenues to apply a multilevel conceptualization of social aspects of pain to advance equitable pain prevention and management.

Therefore, the impact of scientific evidence and social interventions can be maximized by expanding interdisciplinary collaborations between illness-focused fields (including pain) and areas such as public health, public policy, sociology, social work, social psychology, and other social sciences. Interdisciplinary (eg, transdiagnostic) and intersectoral collaborations across the multilevel spectrum are needed to ultimately produce new policies (eg, Health in All Policies), institutions, and practices to improve the effectiveness and equity of pain prevention and management.³³⁵⁻³³⁷ There are myriad possible ways to address these multilevel factors and advance pain equity. Fig 3 presents a starting point of practical examples, including actions of various levels of complexity, for persons and teams/collaborators, organized in the areas of "Reflection and Critical Engagement," "Research and Care," and "Advocacy and Structural Transformation" (eg, challenge discourse and practices that prioritize the legitimacy of "biological pain," given that pain is always biopsychosocial; consider who benefits from the perpetuation of a predominantly biomedical approach to the conceptualization and management of pain). More work is needed to produce in-depth follow-ups to this general framework and periodic progress assessment. We

invite pain researchers, practitioners, educators, persons with lived experience of pain, caregivers, advocates, and the broader community to help expand and apply our knowledge of social aspects of pain and reduce the burden of pain for all people.

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