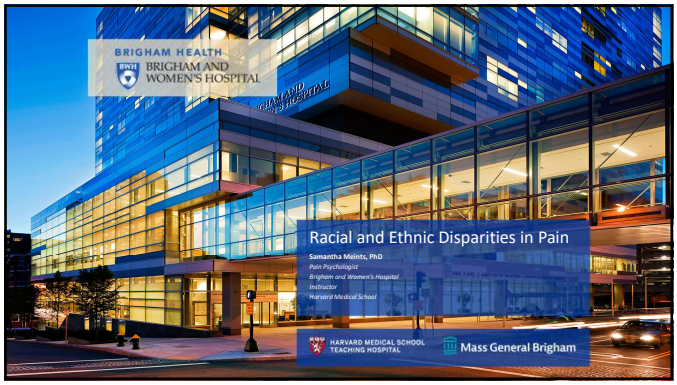

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Disclosures

- I have no disclosures

2

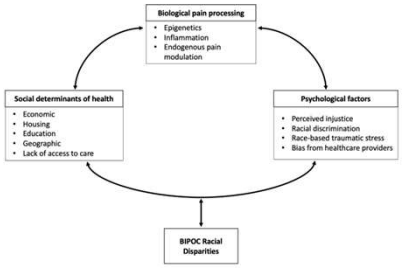
Objectives

1. Characterize racial and ethnic disparities in the experience and treatment of pain
2. Identify biological, psychological, and social mechanisms that may be driving pain inequities
3. Identify solutions to address systemic pain inequities

3

Disparities in Pain

- There are racial, ethnic, and sex disparities in the experience, assessment, and treatment of pain
- Biological, psychological, and social factors interact to contribute to these disparities



4

Terminology

Non-Hispanic Black, African Americans, Black

Non-Hispanic White, White, Caucasian

Hispanic, Latino, Latinx

Natives, Native American, Alaska Native

5

Racial and Ethnic Differences in the Pain Experience

Black
- More sensitive to and less tolerant of experimental pain
- Greater disability, suffering and psychological symptoms for clinical pain

Hispanic
- Fewer pain conditions and less pain interference
- More severe clinical pain and greater sensitivity and less tolerance for experimental pain

Asian American
- Greater pain intensity for clinical pain
- Lower tolerance and threshold, greater pain sensitivity to experimental pain

Native
- Less sensitive to pain
- Greater prevalence (1 in 3 have chronic pain)

6

Coping

- Strategies used to minimize the impact of stress on wellbeing
- Black individuals pray, divert attention, exercise more than Whites
- Hispanics more likely to engage in stoicism
  - An attempt to maintain physical functioning which is a cultural value
- Asians use positive thinking and exercise

Summary of effect sizes for pain coping strategies by categorization

Coping Strategy	k	N	Effect	SMD	95% CI	z	I^2	FSN
Overall	19	6401	B > W	0.25	0.17–0.32	6.35**	66.66	29
Hoping/praying	12	3595	B > W	0.70	0.48–0.92	6.34**	88.89	72
Catastrophizing	17	5307	B > W	0.40	0.26–0.53	5.81**	79.58	51
Diverting Attention	11	2781	B > W	0.20	0.13–0.27	5.72**	0	11
Coping Self-statements	11	3384	B > W	0.08	−0.01–0.17	1.8	34.97	0
Reinterpreting Pain	11	2956	B > W	0.10	0.03–0.18	2.8*	0	0
Ignoring Pain Sensations	10	3209	B > W	−0.09	−0.26–0.08	−1.07	81.05	0
Increasing Behavioral Activity	5	1729	B > W	0.00	−0.11–0.11	−0.02	34.78	0
Exercising and Stretching	2	679	B > W	0.33	0.01–0.65	2.02*	85.16	7
Task Persistence	2	910	W > B	−0.28	−0.41–−0.14	−3.99**	0	4
Guarding	2	679	B > W	0.28	−0.04–0.60	1.72	80.99	4
Relaxation	2	679	B > W	0.23	−0.04–0.50	1.68	46.24	3
Seeking Social Support	3	1029	B > W	0.23	−0.04–0.51	1.66	47.92	4

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Catastrophizing

A cognitive and emotional response to pain characterized by:
Ruination (I cannot seem to get it out of my mind)
Magnification (I am afraid the pain will get worse)
Helplessness (I feel I cannot go on)

Associated with greater pain, poorer physical functioning, greater disability and pain interference

Black and Hispanic individuals catastrophize more in response to pain than Whites

Greater catastrophizing accounts for some of the race differences we see in pain

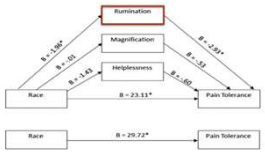

Figure 1. The mediating effect of coping strategies in the association between race and pain tolerance. *$P < .05$.

8

Expectations

Patient expectations influence treatment satisfaction ad pain treatment outcomes

BIPOC report poorer pain expectations

Poorer expectations also result in decreased willingness to undergo treatment (e.g., joint replacement

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Racial Discrimination

- 50-75% of Black, Hispanic, and Asians experienced racial discrimination
- >30% of Black Americans experience discrimination in healthcare encounters
  - >20% avoid seeking healthcare due to anticipated discrimination
- Racial discrimination results in:
  - PTSD
  - Depression
  - Suicidality
  - Race-based traumatic stress
- Greater perceived discrimination related to greater pain intensity and disability

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Perceived Discrimination in Pain Care

- Patients with sickle cell disease report greater discrimination from healthcare providers than other Black individuals
- Hispanics endorse beliefs that health professionals do not understand their pain, do not believe them, and do not care about their pain

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Pain-related Injustice

- Cognitive appraisals reflecting externalization of blame and feelings of unfairness about pain and irreparability of the loss
- Perceived injustice associated with greater chronicity and severity of pain, functional impairment and disability, greater opioid use, and worse treatment outcomes
- Blacks report higher levels of pain-related injustice
  - Greater pain-related injustice associated with greater perceived discrimination

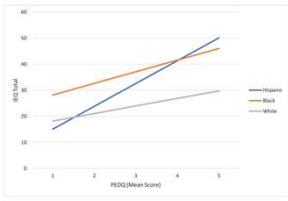

Figure 2.
Relationship between perceived ethnic discrimination and perceived injustice by racial groups.

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Social Determinants of Health & Pain

- Conditions in which people are born, grow, live, work and age
  - Built environment – housing, neighborhood, transportation
  - Food environment – food apartheid
  - Economic environment – jobs, wealth
  - Education environment – schools, literacy
  - Social environment – violence, stress
- Zip code is a better predictor of health than genetics
- Educational attainment, socioeconomic status and occupational factors associated with adverse outcomes in CLBP
- Low SES earlier in life predicts greater pain interference in older adulthood

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Social Determinants (cont'd)

- National study of pain prevalence among White, Black, Hispanic, Asian, Native and multiracial adults
  - Highest prevalence in Natives attributed to low SES
  - Higher prevalence of severe pain in Black vs. White
  - Comparison of White vs. Black at same SES, Blacks have less pain
- Food insecurity associated with chronic pain outcomes
  - May be mediated by chronic inflammation resulting from poor diet

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Inflammation

- Food insecurity and poor diet is associated with oxidative stress and systemic inflammation
- BIPOC more likely to be food insecure and have a poor diet
- BIPOC have greater systemic pro-inflammatory cytokines
- Pro-inflammatory cytokine profile associated with hyperalgesia and increased pain sensitivity
- Pro-inflammatory cytokines are elevated in people with chronic pain

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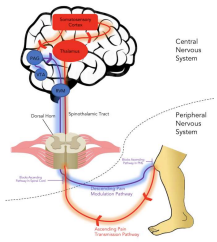
Endogenous pain modulation



- Pro-nociceptive endogenous pain modulator balance contributes to chronic pain
  - Enhanced pain facilitation (temporal summation)
  - Decreased pain inhibition (conditioned pain modulation)
- Black, Asian, and Hispanic individuals have less CPM & greater temporal summation than White individuals

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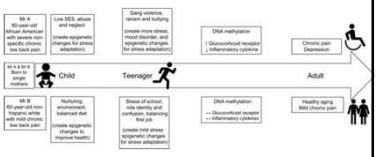
Epigenetics

- Biological mechanisms by which environmental stressors affect expression of genes
  - Non-coding RNAs, acetylation, DNA methylation
- Exposure to stressors (e.g., discrimination, poverty, adverse childhood events) confer epigenetic changes
- Chronic stress and associated maladaptive biological processes (e.g., cortisol response) increase risk for development of chronic pain
- Because BIPOC are more likely to experience environmental stressors, this may help explain pain disparities



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Racial and Ethnic Disparities in Pain Treatment

Minority patients:

- Rated as having less severe pain
- Less likely to receive comprehensive diagnostic and treatment approaches
- Receive less analgesic medication
- More likely to have their pain underestimated by providers
- Less likely to receive opioids as part o their pain management regimen
- Receive less aggressive pain treatment

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Access to care

- In 2017, 94% of White, 90% of Black, 84% of Hispanic Americans had healthcare coverage
- Government-issued health insurance highest among Black and Hispanic
- Healthcare outcomes best in private, teaching, high-volume healthcare settings, places where BIPOC are disproportionately underserved
  - Urban hospitals have 19% BIPOC population, safety net >40% BIPOC
- 8% of White, 16% of Black, 22% of Hispanic patients report difficulty accessing specialty care
- Opioid medications are limited in pharmacies within minority communities

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Cultural Perception of Pain among Hispanic Individuals

- Pain should be overcome without medication unless necessary such as when interfering with work and social roles
- Fear of adverse treatment outcomes (e.g., addiction, side effects)
- Being in pain and using medication perceived as weakness
- Responsibility to provide for family prohibits seeking

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Treatment Preferences

Medications
- Black individuals fear losing control, medication side effects, addiction
- White individuals prioritize pain relief above side effects

Provider
- Blacks and Asians prefer PCP to pain specialist

Surgery
- Blacks less willing to undergo surgery than White

CAM
- Black and Hispanic prefer CAM

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Communication

- Communication styles differ culturally
  - Go off topic
  - Lack of use of medical terminology
  - Vague descriptors (e.g., ache)
  - Use of favorite or sacred number on NRS
- Low health literacy among racial and ethnic minorities
  - Low health literacy associated with higher pain intensity

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Language

- 21% of population are non-English speakers
- Less than 20% of health professionals treating Hispanic pain patients report proficiency in Spanish
- Language barrier results in poorer pain control, lack of treatment seeking, low satisfaction
- Use of interpreter improves treatment and outcomes
  - Interpreters unavailable, miss cultural nuances, may lack medical competence

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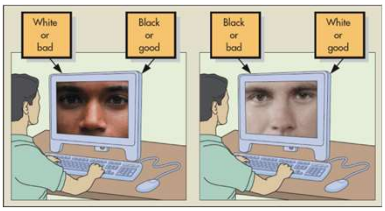
Provider Bias

- Implicit and explicit bias may contribute to provider assessment and treatment
  - In a meta-analysis studies using the IAT to study disparities, 31 of 37 studies found evidence for pro-white or anti-minority bias across training levels and disciplines
- Possible mechanisms
  - Perceptual processes
  - Empathy
  - Medical School curricula
  - False beliefs



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Medical Education

- Medical school curricula misuse race
  - Imprecise labels that conflate race and ancestry
  - Racial and ethnic differences in disease burden presented without context
  - Links disease with racial groups (e.g., sickle cell)
  - Links minorities with increased disease burden thereby pathologizing race
  - Teach guidelines that endorse racial categories in diagnosis and treatment
- ~50% of medical students endorsed false beliefs about biological differences between Black and White individuals
  - Black people have thicker skin

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Solutions

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Modulating Neural Activity driving Bias

- The following have resulted in changes in neural activity associated with increased empathic responding
  - Shifting attention
    - Pay attention to the feelings of other-race individuals
    - May help providers with perspective taking
  - Fostering intergroup relationships
    - Bringing other-race individuals into a team can weaken in-group bias in empathy
  - Increasing communication and interaction with other-race individuals

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Reduce Implicit Bias with IMPLICIT

Introspection	Engage in Introspection to explore own bias
Mindfulness	Practice Mindfulness to reduce use of problematic cognitive shortcuts
Perspective-taking	Engage in Perspective-taking
Learn to slow down	Learn to slow down, reflect on potential bias and reduce reflexive actions
Individuation	Engage in individuation, evaluating other on personal characteristics
Check messaging	Check messaging to embrace multiculturalism
Institutionalize fairness	Institutionalize fairness, promoting change at the organizational level
Take two	Take two, continue practicing cultural humility and self evaluation

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Solutions

- Include anti-racism training in medical school curricula
- Capitalize on perspective-taking interventions
- Practice multicultural humility
  - Identify patient values and meet them where they are
- Reduce cognitive load to reduce reliance on cognitive shortcuts
- Effective questioning, expression of empathy and concern, and shared decision-making result in greater adherence, engagement in self-management, and satisfaction with care
- Diet-based intervention can reduce pain severity and oxidative stress in patients with chronic pain
  - Increase education about and access to healthy foods
- Adapt and implement culturally sensitive coping skills training
- Increase diversity in pain research

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Limitations

1. Focus on between-group inequities
2. Lack of understanding of systemic mechanisms driving inequities
3. Lack of consideration of intersectionality

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Conclusions

There has been a shift in attention toward addressing BIPOC pain disparities

Despite knowledge identifying racial and ethnic differences, we are still lagging in successful interventions to reduce disparities

There is considerable need for a systemic shift in order to overcome inequities in pain and healthcare more broadly

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References

- Meints, S. M., Cortes, A., Morais, C. A., & Edwards, R. R. (2019). Racial and ethnic differences in the experience and treatment of noncancer pain. *Pain management*, *9*(3), 317-334.
- Meints, S. M., Miller, M. M., & Hirsh, A. T. (2016). Differences in pain coping between black and white Americans: A meta-analysis. *The Journal of pain*, *17*(6), 642-653.
- Meints, S. M., Stout, M., Abplanalp, S., & Hirsh, A. T. (2017). Pain-related rumination, but not magnification or helplessness, mediates race and sex differences in experimental pain. *The Journal of Pain*, *18*(3), 332-339.
- Hollingshead, N. A., Ashburn-Nardo, L., Stewart, J. C., & Hirsh, A. T. (2016). The pain experience of Hispanic Americans: A critical literature review and conceptual model. *The Journal of Pain*, *17*(5), 513-528.
- Hirsh, A. T., Miller, M. M., Hollingshead, N. A., Anastas, T., Carnell, S. T., Lok, B. C., ... & Ashburn-Nardo, L. (2019). A randomized controlled trial testing a virtual perspective-taking intervention to reduce race and SES disparities in pain care. *Pain*, *160*(10), 2229.
- Aroke, E. N., Joseph, P. V., Roy, A., Overstreet, D. S., Tollefsbol, T. O., Vance, D. E., & Goodin, B. R. (2019). Could epigenetics help explain racial disparities in chronic pain?. *Journal of pain research*, *12*, 701.
- Maina, I. W., Belton, T. D., Ginzberg, S., Singh, A., & Johnson, T. J. (2018). A decade of studying implicit racial/ethnic bias in healthcare providers using the implicit association test. *Social science & medicine*, *199*, 219-229.
- Roberts JD, Dickinson KL, Hendricks MD, Jennings V. "I Can't Breathe": Examining the Legacy of American Racism on Determinants of Health and the Ongoing Pursuit of Environmental Justice. Current environmental health reports. 2022:1-17.
- Bakhshaie J, Rogers AH, Mayorga NA, Ditre J, Rodriguez-Cano R, Ruiz AC, et al. Perceived racial discrimination and pain intensity/disability among economically disadvantaged Latinos in a federally qualified health center: the role of anxiety sensitivity. Journal of immigrant and minority health. 2019;21(1):21-9.
- Sibrava NJ, Bjornsson AS, Pérez Benítez ACI, Moitra E, Weisberg RB, Keller MB. Posttraumatic stress disorder in African American and Latinx adults: Clinical course and the role of racial and ethnic discrimination. Am Psychol. 2019;74(1):101.
- Sullivan MJ, Adams H, Horan S, Maher D, Boland D, Gross R. The role of perceived injustice in the experience of chronic pain and disability: scale development and validation. Journal of occupational rehabilitation. 2008;18(3):249-61.
- Sullivan MJ, Scott W, Trost Z. Perceived injustice: a risk factor for problematic pain outcomes. The Clinical journal of pain. 2012;28(6):484-8.
- Carriere JS, Donayre Pimentel S, Yakobov E, Edwards RR. A systematic review of the association between perceived injustice and pain-related outcomes in individuals with musculoskeletal pain. Pain Med. 2020;21(7):1449-63.
- Rense SE, Ljosaa TM, Stubhaug A, Granan LP, Falk RS, Jacobsen HB. Perceived Injustice in Patients With Chronic Pain: Prevalence, Relevance, and Associations With Long-Term Recovery and Deterioration. The Journal of Pain. 2022.
- Miller MM, Williams AE, Scott EL, Trost Z, Hirsh AT. Battle of the appraisals: Pain-related injustice versus catastrophizing as mediators in the relationship between pain intensity and 3-month outcomes in adolescents with chronic pain. The Journal of Pain. 2022;23(2):223-35.
- Penn TM, Overstreet DS, Aroke EN, Rumble DD, Sims AM, Kelner CV, et al. Perceived injustice helps explain the association between chronic pain stigma and movement-evoked pain in adults with nonspecific chronic low back pain. Pain Med. 2020;21(11):3161-71.
- Sullivan MJ, Thibault P, Simmonds MJ, Milioto M, Cantin A-P, Velly AM. Pain, perceived injustice and the persistence of post-traumatic stress symptoms during the course of rehabilitation for whiplash injuries. Pain. 2009;145(3):325-31.
- Scott W, Trost Z, Milioto M, Sullivan MJ. Barriers to change in depressive symptoms after multidisciplinary rehabilitation for whiplash: the role of perceived injustice. The Clinical journal of pain. 2015;31(2):145-51.
- Morden KR, Trost Z, Scott W, Bogart KR, Driver S. The unfairness of it all: Exploring the role of injustice appraisals in rehabilitation outcomes. Rehabil Psychol. 2016;61(1):44.

32

References

- Sullivan MJ, Yakobov E, Scott W, Tait R. Perceived injustice and adverse recovery outcomes. Psychol Inj Law. 2014;7(4):325-34.
- Ziadni MS, Sturgeon JA, Bissell D, Guck A, Martin KJ, Scott W, et al. Injustice appraisal, but not pain catastrophizing, mediates the relationship between perceived ethnic discrimination and depression and disability in low back pain. The Journal of Pain. 2020;21(5-6):582-92.
- Trost Z, Sturgeon J, Guck A, Ziadni M, Nowlin L, Goodin B, et al. Examining injustice appraisals in a racially diverse sample of individuals with chronic low back pain. The Journal of Pain. 2019;20(1):83-96.
- Ahujeidi AH, Capo-Lugo CE, Sturgeon JA, Trost Z. Injustice Through Cultural Lens: A Pilot Qualitative Exploration of Pain-Related Injustice Appraisals Among Arab-Americans with Chronic Low Back Pain. The Journal of Pain. 2022;23(5):739-53.
- Lee RT, Perez AD, Boykin CM, Mendoza-Denton R. On the prevalence of racial discrimination in the United States. PLoS One. 2019;14(1). doi: 10.1371/journal.pone.0210698.
- Bleich SN, Findling MG, Casey LS, Blendon RJ, Benson JM, SteelFisher GK, et al. Discrimination in the United States: Experiences of black Americans. Health Serv Res. 2019;54(S2):1399-408. doi: 10.1111/1475-6773.13220.
- Sibrava NJ, Bjornsson AS, Pérez Benítez ACI, Moitra E, Weisberg RB, Keller MB. Posttraumatic stress disorder in African American and Latinx adults: Clinical course and the role of racial and ethnic discrimination. American Psychologist. 2019;74(1):101-16. doi: 10.1037/amp0000339.
- Seaton EK, Iida M. Racial discrimination and racial identity: Daily moderation among Black youth. Am Psychol. 2019;74(1):117-27. doi: 10.1037/amp0000367.
- Oh H, Stickley A, Koyanagi A, Yau R, DeVylder JE. Discrimination and suicidality among racial and ethnic minorities in the United States. J Affect Disord. 2019;245:517-23. doi: 10.1016/j.jad.2018.11.059.
- Carter RT. Racism and Psychological and Emotional Injury. The Counseling Psychologist. 2007;35(1):13-105. doi: 10.1177/0011000006292033.
- Comas-Díaz L, Hall GN, Neville HA. Racial trauma: Theory, research, and healing: Introduction to the special issue. Am Psychol. 2019;74(1):1-5. doi: 10.1037/amp0000442.
- Zvolensky MJ, Kauffman BY, Shepherd JM, Viana AG, Bogiaizian D, Rogers AH, et al. Pain-Related Anxiety Among Latinx College Students: Relations to Body Vigilance, Worry, Anxious Arousal, and General Depression. Journal of Racial and Ethnic Health Disparities. 2019;7(3):498-507. doi: 10.1007/s40615-019-00678-6.
- Zvolensky MJ, Smit T, Rogers AH, Matoska C, Garey L, Viana AG, et al. Exploring pain experience and anxiety sensitivity among Latinx adults in a federally qualified health center. J Behav Med. 2022. doi: 10.1007/s10865-022-00325-2.
- Booker S, Cardoso J, Cruz-Almeida Y, Sibille KT, Terry EL, Powell-Roach KL, et al. Movement-evoked pain, physical function, and perceived stress: An observational study of ethnic/racial differences in aging non-Hispanic Blacks and non-Hispanic Whites with knee osteoarthritis. Exp Gerontol. 2019;124:110622. doi: 10.1016/j.exger.2019.05.011.
- Wyatt R. Pain and ethnicity. AMA Journal of Ethics. 2013;15(5):449-54.
- Meints SM, Wang V, Edwards RR. Sex and race differences in pain sensitization among patients with chronic low back pain. The journal of pain. 2018;19(12):1461-70.
- Perry M, Baumbauer K, Young EE, Dorsey SG, Taylor JY, Starkweather AR. The influence of race, ethnicity and genetic variants on postoperative pain intensity: an integrative literature review. Pain Manag Nurs. 2019;20(3):198-206.
- Cuevas AG, Ong AD, Carvalho K, He T, Chan SWC, Allen JD, et al. Discrimination and systemic inflammation: A critical review and synthesis. Brain Behav Immun. 2020;89:465-79.
- Schmeer KK, Tarrence J. Racial-ethnic disparities in inflammation: evidence of weathering in childhood? J Health Soc Behav. 2018;59(3):411-28.
- Lam PH, Chiang JJ, Chen E, Miller GE. Race, socioeconomic status, and low-grade inflammatory biomarkers across the lifecourse: A pooled analysis of seven studies. Psychoneuroendocrinology. 2021;123:104917.

33

References

- Rassu FS, Luedke JC, Nanavaty N, Mathur VA, Meagher MW. Greater mechanical temporal summation of pain in Latinx-Americans and the role of adverse life experiences. Pain Reports. 2020;5(5). doi: 10.1097/PR9.0000000000000842.
- Othman R, Swain N, Tumilty S, Jayakaran P, Mani R. Pro-nociceptive pain modulation profile in patients with acute and chronic shoulder pain: a hypothesis-generating topical review. Phys Ther Rev. 2021;26(6):403-19.
- Overstreet DS, Michl AN, Penn TM, Rumble DD, Aroke EN, Sims AM, et al. Temporal summation of mechanical pain prospectively predicts movement-evoked pain severity in adults with chronic low back pain. BMC Musculoskelet Disord. 2021;22(1):1-13.
- Owens MA, Parker R, Rainey RL, Gonzalez CE, White DM, Ata AE, et al. Enhanced facilitation and diminished inhibition characterizes the pronociceptive endogenous pain modulatory balance of persons living with HIV and chronic pain. J Neurovirol. 2019;25(1):57-71.
- Cruz-Almeida Y, Sibille KT, Goodin BR, Petrov ME, Bartley EJ, Riley III JL, et al. Racial and ethnic differences in older adults with knee osteoarthritis. Arthritis & Rheumatology. 2014;66(7):1800-10.
- Kim HJ, Yang GS, Greenspan JD, Downton KD, Griffith KA, Renn CL, et al. Racial and ethnic differences in experimental pain sensitivity: systematic review and meta-analysis. Pain. 2017;158(2):194-211.
- Rahim-Williams B, Riley III JL, Williams AK, Fillingim RB. A quantitative review of ethnic group differences in experimental pain response: do biology, psychology, and culture matter? Pain Med. 2012;13(4):522-40.
- Strath LJ, Sorge RE. Racial Differences in Pain, Nutrition, and Oxidative Stress. Pain and Therapy. 2022:1-20.
- Letzen JE, Mun CJ, Kuwabara H, Burton EF, Boring BL, Walls T, et al. Ethnic disparities in pain processing among healthy adults: μ-opioid receptor binding potential as a putative mechanism. Pain. 2020;161(4):810.
- Palit S, Kerr KL, Kuhn BL, Terry EL, DelVentura JL, Bartley EJ, et al. Exploring pain processing differences in Native Americans. Health Psychol. 2013;32(11):1127.
- Rhudy JL, Lannon EW, Kuhn BL, Palit S, Payne MF, Sturycz CA, et al. Assessing peripheral fibers, pain sensitivity, central sensitization, and descending inhibition in Native Americans: main findings from the Oklahoma Study of Native American Pain Risk (OK-SNAP). Pain. 2020;161(2):388.
- Roberts JD, Dickinson KL, Koebele E, Neuberger L, Banacos N, Blanch-Hartigan D, et al. Clinicians, cooks, and cashiers: Examining health equity and the COVID-19 risks to essential workers. Ann Behav Med. 2021:S603-S.
- Marmot M. The health gap: the challenge of an unequal world. The Lancet. 2015;386(10011):2442-4.
- Tehrani SO, Wu SJ, Roberts JD. The color of health: residential segregation, light rail transit developments, and gentrification in the United States. Int J Environ Res Public Health. 2019;16(19):3683.
- Karran EL, Grant AR, Moseley GL. Low back pain and the social determinants of health: a systematic review and narrative synthesis. Pain. 2020;161(11):2476-93.
- Lacey RJ, Belcher J, Croft PR. Does life course socio-economic position influence chronic disabling pain in older adults? A general population study. The European Journal of Public Health. 2013;23(4):534-40.
- Zajacova A, Grol-Prokopczyk H, Fillingim R. Beyond Black vs White: Racial/Ethnic Disparities in Chronic Pain including Hispanic, Asian, Native American, and Multiracial US Adults. medRxiv. 2021.
- Men F, Fischer B, Urquia ML, Tarasuk V. Food insecurity, chronic pain, and use of prescription opioids. SSM-Population Health. 2021;14:100768.
- Gill TM, Zang EX, Murphy TE, Leo-Summers L, Gahbauer EA, Festa N, et al. Association between neighborhood disadvantage and functional well-being in community-living older persons. JAMA Internal Medicine. 2021;181(10):1297-304.
- Strath LJ, Sims AM, Overstreet DS, Penn TM, Bakshi RJ, Stansel BK, et al. Dietary Inflammatory Index (DII) is Associated with Movement-Evoked Pain Severity in Adults with Chronic Low Back Pain: Sociodemographic Differences. The Journal of Pain. 2022.
- Sansom G, Hannibal B. Disparate access to nutritional food; place, race and equity in the United States. BMC nutrition. 2021;7(1):1-6.
- Strath LJ, Jones CD, Philip George A, Lukens SL, Morrison SA, Soleymani T, et al. The effect of low-carbohydrate and low-fat diets on pain in individuals with knee osteoarthritis. Pain Med. 2020;21(1):150-60.
- Van den Berg R, Jongbloed E, De Schepper E, Bierma-Zeinstra S, Koes B, Luijsterburg P. The association between pro-inflammatory biomarkers and nonspecific low back pain: a systematic review. The Spine Journal. 2018;18(11):2140-51.
- Vanderwall AG, Milligan ED. Cytokines in pain: harnessing endogenous anti-inflammatory signaling for improved pain management. Front Immunol. 2019;10:3009.
- Prado J, Westerink RH, Popov-Celeketic J, Steen-Louws C, Pandit A, Versteeg S, et al. Cytokine receptor clustering in sensory neurons with an engineered cytokine fusion protein triggers unique pain resolution pathways. Proceedings of the National Academy of Sciences. 2021;118(11):e2009647118.
- Park J, Decker JT, Smith DR, Cummings BJ, Anderson AJ, Shea LD. Reducing inflammation through delivery of lentivirus encoding for anti-inflammatory cytokines attenuates neuropathic pain after spinal cord injury. J Control Release. 2018;290:88-101.
- Zhang J-M, An J. Cytokines, inflammation and pain. Int Anesthesiol Clin. 2007;45(2):27.
- Beydoun MA, Obhi HK, Weiss J, Canas JA, Beydoun HA, Evans MK, et al. Systemic inflammation is associated with depressive symptoms differentially by sex and race: a longitudinal study of urban adults. Mol Psychiatry. 2020;25(6):1286-300.

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References

- Green CR, Anderson KO, Baker TA, Campbell LC, Decker S, Fillingim RB, et al. The unequal burden of pain: confronting racial and ethnic disparities in pain. Pain Med. 2003;4(3):277-94.
- Tait RC, Chibnall JT. Racial/ethnic disparities in the assessment and treatment of pain: psychosocial perspectives. Am Psychol. 2014;69(2):131.
- Druckman JN, Trawalter S, Montes I, Fredendall A, Kanter N, Rubenstein AP. Racial bias in sport medical staff's perceptions of others' pain. The Journal of Social Psychology. 2018;158(6):721-9.
- Haq N, McMahan VM, Torres A, Santos G-M, Knight K, Kushel M, et al. Race, pain, and opioids among patients with chronic pain in a safety-net health system. Drug Alcohol Depend. 2021;222:108671.
- Price-Haywood EG, Burton J, Burstain T, Harden-Barrios J, Lefante J, Shi L, et al. Clinical effectiveness of decision support for prescribing opioids for chronic noncancer pain: a prospective cohort study. Value Health. 2020;23(2):157-63.
- Hewes HA, Dai M, Mann NC, Baca T, Taillac P. Prehospital pain management: disparity by age and race. Prehospital Emergency Care. 2018;22(2):189-97.
- Kennel J, Withers E, Parsons N, Woo H. Racial/ethnic disparities in pain treatment: evidence from Oregon emergency medical services agencies. Med Care. 2019;57(12):924-9.
- Gaither JR, Gordon K, Crystal S, Edelman EJ, Kerns RD, Justice AC, et al. Racial disparities in discontinuation of long-term opioid therapy following illicit drug use among black and white patients. Drug Alcohol Depend. 2018;192:371-6.
- Janevic MR, Mathur VA, Booker SQ, Morais C, Meints SM, Yeager KA, et al. Making pain research more inclusive: Why and how. The Journal of Pain. 2021.
- Morais CA, Aroke EN, Letzen JE, Campbell CM, Hood AM, Janevic MR, et al. Confronting racism in pain research: A call to action. The Journal of Pain. 2022.
- Letzen JE, Mathur VA, Janevic MR, Burton MD, Hood AM, Morais CA, et al. Confronting Racism in All Forms of Pain Research: Reframing Study Designs. The Journal of Pain. 2022.
- Hood AM, Booker SQ, Morais CA, Goodin BR, Letzen JE, Campbell LC, et al. Confronting Racism in All Forms of Pain Research: A Shared Commitment for Engagement, Diversity, and Dissemination. The Journal of Pain. 2022.
- Hirsh AT, Miller MM, Hollingshead NA, Anastas T, Carnell ST, Lok BC, et al. A randomized controlled trial testing a virtual perspective-taking intervention to reduce race and SES disparities in pain care. Pain. 2019;160(10):2229.
- Anastas TM, Miller MM, Hollingshead NA, Stewart JC, Rand KL, Hirsh AT. The unique and interactive effects of patient race, patient socioeconomic status, and provider attitudes on chronic pain care decisions. Ann Behav Med. 2020;54(10):771-82.
- Mende-Siedlecki P, Qu-Lee J, Backer R, Van Bavel JJ. Perceptual contributions to racial bias in pain recognition. J Exp Psychol Gen. 2019;148(5):863.
- Mende-Siedlecki P, Lin J, Ferron S, Gibbons C, Drain A, Goharzad A. Seeing no pain: Assessing the generalizability of racial bias in pain perception. Emotion. 2021.
- Han S. Neurocognitive basis of racial ingroup bias in empathy. Trends Cogn Sci. 2018;22(5):400-21.
- Azevedo RT, Macaluso E, Avenanti A, Santangelo V, Cazzato V, Aglioti SM. Their pain is not our pain: brain and autonomic correlates of empathic resonance with the pain of same and different race individuals. Human brain mapping. 2013;34(12):3168-81.
- Sheng F, Liu Q, Li H, Fang F, Han S. Task modulations of racial bias in neural responses to others' suffering. NeuroImage. 2014;88:263-70.
- Contreras-Huerta LS, Baker KS, Reynolds KJ, Batalha L, Cunnington R. Racial bias in neural empathic responses to pain. PLoS One. 2013;8(12):e84001.
- Saxe R, Wexler A. Making sense of another mind: the role of the right temporo-parietal junction. Neuropsychologia. 2005;43(10):1391-9.
- Sheng F, Han S. Manipulations of cognitive strategies and intergroup relationships reduce the racial bias in empathic neural responses. Neuroimage. 2012;61(4):786-97.
- Zuo X, Han S. Cultural experiences reduce racial bias in neural responses to others' suffering. Culture and Brain. 2013;1(1):34-46.
- Edgoose JY, Quiogue M, Sidhar K. How to identify, understand, and unlearn implicit bias in patient care. Fam Pract Manag. 2019;26(4):29-33.
- Mathur VA, Trost Z, Ezenwa MO, Sturgeon JA, Hood AM. Mechanisms of injustice: what we (do not) know about racialized disparities in pain. Pain. 2022;163(6):999-1005.
- Amutah C, Greenidge K, Mante A, Munyikwa M, Surya SL, Higginbotham E, et al. Misrepresenting race—the role of medical schools in propagating physician bias. Mass Medical Soc; 2021. p. 872-8.
- Acosta D, Ackerman-Barger K. Breaking the silence: time to talk about race and racism. Acad Med. 2017;92(3):285-8.
- Ahmad NJ, Shi M. The need for anti-racism training in medical school curricula. Acad Med. 2017;92(8):1073.
- Tsai J, Crawford-Roberts A. A call for critical race theory in medical education. Acad Med. 2017;92(8):1072

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