



Mini Review

Copyright © All rights are reserved by Ray Marks

Osteoarthritis and Poverty: Challenges and Opportunities

Ray Marks*

OARC Clinical Research and Education Director, Ontario L3T 5H3, Canada

*Corresponding author: Ray Marks, OARC Clinical Research and Education Director, Ontario L3T 5H3, Canada

Received Date: February 20, 2024

Published Date: February 28, 2024

Abstract

Osteoarthritis is a prevalent highly disabling joint disease of immense public concern in all parts of the world. While most research in this sphere has examined the nature of osteoarthritis in the context of its common focal joint specific impact, can poverty-as a general disadvantageous stressful social condition of resource limitations- influence osteoarthritis presentation and outcomes? If so, can any outcome improvements in this disease be impacted by factoring in socioeconomic status into osteoarthritis investigations, or through dedicated anti-poverty efforts? This brief examines what we know in this sense and why we should perhaps examine this multidimensional social correlate more routinely and comprehensively. Based on key data sources, relevant articles published in the past 20 years duly reviewed indicate that multiple aspects of osteoarthritis presentation and outcomes can be influenced by the social disadvantages of poverty, all other factors being equal, and therapies will fail to achieve their promise if ignored.

Keywords: Disability; Economics; Osteoarthritis; Poverty; Social Determinants of Health

Background

Osteoarthritis, the most prevalent form of painful disabling arthritis commonly affects the freely moving joints of many older adults such as the hip or knee joints. An incurable slowly progressive disease [1,2], it is a disease commonly attributed to the manifestation of an array of underlying articular cartilage and bone joint pathologies and related neuromuscular, biological and signaling pathways that contribute to pain-the symptom of most concern to the patient in this disease. While attributed in part to injury exposure, genetics, and aging, far less attention has been given to extrinsic factors that may mediate or initiate this process, and in particular poverty as social state of possible stress, lack of knowledge and resources, or as an outcome of unresolved severe osteoarthritis is not well examined to any degree despite the well published impact of osteoarthritis disease on health costs and

productivity [2]. As well, treatments for this condition are not often recommended differentially in the presence of social inequalities, and the possible impact of political policy issues, occupational, and economic influences on osteoarthritis inequalities that can undoubtedly induce suffering remain generally unexplored with few exceptions [3].

Review Aims

This mini review aimed to examine what is known about poverty and its impact on osteoarthritis manifestations, correlates, or outcomes and to inform research as well as practice thereby.

Rationale

Many older adults currently desire to live in the community and those who do must be able to function safely and without due

stress and have access to care and resources. While not all health risk events can be foreseen or prevented, factors other than aging such as poverty may prove risky or undermine the outcomes of more advanced available therapies and others, even if conducted with care, if the social circumstances of the individual is not duly accounted for [4,5].

Methods

To examine relevant materials concerning excess osteoarthritis and poverty as this applies to aging adults susceptible to osteoarthritis who wish to live out their lives in the community, the data sources PUBMED, GOOGLE SCHOLAR and PubMed Central believed to house salient contemporary data were employed. Since poverty as denoted by income, education, housing and access to care are current global challenges; data pertaining to the specific aims of this commentary and review were sought regardless of year of origin. No formal analysis was attempted however, as this is not a topic one can readily explore via traditional controlled trials in most cases for ethical reasons, and interested readers are urged to pursue one or more of these lines of inquiry posted in the current reference section in more depth. Excluded were detailed osteoarthritis intervention studies, as well as surgical and drug management reports for offsetting osteoarthritis, although it is recognized that inequalities here are rife. A strong focus was placed however, on examining poverty impacts on osteoarthritis manifestations and treatment outcomes and encouraging practitioners to be mindful of the social factors that influence their clients and possible treatment options and ability to adhere to recommendations. The term poverty was used to broadly describe the presence of low income, education, health resource access, occupational factors and housing, and as well as composite subnormal living conditions and material deprivation. The term osteoarthritis was used as in the literature to describe or refer to an age associated chronic disease of one or more joints often exacerbated by physical and emotional stresses and stressors. All forms of osteoarthritis were deemed acceptable to examine if an element of poverty was duly discussed, including its mediating effect as well as its response to osteoarthritis disability. The data did not permit any comprehensive analysis and varied from survey based subjective reports to clinical outcome reports after surgery using diverse measures, using varied samples, terminology, clinical parameters, and assessments.

Results

General findings

The majority of studies on this current topic have clearly been undertaken in the United States rather than other countries. This may obscure the overall impact, while focusing on the seriousness of this issue as a contextual issue because most of the countries have some form of universal health care, thus may not readily acknowledge a mediating or moderating osteoarthritis associated role due to persistent financial and resource constraints. Alternately, it may also be a poorly studied topic because osteoarthritis is commonly deemed a local disease of one or more joints rather than a reaction to societal factors that are hard to assess and measure. Funders too may be less likely to venture into studying aspects of inequity

or disadvantage that are oftentimes controversial, while funds may be prioritized for examining local pharmacologic or surgical interventions. There does however, seem to be some interest in examining poverty issues of late, due to its possible ramifications for understanding and treating some cases of osteoarthritis in a more holistic manner if they are found disadvantaged socially or economically as well as for a global desire to eradicate poverty and foster more equal global socioeconomic advantages for all [6].

According to a 2006 report by Dieppe [6] a study of eight European countries showed that self-reported arthritis, osteoarthritis and back complaints were all strongly related to socio-economic status (using education as the indicator). In addition, a wealth of data had suggested those who were most deprived in the United Kingdom-where social safety nets have been employed for decades- were less likely to obtain appropriate service provisions for severe musculoskeletal problems such as osteoarthritis than those deemed to be advantaged economically, in spite of the country's social welfare and health services policies.

In this regard Sweden too has shown economic disparities to prevail and influence osteoarthritis outcomes [7], while in the United States there is no shortage of evidence of health inequalities in almost every sphere, including the surgical sphere employed frequently to ameliorate intractable osteoarthritis pain [8]. This situation is further compounded by findings that African Americans and Hispanics for example, who are often subject to social inequities and life affirming resources have consistently been found to have a higher prevalence of severe arthritis and other rheumatic conditions than White Americans [9]. In addition, when examining variations in osteoarthritis treatments by socioeconomic status, it appears African Americans with osteoarthritis are less likely than Whites to be treated with narcotic analgesics. Rates of total knee or hip replacement surgery were also found to be substantially lower among African Americans and Hispanics than among whites in the United States, and among those cases awaiting hip or knee replacement surgery, those deemed to be in the lower socioeconomic classes had more profound adverse pre surgical plus post surgical disease presentations. Unsurprisingly, those assigned to the 'most deprived' socioeconomic category tended to benefit least in the long term if they were offered the opportunity [8]. Low income also correlated with baseline and follow up pain among cases scheduled for replacement surgery [10], and this finding seems of import given that in addition to United States data, osteoarthritis cases studied in the United Kingdom who were deemed to have a low rather than moderate or high socioeconomic status were similarly disadvantaged. While observed social oriented disease differences may be biological or behavioral or both - poverty alone appears to be a severe form of deprivation that may have an important association with selected disease processes and arthritis outcomes, as well as the ability to partake in as well as adhere to health recommendations known to potentially impact inflammation and even mortality.

In addition to its impact on overall health, other data show activity limitations due to poverty associated factors can also impact social connectedness and psychological well-being, as well

as obesity -while reducing the quality of life, especially among those with osteoarthritis who are unable to work or function without distress. The fact education-a proxy for socioeconomic disadvantage has a strong bearing on osteoarthritis progression in many cases is also evidenced in multiple studies [11]. This issue is very important to acknowledge by those who seek to minimize osteoarthritis disability at an early disease phase given that Goodman, et al. [12] revealed that poverty places adults requiring knee joint replacement at an excess pain and dysfunction risk, even if education is eventually offered. Unsurprisingly, those cases having a college education do appear to benefit more profoundly than those living in poverty in terms of surgical outcomes, even if the surgery is technically comparable. As per Callahan, et al. [13] low educational attainment was significantly associated with several osteoarthritis outcome and profile measures in a negative sense. In addition, living in a community with a high household poverty rate was associated with multiple osteoarthritis indicators, and these might be due to associated increases in obesity, opioid reliance, sedentary behaviors, and being on public rather than private insurance as well as factors that are not yet examined [2,14]. Occupation however, had no significant independent association beyond educational attainment and community poverty, even though job loss due to osteoarthritis might occur more readily in low-income settings.

Specific findings

As noted by Thompson, et al. [15] at the knee, the joint most commonly affected by osteoarthritis there appears to be disproportionately clinical presentation that varies negatively along racial and ethnic minority factors. For example, non-Hispanic Blacks appear to report a higher prevalence and severity of knee osteoarthritis symptoms than those of non-Hispanic Whites, including pain and physical functional impairments. However, although why this occurs is not known [3], there does appear to be a possible mediating or moderating role for poverty or its determinants in explaining this disparity, although other factors could of course be implicated, such as genetics. Those cases studied and who were said to live below the poverty line experienced the most severe knee pain and poorest levels of reported physical function, and this effect was not necessarily eliminated even when similar surgical interventions were applied [16].

Cleveland, et al. [17,18] who examined baseline data from the Johnston County Osteoarthritis Project as far as the influence of individual and community socioeconomic status measures with hip osteoarthritis outcomes goes found living in a community of high household poverty correlated independently with hip radiographic osteoarthritis indicators. Similar independent associations were found between low educational attainment among those with symptomatic bilateral cases after adjusting for all socio economic measures simultaneously. No significant associations were observed between occupation and hip osteoarthritis outcomes, nor did race or sex modify the associations, thus strengthening the influence of deficient individual and community social factors and education in the disease cycle. However, not all potential factors in explaining their findings were put forth. For example, a role for perceived

discrimination is associated with chronic pain and depression and could conceivably contribute to racial health disparities, and poor osteoarthritis physical and mental health status with greater effects among those with multiple social disadvantageous situations [19]. This group found cumulative disadvantage was of possible import because it was a variable significantly associated with reports of a higher perceived sense of discrimination, pain, and depression and was a possible psychosocial stressor contributing to the worsening of osteoarthritis-related mental and physical health outcomes, with greater effects observable among those from multiple socially disadvantaged groups.

In a further report, Kewitt, et al. [20] who strove to examine how neighborhood characteristics are associated with health outcomes among older adults with osteoarthritis found greater perceived neighborhood resources for physical activity and walking were associated with higher (better) knee impact scores. Greater perceived neighborhood resources for physical activity and walking were associated with fewer depressive symptoms in a sample of older adults with radiographic knee osteoarthritis. This may be explained or influenced by either actual or perceived socioeconomic status [21] and its impact on disability, balance and health status, and opportunities to receive self-management programs [22] among low-income osteoarthritis sufferers [23]. A further negative impact of limited financial and tangible resources may also arise in those with prevailing social disadvantages due to disease associated lost wages and their independent and collective disease impacts [2]. In Sweden [22] where those with lower incomes suffer more readily than higher income cases, it has been observed that those osteoarthritis cases with low education may well experience higher all-cause and cause-specific mortality especially from cardiovascular diseases than those with better education [24]. The observed inequalities in those with osteoarthritis are important in Sweden and other countries because they tend to reflect the inequalities in the population at large. In the United States for example, where health inequities prevail in many spheres, a detailed analysis has further revealed a lower age-adjusted prevalence of self-reported osteoarthritis among the lower socioeconomic group when compared to those with higher socioeconomic status [25].

In addition to the impact of low socio economic status, also associated and accountable for the unequal outcomes and profile characterization in various low income and unaffordable osteoarthritis management [26], as well as well as ethnic and cultural groups [27], poverty may play an important role as a factor influencing the many emergent social determinants of health [28]. In their study, this group found Blacks and people deemed to be of the Hispanic race to be significantly influenced in terms of achieving the bench marks for hip joint range of motion improvements after intervention compared to Whites. Significant associations were also found based on education, gender, comorbid health conditions, and neighborhood poverty. As per Faison, et al. [29] this may be due to the impacts of poverty on a combination of patient, provider, and healthcare system treatment disparities among different populations, where economic disadvantage and

material deprivation has a potent widespread impact on clinical outcomes, healthcare costs, disease severity, and clinical and economic outcomes and may include one or more indicators of disadvantage below:

- Discrimination
- Educational Deficits
- Homelessness
- Limited/Fragmented Care/ Access
- Suboptimal Care Quality
- Poor Nutrition
- Extent of Repetitive Work
- Lack of Resources - funds to secure therapy. self-help devices, vitamins

Discussion

As recounted in many past as well as current reports, osteoarthritis, the most common rheumatic disease, and one that is increasing in prevalence, remains highly impervious to amelioration. Affecting a high percentage of older adults, incrementally and adversely, the disease persists in affecting the ability of the affected individual to participate in multiple desired activities, as well as having immense associated social, public health, and economic ramifications. Principally due to varying degrees of localized joint tissue disruptions that may induce episodes of unrelenting pain, the disease can not only severely impair an individual's ability to function physically, but mentally and emotionally as well. Unfortunately, even where osteoarthritis is amenable to artificial joint-replacement surgery, and various forms of medication, it has become clear that the ability to minimize osteoarthritis pain may prove ineffective if the individual continues to undertake harmful behaviours that are injurious to the joint, such as having to continue repetitive occupations due to economic imperatives, as well as a failure to feel empowered in this respect, that may be compounded by poor health literacy and education in general in multiple ways.

Despite its arguable relevance, there is however, a paucity of data with regard to poverty and/or its association with socioeconomic disadvantages in the context of osteoarthritis, a chronic disabling joint condition growing in prevalence among many older adults and others, many of whom reside in low-income countries [30] as well as developed countries [31]. It would appear however, from the available evidence that while not studied intently, poverty or its attribute of lower than desirable socioeconomic status as an umbrella term for a general socially prevalent oftentimes cumulative influence of deficient economic prosperity on day-to-day existence is worth exploring. This investment may not only help to uncover why some adults and not others appear at a greater risk for severe osteoarthritis in the face of similar intervention options but may accordingly improve upon treatments and the scope of these for reducing excess disability and its costs as well as possible surgical outcome challenges, plus the impacts of being sedentary, and opioid addiction. Moreover, from a primary prevention vantage

point, even if income, education, and living conditions have a marginal influence on osteoarthritis conceptually, opportunities to counter these societal conditions as well as obesity may yet foster the potential for overall wellbeing and more chance of a high life quality than a limited one.

At the same time, even as artificial intelligence [AI] and deep learning osteoarthritis applications progress and appear noteworthy, these interacting data devices will still potentially fail to offer solid all-encompassing portraits of insight if they fail to embrace this potential clinically significant osteoarthritis determinant of poverty, not discussed or detailed in many clinical trials and basic research studies. Commonly deemed a focal progressive disorder affecting one or more joints, a role for ecological factors such as socioeconomic is not commonly given attention thus possibly implying it has a minor bearing on the magnitude and extent of this prevalent joint disease. However, in view of the enormity of the public health and societal burden of osteoarthritis it appears a better understanding of all disease determinants that might be amenable to change could have far reaching impacts.

Alternately, until more insights and study of larger representative adults that can tease out osteoarthritis clinically significant modifiable disease outcome and manifestation disparities, much suffering as well as the need for costly health care resources will undoubtedly persist. Clearly, osteoarthritis cases who live under consistent social disadvantage may not only experience more stress in general, than high income comparable cases, but more exposure to joint stressors and pathology if they are forced to work on repetitive tasks, have limited health coverage, live in unsafe housing conditions, have no funds for therapy, nutritious foods, or assistive devices, nor a regular caregiver. They may have poorly developed communication skills, limited technological skill and device access, and may suffer from depression along with obesity, frailty, and deprivation linked cardiovascular conditions. They may thus suffer unduly to various degrees, regardless of geography or available technology [32-33] if exposed to perpetual adversity that has extended from childhood in some cases [37-39].

To begin to limit one or more of the numerous negative social impacts on osteoarthritis pain and disability in vulnerable groups in mid and later life, in accord with most current researchers, it seems that until more data are forthcoming, physicians, public health personnel, policy makers and allied health workers can yet make significant contributions in the interim by conducting empathetic and nonjudgmental client dialogues, and tailoring their recommendations accordingly, while more broadly acknowledging related health inequities past and present such as deprivation using a life course approach. They may be assured that acting proactively in efforts to help support early low-income childhood and adult wellbeing rather than ignoring socially derived health risks may well yield many beneficial effects as may dedicated efforts to eradicate poverty in any way wherever it manifests. Advancements in the concept of health equity as well as the influential role of culture are indeed of further high relevance in the realm of efforts towards preventing and mitigating osteoarthritis disability and

pain that are more manifest in the context of social disadvantage than not are arguably of great import in the presence of other costly associated potentially emergent chronic diseases and mental health challenges at the very least.

As outlined in the literature, the ability to function physically and socially in meaningful activities not only promises to be life affirming in its own right as well as mitigating preventable degrees of disability and despair. However, action is sorely needed to allay multiple health costs and immense intervention needs that arise in general and due to excess osteoarthritis disability. It may also be vital for providers to encourage more resources to not only provide for universal education for all and ensure a viable income level is achievable, but efforts to specifically eliminate literacy discrepancies that impact health understandings in the future, along with efforts and opportunities for future practitioners to develop their expertise not only focally but through a socio-ecological lens in this realm may prove immensely beneficial despite a lack of any strong evidence based contemporary studies.

This realm of endeavor affecting many older adults and all societies can arguably be greatly enhanced in the realm of training future allied health and medical professionals, as well as economists, and policy makers, plus psychologists to ascertain more precisely how social factors can have an influence on cartilage degradation mechanisms and clinical pain or how their management recommendations may prove suboptimal if ignored. To this end, further studies including those that are lab based, plus both qualitative and quantitative clinical research approaches to address osteoarthritis mechanistic issues may prove helpful in determining more targeted and therefore successful pain relief and intervention [34,35,40-45]. Additionally, efforts to eradicate perceptions of past racism may prove helpful and thus warrant attention [46]. Moreover, as regards joint surgery, evidence points to inequalities and the degree of social deprivation that affects outcomes despite any expert technological surgical approaches and skills and cautions providers of healthcare to take any action they view as possible that could introduce unwarranted costly outcome variations in the provision of overall care [47-50].

In addition to multiple health impacts, being homeless, having obesity and an unqualified job can all interact to raise the risk and progression of osteoarthritis and needs to be addressed accordingly [51-56]. These social factors are not new, and may clearly induce an ongoing or unexpectedly high socioeconomic burden on many diagnosed as having osteoarthritis. Among, other factors, inequities may clearly impact those determinants that induce osteoarthritis in many-namely – many low paying occupations, obesity and joint injury risk-and a parallel lack of adequate vocational retraining or training efforts and income support [57-59]. While pharmacologic and surgical approaches may help, health costs are still likely to rise if a role for socioeconomics and social factors, work and resource access, while modifiable, are not duly planned for and equalized commensurately for all.

As per Vitaloni, et al. [11], it appears safe to say, while educational opportunities can raise osteoarthritis life quality, poverty,

psychological distress and pervasive stressors, plus depression may well reduce this. Moreover, a failure to differentiate osteoarthritis patient needs in light of their unique disease attributes, plus possible 'poverty' of education-a most potent factor; overall health, and adverse social circumstances plus limited resources, is likely to induce a perpetual excess osteoarthritis burden cycle of suffering and high costs, loss of employment, feelings of failure, and identity loss [7,25,60-62], even though complimentary counter osteoarthritis interventions such as exercise, mindfulness, and diet are mainstream cost effective safe approaches deemed highly efficacious.

In this regard, the value of a "biopsychosocial" approach to assessing and detailing a patient's living situation, their educational history, as well as their disease manifestations, and access to care could help to tailor their specific needs, and thereby lessen the overall osteoarthritis burden in the elderly markedly and universally [63,64].

Concluding Remarks

Despite increasing and emerging evidence that some societal groups clearly suffer more than others from painful osteoarthritis, the lack of sound support for a meaningful and definitive link of poverty or its attributes as related to osteoarthritis and its immense global burden is somewhat less than robust, albeit quite compelling. Even if more substantive support for a role in socially unequal practices as well as health policies that affect older multiple osteoarthritis subgroups differentially, it can be concluded that there is some stark past and emerging evidence pointing in our view to several observations.

- 1) There are diverse social equity factors that may prevent all osteoarthritis cases from achieving high quality care access and equitable health outcomes and that can be traced to selected healthcare policies, socioeconomic factors, and others.
- 2) Equity in educational opportunity and quality is one remediable factor in this regard, another is occupational training, fair wages, and efforts to enhance safety in the workplace.
- 3) Extending the scope of medical and public health practices to embrace all the needs of all osteoarthritis clients, especially the older disadvantaged sufferer is strongly indicated.
- 4) Policy makers and economists can play a resounding role in advancing this line of inquiry by examining the costs as well as the benefits of efforts to raise living standards and make self-care options affordable rather than a struggle wherever they are suboptimal and raise rather than mitigate osteoarthritis health costs and utilization.
- 5) Epidemiologists can advance this line of inquiry by highlighting the link between where osteoarthritis occurs readily and why only certain sectors of the global population are affected and not others.
- 6) Screening and early interventions at the societal level where indicated such as literacy and housing initiatives are

strongly advocated to foster primary as well as secondary and tertiary prevention and favorable low cost outcomes.

In sum, it appears safe to imply that many behaviourally oriented and other necessary osteoarthritis management approaches and interventions may fail to mitigate or reduce the onset inflammation and progression of functional disability and pain experienced by people of all ages at risk for disabling osteoarthritis to any meaningful degree if:

- a. Access to basic as well as expert timely care is limited or sporadic.
- b. The provider[s] fail to identify/address any remediable social health determinant.
- c. The patient does not understand how their health behaviours impact their joint status and has low self-efficacy for communicating needs.
- d. Policy makers, funders, public and occupational health personnel, and the legal system fail to identify and duly address the role of inequities in osteoarthritis access, resources, and service delivery processes, in the costs of overall health care, and their moral obligation to foster optimal health for all aging citizens.

Acknowledgement

None.

Conflicts of Interest

No conflict of interest.

References

1. Luong M L, Cleveland R J, Nyrop K A, Callahan L F (2012) Social determinants and osteoarthritis outcomes. *Aging Health* 8(4): 413-437.
2. Zhao X, Shah D, Gandhi K, Wei W, Dwibedi N, et al. (2019) Clinical, humanistic, and economic burden of osteoarthritis among noninstitutionalized adults in the United States. *Osteoarthritis and Cartilage* 27(11): 1618-1626.
3. Vaughn IA, Terry EL, Bartley EJ, Schaefer N, Fillingim RB (2019) Racial-ethnic differences in osteoarthritis pain and disability: A meta-analysis. *The Journal of Pain* 20(6): 629-644.
4. Lennon R P, Lopez K C O, Socha J A M, Montealegre F E G, Chandler J W, et al. (2019) Health characteristics of the Wayuu Indigenous people. *Military Medicine* 184(7-8): e230-e235.
5. Bass A R, Mehta B, Szymonifka J, Finik J, Lyman S, Lai E Y, et al. (2019) Racial disparities in total knee replacement failure as related to poverty. *Arthritis Care & Research* 71(11): 1488-1494.
6. Dieppe P (2006) The relationships of musculoskeletal disease to age, pain, poverty and behaviour. *Rheumatology* 45(3): 248-249.
7. Kiadaliri A A, Gerhardsson de Verdier M, Turkiewicz A, Lohmander L S, Englund M (2017) Socioeconomic inequalities in knee pain, knee osteoarthritis, and health-related quality of life: A population-based cohort study in southern Sweden. *Scandinavian Journal of Rheumatology* 46(2): 143-151.
8. Bonsel J M, Reijman M, Verhaar J A, Van Steenbergen L N, Janssen M F, Bonsel G J (2023) Socioeconomic inequalities in patient-reported outcome measures of Dutch primary hip and knee arthroplasty patients for osteoarthritis. *Osteoarthritis and Cartilage* 32(2): 200-209.
9. Odotula J, Ward M M (2005) Ethnic and socioeconomic disparities in health among patients with rheumatic disease. *Current Opinion in Rheumatology* 17(2): 147-152.
10. Battista S, Kiadaliri A, Jönsson T, Gustafsson K, Englund M, et al. (2023) Income-related inequality changes in osteoarthritis first-line interventions: A cohort study. *Archives of Physical Medicine and Rehabilitation*.
11. Vitaloni M, Botto-van Bemden A, Sciortino Contreras R M, Scotton D, Bibas M, Quintero M, et al. (2019) Global management of patients with knee osteoarthritis begins with quality of life assessment: A systematic review. *BMC Musculoskeletal Disorders* 20(1): 1-12.
12. Goodman S M, Mandl L A, Mehta B, Navarro-Millan I, Russell L A, et al. (2018) Does education level mitigate the effect of poverty on total knee arthroplasty outcomes?. *Arthritis Care & Research* 70(6): 884-891.
13. Callahan L F, Cleveland R J, Shreffler J, Schwartz T A, Schoster B, et al. (2011) Associations of educational attainment, occupation and community poverty with knee osteoarthritis in the Johnston County (North Carolina) osteoarthritis project. *Arthritis Research & Therapy* 13(5): R169.
14. Assari S, Bazargan M, Chalian M (2020) The unequal effect of income on risk of overweight/obesity of whites and blacks with knee osteoarthritis: the osteoarthritis initiative. *Journal of Racial and Ethnic Health Disparities* 7(4): 776-784.
15. Thompson K A, Terry E L, Sibille K T, Gossett E W, Ross E N, et al. (2019) At the intersection of ethnicity/race and poverty: Knee pain and physical function. *Journal of Racial and Ethnic Health Disparities* 6(6): 1131-1143.
16. Goodman S M, Mehta B, Zhang M, Szymonifka J, Nguyen J T, et al. (2018) Disparities in total hip arthroplasty outcomes: census tract data show interactions between race and community deprivation. *The Journal of the American Academy of Orthopaedic Surgeons* 26(21): e457-e464.
17. Cleveland R J, Schwartz T A, Prizer L P, Randolph R, Schoster B, et al. (2013) Associations of educational attainment, occupation, and community poverty with hip osteoarthritis. *Arthritis Care & Research* 65(6): 954-961.
18. Cleveland R J, Luong M L N, Knight J B, Schoster B, Renner J B, et al. (2013) Independent associations of socioeconomic factors with disability and pain in adults with knee osteoarthritis. *BMC Musculoskeletal Disorders* 14: 1-10.
19. McClendon J, Essien U R, Youk A, Ibrahim S A, Vina E, et al. (2021) Cumulative disadvantage and disparities in depression and pain among veterans with osteoarthritis: The role of perceived discrimination. *Arthritis Care & Research* 73(1): 11-17.
20. Kowitz S D, Aiello A E, Callahan L F, Fisher E B, Gottfredson N C, et al. (2021) How are neighborhood characteristics associated with mental and physical functioning among older adults with radiographic knee osteoarthritis? *Arthritis Care & Research*, 73(3): 308-317.
21. Knight J B, Callahan L F, Luong M L, Shreffler J, Schoster B, et al. (2011) The association of disability and pain with individual and community socioeconomic status in people with hip osteoarthritis. *The Open Rheumatology Journal* 5: 51-58.
22. Gustafsson K, Kvist J, Eriksson M, Dahlberg L E, Rolfson O (2020) Socioeconomic status of patients in a Swedish national self-management program for osteoarthritis compared with the general population—a descriptive observational study. *BMC Musculoskeletal Disorders* 21: 1-13.
23. Esquivel-Valerio J A, Orzua-de la Fuente W M, Vázquez-Fuentes B R, Garza-Elizondo M A, Negrete-López R, et al. (2018) The impact of osteoarthritis on the functioning and health status of a low-income population: an example of a disability paradox. *JCR: Journal of Clinical Rheumatology* 24(2): 57-64.
24. Lindéus M, Turkiewicz A, Englund M, Kiadaliri A (2022) Socioeconomic inequalities in all-cause and cause-specific mortality among patients with osteoarthritis in the Skåne Region of Sweden. *Arthritis Care & Research* 74(10): 1704-1712.
25. Xu Y, Wu Q (2021) Trends and disparities in osteoarthritis prevalence among US adults, 2005-2018. *Scientific Reports* 11(1): 21845.

26. Eyles J P, Sharma S, Telles R W, Namane M, Hunter D J, et al. (2022) Implementation of best-evidence osteoarthritis care: Perspectives on challenges for, and opportunities from, low and middle-income countries. *Frontiers in Rehabilitation Sciences* 2: 826765.
27. Rubenstein W J, Harris A H S, Hwang K M, Giori N J, Kuo A C (2020) Social determinants of health and patient-reported outcomes following total hip and knee arthroplasty in Veterans. *The Journal of Arthroplasty* 35(9): 2357-2362.
28. Reyes AM, Katz J N (2021) Racial/ethnic and socioeconomic disparities in osteoarthritis management. *Rheumatic Disease Clinics* 47(1): 21-40.
29. Faison W E, Harrell P G, Semel D (2021) Disparities across diverse populations in the health and treatment of patients with osteoarthritis. *In Healthcare* 9(11): 1421.
30. Yahaya I, Wright T, Babatunde OO, Corp N, Helliwell T, et al. (2021) Prevalence of osteoarthritis in lower middle- and low-income countries: A systematic review and meta-analysis. *Rheumatology International* 41(7): 1221-1231.
31. Brennan S L, Lane S E, Lorimer M, Buchbinder R, Wluka A E, et al. (2014) Associations between socioeconomic status and primary total knee joint replacements performed for osteoarthritis across Australia 2003-10: Data from the Australian Orthopaedic Association National Joint Replacement Registry. *BMC Musculoskeletal Disorders* 15: 356.
32. Mingo C A, Martin K R, Shreffler J, Schoster B, Callahan L F (2014) Individual and community socioeconomic status: Impact on mental health in individuals with arthritis. *Arthritis* 256498.
33. Peat G, Yu D, Grønne D T, Marshall M, Skou S T, et al. (2023) Do patients with intersectional disadvantage have poorer outcomes from osteoarthritis management programs? A tapered balancing study of patient outcomes from the Good Life With Osteoarthritis in Denmark Program. *Arthritis Care & Research* 75(1): 136-144.
34. Bartley E J, Palit S, Staud R (2017) Predictors of osteoarthritis pain: the importance of resilience. *Current Rheumatology Reports* 19(9): 57.
35. Vennu V, Abdulrahman T A, Alenazi A M, Bindawas S M (2020) Associations between social determinants and the presence of chronic diseases: Data from the osteoarthritis Initiative. *BMC Public Health* 20(1): 1323.
36. Pisanty-Alatorre J, Bello-Chavolla O Y, Vilchis-Chaparro E, Goycochea-Robles M V (2024) Associations of current and childhood socioeconomic status and health outcomes amongst patients with knee or hip osteoarthritis in a Mexico City family-practice setting. *BMC Musculoskeletal Disorders* 25(1): 91.
37. Zacañas Pons L, Turró Garriga O, Saez M, Garre Olmo J (2024) Multimorbidity patterns and disability and healthcare use in Europe: Do the associations change with the regional socioeconomic status?. *European Journal of Ageing* 21(1): 1.
38. Runhaar J, Van Berkel A C, Agricola R, Van Meurs J, Bierma-Zeinstra S M A (2023) Risk factors and population-attributable fractions for incident hip osteoarthritis. *HSS Journal* 19(4): 407-412.
39. Blüher M (2019) Obesity: global epidemiology and pathogenesis. *Nature Reviews. Endocrinology* 15(5): 288-298.
40. Stowers M D J, Gibson A, Gupta A, Pohl M J (2023) Postcode osteoarthritis: geographic inequities in hip and knee arthroplasty. *ANZ Journal of Surgery* 93(5): 1197-1202.
41. Kemp B R, Ferraro K F, Morton P M, Thomas P A, Mustillo S A, et al. (2022) Do early-life social, behavioral, and health exposures increase later-life arthritis incidence?. *Research on Aging* 44(7-8): 479-493.
42. Wu V S, Acuña A J, Kim A G, Burkhart R J, Kamath A F (2023) Impact of social disadvantage among total knee arthroplasty places of service on procedural volume: a nationwide Medicare analysis. *Archives of Orthopaedic and Trauma Surgery* 143(8): 4579-4585.
43. Booker S, Herr K (2021) Voices of African American older adults on the implications of social and healthcare-related policies for osteoarthritis pain care. *Pain Management Nursing* 22(1): 50-57.
44. Ma L, Chhetri J K, Zhang L, Sun F, Li Y, et al. (2021) Cross-sectional study examining the status of intrinsic capacity decline in community-dwelling older adults in China: prevalence, associated factors and implications for clinical care. *BMJ Open* 11(1): e043062.
45. Hausmann L R, Hannon M J, Kresevic D M, Hanusa B H, Kwok C K, et al. (2011) Impact of perceived discrimination in healthcare on patient-provider communication. *Medical Care* 49(7): 626-633.
46. Lenguerrand E, Ben-Shlomo Y, Rangan A, Beswick A, Whitehouse M R, et al. (2023) Inequalities in provision of hip and knee replacement surgery for osteoarthritis by age, sex, and social deprivation in England between 2007-2017: A population-based cohort study of the National Joint Registry. *PLoS Medicine* 20(4): e1004210.
47. Edwards N M, Varnum C, Nelissen R G H H, Overgaard S, Pedersen A B (2022) The association between socioeconomic status and the 30- and 90-day risk of infection after total hip arthroplasty: a registry-based cohort study of 103,901 patients with osteoarthritis. *The Bone & Joint Journal* 104-B (2): 221-226.
48. Eberly L, Richter D, Comerci G, Ocksrider J, Mercer D, et al. (2018) Psychosocial and demographic factors influencing pain scores of patients with knee osteoarthritis. *PLoS One* 13(4): e0195075.
49. Reyes C, Garcia-Gil M, Elorza J M, Mendez-Boo L, Hermosilla E, et al. (2015) Socio-economic status and the risk of developing hand, hip or knee osteoarthritis: A region-wide ecological study. *Osteoarthritis and Cartilage* 23(8): 1323-1329.
50. Blümel J E, Aedo S, Arteaga E, Vallejo M S, Chedraui P (2022) Factores de riesgo de artrosis de rodilla, cadera o ambas en mujeres chilenas de mediana edad: un estudio de cohorte de tres décadas [Risk factors for the development of osteoarthritis in middle-aged women]. *Revista medica de Chile* 150(1): 46-53.
51. Guo W, Li B L, Zhao J Y, Li X M, Wang L F (2024) Causal associations between modifiable risk factors and intervertebral disc degeneration. *The spine journal: official journal of the North American Spine Society* 24(2): 195-209.
52. Niu R, Egan C, Fang C, Duru N, Alley M C, et al. (2022) Total Joint Arthroplasty in Homeless Patients at an Urban Safety Net Hospital. *The Journal of the American Academy of Orthopaedic Surgeons* 30(11): 523-527.
53. Van Schoor N M, Timmermans E J, Huisman M, Gutiérrez-Misis A, Lems W, et al. (2022) Predictors of resilience in older adults with lower limb osteoarthritis and persistent severe pain. *BMC Geriatrics* 22(1): 246.
54. Hoelen T A, Schotanus M, Van Kuijk S, Bastiaenen C, Boonen B, et al. (2023) The relation between socioeconomic status and patient symptoms before and one year after lower extremity arthroplasty. *Journal of Orthopaedics* 39: 11-17.
55. Litwic A, Edwards M H, Dennison E M, Cooper C (2013) Epidemiology and burden of osteoarthritis. *British Medical Bulletin* 105: 185-199.
56. Georgiev T, Angelov A K (2019) Modifiable risk factors in knee osteoarthritis: treatment implications. *Rheumatology international* 39(7): 1145-1157.
57. Tang X, Wang S, Zhan S, Niu J, Tao K, et al. (2016) The prevalence of symptomatic knee osteoarthritis in China: Results from the China Health and Retirement Longitudinal Study. *Arthritis & Rheumatology* 68(3): 648-653.
58. Lindéus M, Turkiewicz A, Englund M, Kiadaliri A (2022) Socioeconomic inequalities in all-cause and cause-specific mortality among patients with osteoarthritis in the Skåne Region of Sweden. *Arthritis Care & Research* 74(10): 1704-1712.
59. Fairley J L, Seneviwickrama M, Yeh S, Anthony S, Chou L, et al. (2021) Person-centred care in osteoarthritis and inflammatory arthritis: A scoping review of people's needs outside of healthcare. *BMC Musculoskeletal Disorders* 22(1): 341.
60. Callahan L F, Cleveland R J, Allen K D, Golightly Y (2021) Racial/ethnic, socioeconomic, and geographic disparities in the epidemiology of knee

- and hip osteoarthritis. *Rheumatic Diseases Clinics of North America* 47(1): 1-20.
61. Lee J Y, Han K, Park Y G, Park S H (2021) Effects of education, income, and occupation on prevalence and symptoms of knee osteoarthritis. *Scientific Reports* 11(1): 13983.
62. Pincus T, Castrejon I (2019) Low socioeconomic status and patient questionnaires in osteoarthritis: challenges to a “biomedical model” and value of a complementary “biopsychosocial model”. *Clinical and Experimental Rheumatology* 120(5): 18-23.
63. Pollard B, Dixon D, Johnston M (2014) Does the impact of osteoarthritis vary by age, gender and social deprivation? A community study using the International Classification of Functioning, Disability and Health. *Disability and Rehabilitation* 36(17): 1445-1451.