



## Exploring social determinants of health on chemotherapy-induced peripheral neuropathy severity in ovarian cancer: An integrative review

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### ABSTRACT

Ovarian cancer remains a significant public health concern for women despite advancements in cancer management. Despite comprising only 2.5 % of cancers in women, ovarian cancer ranks as the fifth leading cause of cancer-related deaths among women, with patients frequently receiving late diagnoses. Chemotherapy, a primary treatment, frequently causes chemotherapy-induced peripheral neuropathy (CIPN), affecting over 60 % of patients and leading to severe sensory, motor, and autonomic nerve impairments. This often necessitates dosage reduction or discontinuation of treatment, thereby increasing mortality. While CIPN's impact on patients is well-documented, there is a paucity of knowledge of how structural and intermediary social determinants of health factors (SDOH), such as socioeconomic and political context, material circumstances such as living and walking conditions, area deprivation, and food availability, affect CIPN severity. The aim of this article was to explore the association between various SDOH and CIPN severity in ovarian cancer, identifying potential research gaps and future research directions. This article seeks to inform targeted interventions to mitigate CIPN's impact by elucidating these associations.

### 1. Introduction

Ovarian cancer remains a significant public health concern for women despite advancements in cancer management. Surveillance, Epidemiology, and End Results (SEER) Program data and American Cancer Society projections estimate that in 2024, 19,680 new cases of ovarian cancer will be diagnosed in the United States, resulting in 12,740 deaths (Institute and Stat, 2024; Ovarian Cancer Research Alliance, 2024). Over the past four decades, mortality rates have seen only marginal improvement, emphasizing the need for intensified research and interventions (Zheng et al., 2020). Despite comprising only 2.5 % of cancers in women, ovarian cancer ranks as the fifth leading cause of cancer-related deaths among women, with patients frequently receiving late diagnoses (Institute and Stat, 2024; Ovarian Cancer Research Alliance, 2024; Armstrong et al., 2022; Stewart et al., 2019; Hufnagel et al., 2021). Disparities in mortality rates are evident (Ovarian Cancer Research Alliance, 2024) with slightly higher rates observed among African American women compared to their Caucasian counterparts (Mei et al., 2023; Howell et al., 2013).

Chemotherapy, a common multi-drug treatment for ovarian cancer, often includes neurotoxic drugs like carboplatin and paclitaxel (Cavaletti and Marmiroli, 2010). These drugs can cause damage to the central and peripheral nervous systems (Zajaczkowska et al., 2019). Chemotherapy-induced peripheral neuropathy (CIPN) is a frequent side effect experienced by over 60 % of patients, with a high prevalence of 20 % in those with ovarian cancer (Oneda et al., 2021; Seretny et al., 2014). CIPN can occur during or months to years after cancer treatments have ended and is characterized by numbness and tingling in body extremities (hands/feet and fingers/toes) and can be painful in 40 % of cases (Smith et al., 2011; Hsu et al., 2017; Ezendam et al., 2014; Bienfait F, Julienne A, Jubier-Hamon S, Seegers V, Delorme T, Jaoul V, et al. Evaluation of 8% Capsaicin Patches in Chemotherapy-Induced Peripheral Neuropathy: A Retrospective Study in a Bienfait et al., 2023; Kolb et al., 2016). This condition poses a significant health risk, leading to impaired function, falls, and socioeconomic disadvantages such as work loss burden, as well as reduced quality of life (Cavaletti et al., 2023; Toftthagen et al., 2012; Pike et al., 2012; Jordan et al., 2019). Early detection and assessment of CIPN symptoms are essential for mitigating

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severity (Jordan et al., 2019). Unfortunately, there is no known cure for CIPN, and it can persist long after treatment, with symptoms lasting up to three years post-therapy in some cases (Ezendam et al., 2014; Jordan et al., 2019; Kanzawa-Lee et al., 2020; Mizrahi, 2021). Managing CIPN often requires reducing or discontinuing chemotherapy, potentially compromising treatment outcomes (Doyle and Salvemini, 2021); in fact, it is estimated that approximately 6–7 % of patients discontinue chemotherapy due to CIPN (Seretny et al., 2014). The severity of CIPN varies across patients, and the reasons for this are not fully understood, but social determinants of health (SDOH) may contribute to this.

SDOH refers to nonmedical factors that influence health outcomes, including the environments where individuals are born, raised, work, live, and age, as well as broader systems shaping daily life such as education, income, occupation, social class, public policies, health system, race/ethnicity, social policies, cultural values, governance, behavioral factors, and psychosocial factors (WHO, 2010). Healthcare experts recognize that social circumstances may play a more significant role in health outcomes than biological factors or genetics, accounting for between 30–55 % of health outcomes (Mei et al., 2023; Moss et al., 2019; WHO, 2024). Social determinants such as ethnicity, socioeconomic status, and poor access to health care are linked to high mortality among ovarian cancer patients (Karanth et al., 2019). Understanding the influence of SDOH on health disparities may be essential for addressing the differences in disease burden among various populations, including ovarian cancer patients. The aim of this article was to explore the association between SDOH and CIPN severity in ovarian cancer patients. More specifically, in this integrative review, we have summarized the diverse literature and identified the SDOH factors that may contribute to CIPN ranging from psychosocial factors, behavioral factors, to biological factors. These SDOH concepts are organized around the conceptual framework developed by the Commission on Social Determinants of Health (CSDH) which generated an approach to understanding the SDOH and their impact on health outcomes (WHO, 2010) (see Fig. 1). From this, positive and negative hypothetical case examples of the interplay of SDOH and CIPN severity for ovarian cancer are provided. We conclude by providing a variety of future research directions.

2. Methods

The five-step integrative review framework presented by Whittemore and Knaf (2005) guided this review. The five steps include problem identification, literature search, data evaluation, data analysis,

and presentation (Whittemore and Knaf, 2005).

Step 1: Problem Identification:

The first step of the integrative review process is to identify the problem (Whittemore and Knaf, 2005). The variables of interest for this integrative review are CIPN and SDOH which have been defined in the introduction. While the effects of CIPN are well-documented, there is limited knowledge on how SDOH factors contribute to the variability in CIPN severity among ovarian cancer patients. Therefore, the guiding research question for this review is: How do social determinants of health affect the severity of CIPN in ovarian cancer patients?

Step 2: Literature Search:

2.1. Search Strategy

On June 14, 2024, using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach (Moher et al., 2009) to ensure a comprehensive and replicable search, a health sciences librarian (AJ) collaborated with the authors to develop sensitive search strategies for three databases (i.e., Embase, PubMed, and Scopus) for research studies on the association between SDOH and CIPN in the ovarian cancer population. Search terms provided in Table 1 were not restricted by year as this is a relatively new and emerging area of science.

2.2. Eligibility criteria

Specifically, the articles (in English) were evaluated for the following inclusion criteria: 1) original research studies in adult humans (including systematic reviews, review articles, or case reports); 2) studies focusing on ovarian cancer patients undergoing chemotherapy, with specific attention to those addressing CIPN and SDOH as determined by SDOH various concepts such as governance, macroeconomic policies, social policies, public policies, cultural values, social class, gender, ethnicity (racism), income, education, occupation, walking conditions, area deprivation, food availability, psychosocial factors such as stress and social support, health-related behaviors like diet and exercise, and biological factors; and, 3) studies with full-text availability. Studies that did not meet all three inclusion criteria were excluded.

2.3. Screening

In total, we identified 234 records, removed 75 duplicates, and were

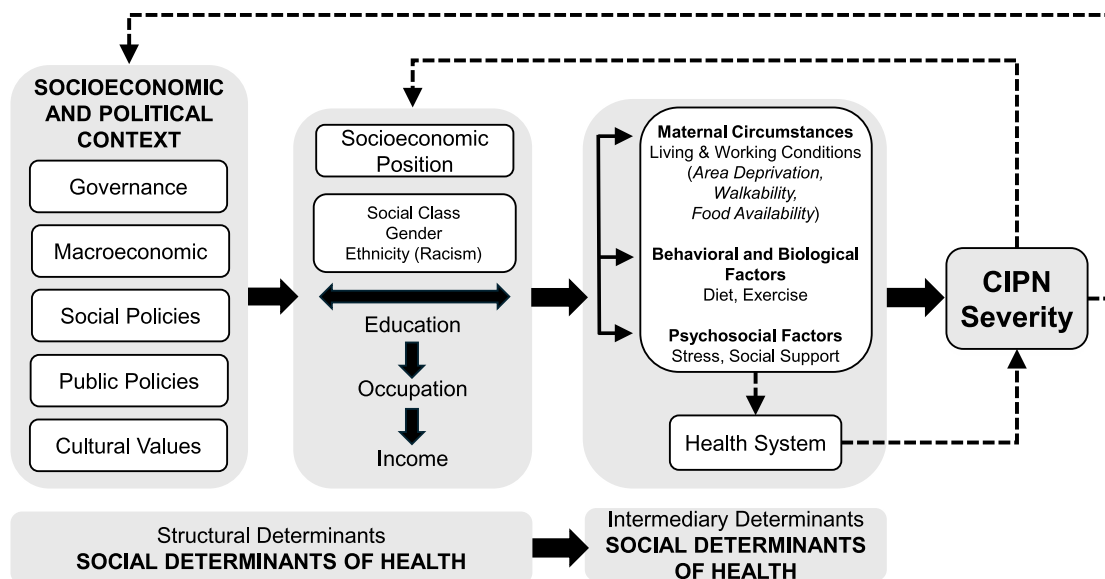


Fig. 1. Conceptual Model of SDOH on CIPN in Ovarian Cancer.

**Table 1**  
Terms Used to Search for Targeted Articles in Embase, PubMed, and Scopus.

Database	Search Terms/Syntax
Embase Search conducted on June 14, 2024 71 results	('health care access'/exp OR 'social determinants of health'/exp OR (community OR economic OR social OR socio* OR structur* OR system*) NEAR/3 (determinant* OR factor*) OR (access*) NEAR/3 (care OR health* OR health-care OR healthcare OR medic* OR therap* OR treatment*) OR cultur* OR debt* OR discrimina* OR education OR employ* OR expens* OR financ* OR income* OR litera* OR language* OR neighborhood* OR poverty OR race* OR racial OR safe* OR SDOH OR training* OR transportation) AND ('chemotherapy-induced peripheral neuropathy'/exp OR chemotherapy-induced-peripheral-neur* OR CIPN) AND ('ovary cancer'/exp OR (ovar*) NEAR/3 (cancer* OR carcinoma* OR malignan* OR neoplasm* OR tumor*))
PubMed Search conducted on June 14, 2024 85 results	('Health Services Accessibility'[Mesh] OR 'Social Determinants of Health'[Mesh] OR ((community OR economic OR social OR socio* OR structur* OR system*) AND (determinant* OR factor*)) OR ((access*) AND (care OR health* OR health-care OR healthcare OR medic* OR therap* OR treatment*)) OR cultur* OR debt* OR discrimina* OR education OR employ* OR expens* OR financ* OR income* OR litera* OR language* OR neighborhood* OR poverty OR race* OR racial OR safe* OR SDOH OR training* OR transportation) AND ('Neuralgia/chemically induced'[Mesh] OR 'Peripheral Nervous System Diseases/chemically induced'[Mesh] OR chemotherapy-induced-peripheral-neur* OR CIPN) AND ('Ovarian Neoplasms'[Mesh] OR (ovar*) AND (cancer* OR carcinoma* OR malignan* OR neoplasm* OR tumor*))
Scopus Search conducted on June 14, 2024 78 results	((community OR economic OR social OR socio* OR structur* OR system*) AND (determinant* OR factor*)) OR ((access*) AND (care OR health* OR health-care OR healthcare OR medic* OR therap* OR treatment*)) OR cultur* OR debt* OR discrimina* OR education OR employ* OR expens* OR financ* OR health-services-access* OR income* OR litera* OR language* OR neighborhood* OR poverty OR race* OR racial OR safe* OR SDOH OR social-determinants-of-health OR training* OR transportation) AND (chemotherapy-induced-peripheral-neur* OR CIPN) AND ((ovar*) AND (cancer* OR carcinoma* OR malignan* OR neoplasm* OR tumor*))

left with 159 records for review (Fig. 2). Two of the authors (COO & FBA) independently reviewed the article titles, abstracts, and articles using the Covidence software to determine if they met the study inclusion criteria. After the initial screening, 150 records were excluded as they did not meet all three inclusion criteria (original research in humans, focus on ovarian cancer patients undergoing chemotherapy and addressing CIPN and SDOH, and full-text availability). Nine articles were selected for final eligibility screening, and seven were further excluded for the following reasons: not examining CIPN (n = 4), full-text unavailable (n = 1), and wrong patient population (n = 2). In the end, two articles were included in the analysis.

#### Step 3: Data Evaluation:

All included articles met ethical and methodological research standards. All quantitative articles employed accepted research designs and quantitative methods (Polit and Beck, 2021).

#### Step 4: Data analysis:

### 2.4. Characteristics of included articles

Two articles were included for the final review, as shown in Table 2. Both articles were quantitative studies conducted in the United States.

One was a cohort study, while the other involved a secondary data analysis of a randomized controlled trial. Both studies had sample sizes of 134 and 1147 ovarian cancer patients, respectively.

### 3. Results

#### Step 5: Presentation:

The findings for this review are organized around the conceptual framework developed by the Commission on Social Determinants of Health (CSDH) which generated an approach to understanding the SDOH and their impact on health outcomes (WHO, 2010).

As seen in Fig. 1, the CSDH framework emphasizes two key elements that shape health outcomes: Structural determinants and intermediary determinants (WHO, 2010). The structural determinants consist of the socioeconomic and political context, and the socioeconomic position. The socio-economic and political context encompasses governance, macroeconomic policies, social policies, public policies, and cultural values, all of which influence the distribution of resources and health opportunities (WHO, 2010). The socioeconomic position define individuals' positions within a societal hierarchy influencing access to health, and includes social class, gender, ethnicity (racism), income, education, and occupation (WHO, 2010). Intermediary determinants of health are factors that mediate the impact of structural determinants on health outcomes. These include material circumstances like living and walking conditions, area deprivation, food availability, psychosocial factors such as stress and social support, health-related behaviors like diet and exercise, and biological factors. Additionally, the health system itself acts as a social determinant by influencing access to and quality of healthcare services. These intermediary factors stem from the underlying social stratification created by structural determinants and directly affect individuals' health outcomes (WHO, 2010). Collectively, the elements of the CSDH framework reveal an important interaction of political, socio-economic, and material circumstances in shaping health outcomes. A critical exploration and understanding of these determinants will be important for the intervention of CIPN in ovarian cancer patients.

#### 3.1. Association of SDOH concepts on CIPN in ovarian cancer

Using the CSDH conceptual model to guide the identification of key SDOH related to CIPN severity in ovarian cancer, we identified two major SDOH concepts from the included articles: behavioral and biological factors, and psychosocial factors.

##### 3.1.1. Behavioral and biological factors

Behavioral and biological factors, such as smoking, diet, exercise, and genetic predispositions, significantly influence health outcomes for cancer patients (Kushi et al., 2012). According to the CSDH model, these lifestyle factors and their biological consequences play a crucial role in shaping health outcomes (WHO, 2010).

A study by Cao et al. (2023) involving 134 ovarian cancer patients, with 69 in the exercise intervention arm and 65 in the attention control arm, found that a six-month aerobic exercise intervention significantly enhanced self-reported CIPN symptoms compared to the attention control group. More specifically, CIPN symptoms described as numbness, tingling, and pain in the hands and feet were less severe in patients who participated in regular aerobic exercise. This study supports the association between exercise and CIPN severity in ovarian cancer patients demonstrating that regular aerobic exercise may mitigate the severity of CIPN symptoms during treatment (Cao et al., 2023). However, the study had several limitations that should be considered. Over 90% of the participants were non-Hispanic White individuals who spoke English, limiting the generalizability of the findings to more diverse populations. Additionally, CIPN was a secondary outcome in the original trial, necessitating replication in studies where CIPN is the primary focus to confirm these benefits. The reliance on self-reported data, without

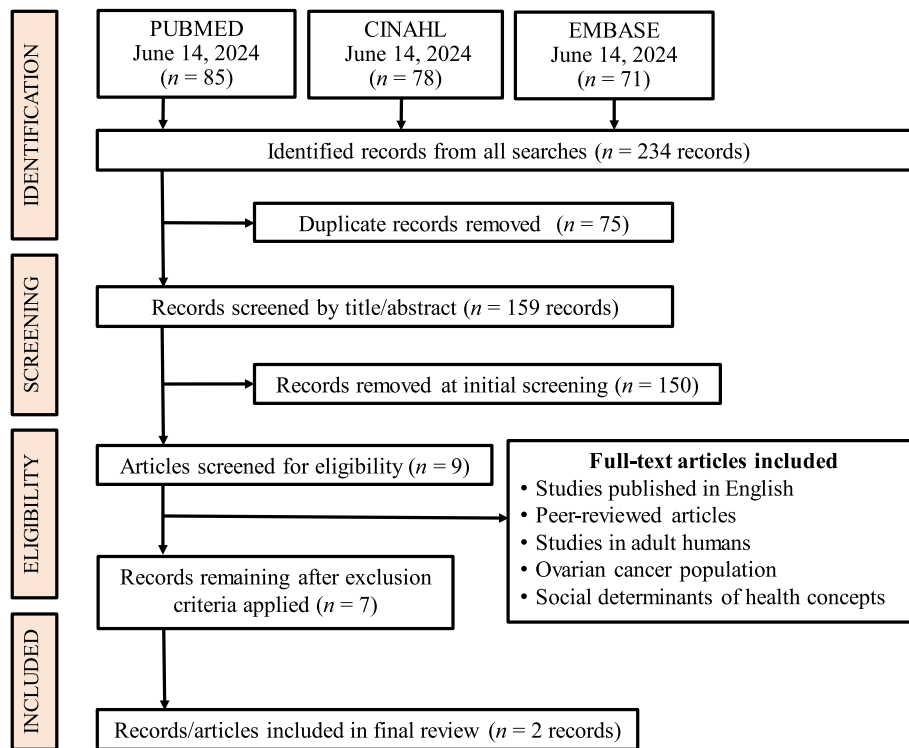


Fig. 2. PRISMA Diagram Demonstrating Screening Method for Literature Search (Adapted from Moher et al., 2009).

clinically meaningful cutoffs for the FACT/GOG-Ntx scale, introduces subjectivity and potential inaccuracies in measuring clinical improvements. Furthermore, the study did not include objective assessments of neural function, which would provide a more comprehensive understanding of the effects of exercise on CIPN. Finally, the limited power for subgroup and interaction analyses restricts the identification of specific groups that might benefit more from the exercise intervention. Addressing these limitations in future research will be important in building a more robust understanding of the impact of exercise on CIPN in ovarian cancer patients.

### 3.1.2. Psychosocial factors

Psychosocial factors, including psychosocial stressors, living conditions, and social support networks, significantly influence health outcomes (Choi et al., 2013). According to the social determinants of health model, these factors are critical in shaping the overall well-being and health outcomes among individuals.

Cancer patients facing higher levels of stress and fewer coping resources may experience worsened CIPN severity due to the psychosocial context surrounding their diagnosis and treatment (Cadet et al., 2021; Gotay and Wilson, 1998). A study by Ezendam et al. (2014) assessing the prevalence and risk factors of CIPN and its impact on health-related quality of life among ovarian cancer survivors 2 to 12 years after diagnosis found that women reporting higher levels of CIPN also experienced lower levels of physical, role, emotional, cognitive, and social functioning. This study suggests that psychological factors, such as stress and social support, may influence CIPN severity and overall health-related quality of life. However, the study had limitations, such as potential confounding factors, a relatively low response rate, and the use of only three items to assess CIPN. This study limitations underscores the need for comprehensive assessment tools and larger sample sizes in future research to better understand the interplay between CIPN and psychosocial factors.

### 3.2. Hypothetical examples of SDOH on CIPN in ovarian cancer

To facilitate a basic understanding, hypothetical examples are presented illustrating the complex interplay of SDOH concepts that may influence CIPN among ovarian cancer patients.

#### 3.2.1. Maria, a 45-year-old Hispanic woman (Positive Example)

Maria, a 63-year-old Hispanic woman, was diagnosed with Stage III ovarian cancer a year ago. Four months after starting chemotherapy, she began experiencing tingling, numbness, and mild pain in her hands and feet. Concerned about these symptoms, Maria consulted her oncologist, who assessed her using The PRO-CTCAE (Patient-Reported Outcomes version of the Common Terminology Criteria for Adverse Events) (Dueck et al., 2015) to rate Maria's CIPN pain severity and interference with daily activities. Her initial CIPN severity indicates severe symptoms that have interfered with her daily activities. For example, she experiences difficulty with tasks such as buttoning and zipping her clothing, tying her shoes, and holding eating utensils.

As a high-income earner in a stable managerial position, Maria had comprehensive health insurance that granted her access to high-quality healthcare services. Holding a master's degree in biological science, she could understand her medical condition and treatment options, which facilitated informed decision-making and effective management of her CIPN symptoms. Her oncologist recommended a comprehensive management plan, including regular health care consultations.

Maria lived in a safe, affluent neighborhood with access to well-equipped gyms and nutritious food, allowing her to engage in regular aerobic exercise and maintain a healthy lifestyle. Her job offered supportive workplace policies, providing her the flexibility to attend medical appointments and rest as needed without financial strain. Additionally, the healthcare policies and governance structures in her country ensured that advanced treatments and specialist care were accessible, further aiding in the management of her condition.

Maria's cultural background emphasized the importance of family support, and her strong family network provided emotional and practical assistance. Psychosocial factors, including her robust social support

**Table 2**  
Summary of Included Articles.

Author/ Year	Study Design/Aim	Participants	Outcome Measures/SODH	Findings	Strengths/ Limitations
1. Ezendam et al. (2014)	Cohort study to assess the prevalence and risk factors of chemotherapy-induced peripheral neuropathy, and its impact on health-related quality of life among ovarian cancer survivors 2 to 12 years after diagnosis	1147 of ovarian cancer patients	<b>Outcome Measures</b> Quality of Life = EORTC QLQ-OV28 (European Organization for Research and Treatment of Cancer Quality of Life, Ovarian cancer module)  <b>SODH</b> Psychosocial factors (social support)	Women reporting higher levels of CIPN also experienced lower levels of physical, role, emotional, cognitive, and social functioning, indicating that psychological factors can significantly impact CIPN severity and overall health-related quality of life.	<b>Strengths</b> This study is the first study on CIPN in a population-based survivorship cohort, including longer-term ovarian cancer patients.  <b>Limitations</b> Other factors related to chemotherapy may have confounded the worse health-related quality of life outcomes, influencing the overall health-related quality of life
2. Ceo et al. (2023)	A secondary analysis of a randomized clinical trial to evaluate the effect of a 6-month aerobic exercise intervention on CIPN among women treated for ovarian cancer	134 ovarian cancer patients, of which 69 were in the exercise intervention arm and 65 in the attention control arm	<b>Outcome Measures</b> CIPN score = Functional Assessment of Cancer Therapy/Gynecologic Oncology Group–Neurotoxicity (FACT/GOG-Ntx) scale  <b>SODH</b> Behavioral Factors (Exercise)	A six-month aerobic exercise intervention compared to attention control significantly enhanced self-reported CIPN in ovarian cancer patients undergoing treatment. This suggests that integrating behavioral factors such as exercise into standard oncology care may alleviate CIPN symptoms and improve the quality of life for individuals with ovarian cancer.	<b>Strengths</b> • The Women’s Activity and Lifestyle Study in Connecticut randomized clinical trial, the largest randomized study of exercise among ovarian cancer patients, uniquely focused on the impact of exercise on CIPN.  <b>Limitations</b> • Most samples consisted of non-Hispanic White English-speaking individuals, which limits generalization to other ethnic ties.

Notes. CIPN=Chemotherapy Induced Peripheral Neuropathy; FACT/GOG-Ntx = Functional Assessment of Cancer Therapy/Gynecologic Oncology Group–Neurotoxicity; SODH=Social Determinants of Health.



system, played a critical role in her overall well-being and ability to cope with the stresses of chemotherapy. Despite potential underlying biases in the healthcare system as a Hispanic woman, her financial stability and educational status helped mitigate these barriers.

Several months into her comprehensive management plan, Maria's CIPN symptoms began to improve. Her oncologist reassessed her using the PRO-CTCAE measurement tool, and her severity decreased, indicating mild symptoms with a little bit interference to her daily activities. This reduction in her CIPN severity may be due to the effective management facilitated by the SODH in Maria's life, including her income, education, living conditions, access to healthcare, behavioral practices like exercise, and psychosocial support. These SODH factors may collectively contribute to her ability to manage CIPN effectively, reducing its impact on her quality of life.

### 3.2.2. Linda, a 60-year-old African American woman (Negative Example)

Linda, a 55-year-old African American woman, was diagnosed with Stage III ovarian cancer a year ago. Like Maria, Linda started chemotherapy but began experiencing tingling, numbness, and mild pain in her hands and feet five months into treatment. Due to CIPN in her feet, she has impaired balance and has tripped and fallen several times. And at night, she experiences pain in her feet with the bedsheets touching her toes, which compromises her sleep quality. Additionally, CIPN in her hands makes it difficult for Linda to type on keyboards in her job as an administrative assistant. Concerned about these symptoms, Linda sought medical advice, but due to limited health insurance coverage and financial constraints from working multiple low-wage jobs, she could only afford sporadic consultations with healthcare providers at a community clinic.

With only a high school education, Linda struggled to fully grasp the complexities of her medical condition and treatment options. This lack of understanding hindered her ability to actively participate in decisions regarding her care, impacting the effectiveness of her symptom management. Without access to a well-equipped gym or nutritious food, Linda found it challenging to engage in regular aerobic exercise, which may further exacerbate her symptoms.

Linda's workplace offered minimal support, making it difficult for her to take time off for medical appointments without risking job stability. In addition, in the Alabama Black Belt region, where Linda lives, there is a significant shortage of gynecological providers as very few providers are available within a 300-mile radius, highlighting the severe lack of access to specialized care in this area (Watch, 2018). Linda's cultural background emphasized family support, yet her immediate family members faced similar financial hardships and lacked the means to provide assistance.

Months into her treatment, Linda's CIPN symptoms persisted and worsened. When reassessed using the PRO-CTCAE, her CIPN severity remained severe with limited ability to carry out her daily activities. Her income, education, access to healthcare, supportive living conditions, and psychosocial support may have contributed to Linda's inability to effectively manage her CIPN. This situation underscores how SODH may influence patients' and clinicians' ability to manage complex conditions like CIPN.

## 4. Synthesis and Discussion

The overall purpose of this integrative review is guided by the research question: How do social determinants of health influence the severity of chemotherapy-induced peripheral neuropathy in ovarian cancer patients. Using the CSDH framework as a guide, this review aimed to understand the potential association between structural and intermediary SODH and their impact on CIPN severity. The CSDH framework emphasizes that health outcomes are shaped by a complex interaction of structural determinants, such as socioeconomic and political contexts, and intermediary determinants, including living conditions, psychosocial factors, and health-related behaviors (WHO, 2010).

This review has identified behavioral and biological factors, as well as psychosocial factors, as potential contributors to CIPN severity in ovarian cancer population. These papers provide preliminary evidence of a possible association between SODH and CIPN. However, evidence is limited, and future studies are needed. For instance, Cao et al. (2023) demonstrated that regular aerobic exercise significantly reduced CIPN symptoms in ovarian cancer patients, highlighting the role of positive health behaviors in managing neuropathy. In a study similar to that of Kleckner et al. (2024), the effects of exercise on CIPN and the interoceptive brain system were tested on 19 cancer patients (aged  $65 \pm 11$  years, 52 % women; with breast, gastrointestinal, and multiple myeloma cancer). The study found that exercise had moderate to large beneficial effects on CIPN symptoms (Kleckner et al., 2024). Although exercise has not been definitively proven to mitigate CIPN and the studies had their limitations in terms of generalizability, these findings tie back to the intermediary determinants of health in the CSDH framework, showing how lifestyle interventions might mitigate the adverse effects of neurotoxic chemotherapy, such as CIPN. Further research is needed to confirm these results and understand the mechanisms at play. Also, other behavioral health factors such as alcohol, substance use, and diet were not examined; however, we do know from newer evidence suggests that diet may be associated with CIPN severity. For example, a study by Knoerl et al. (2024) found that for each one-point increase in diet quality (as measured by a self-administered graphical Food Frequency Questionnaire that collects data on participants' dietary behavior and food use patterns), CIPN severity decreased by  $-0.06$  (95 % CI:  $-0.10, -0.02$ ,  $P < 0.01$ ). This suggests that worsening CIPN severity and interference may be associated with poorer diet quality, even after controlling for age, BMI, caloric intake, and sex (Knoerl et al., 2024).

Regarding the psychosocial factors, Ezendam et al. (2014) found that higher levels of CIPN severity were correlated with poorer psychological and social functioning, underscoring the potential association among psychosocial factors such as stress and social support networks on CIPN severity. Although this study did not demonstrate a causal relationship, the findings do suggest that psychosocial factors may be associated with CIPN severity. In fact, prior studies of CIPN in other cancer patients affirm that CIPN is more severe in patients with low social support (Oh et al., 2020). For example, a study by Oh et al. (2020) involving 184 patients with breast cancer utilized a prospective observational study to assess the impact of perceived social support on chemotherapy-related symptoms. The study reported that patients with moderate-to-high perceived social support experienced less severe chemotherapy-related symptoms compared to patients with low perceived social support during chemotherapy (Oh et al., 2020). This study supports the notion that psychological and social support systems are critical in managing chronic conditions like CIPN, aligning with the CSDH framework's emphasis on the impact of psychosocial stressors.

The hypothetical cases of Maria and Linda illustrate the potential impact of SDOH on CIPN-associated functional interference in ovarian cancer patients, as guided by the CSDH framework. Maria's higher socioeconomic position, characterized by her income, education, stable occupation, access to quality healthcare, affluent neighborhood, and strong psychosocial support, may have facilitated effective management of her CIPN symptoms, demonstrating how positive structural and intermediary determinants can lead to better health outcomes (WHO, 2010; Cao et al., 2023; Brewer et al., 2015). This assertion is supported by prior studies (Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *Am J Public Health.*, 2010; Frohlich and Potvin, 2008). Specifically, Maria's hypothetical case example is supported by the findings of Braveman et al. (2010), who showed that in the United States, health outcomes are strongly influenced by socioeconomic factors such as income and education, with higher levels of these factors generally associated with better health. Unfortunately, although Braveman et al. (2010) did not study CIPN in cancer populations, their findings suggest that an individual's level of income and education can

impact their health outcome symptom-associated health outcomes.

Alternatively, Linda's lower socioeconomic status, limited education, inadequate healthcare access, and insufficient social support may have been barriers to accessing information and resources that would help mitigate CIPN-associated functional interference, highlighting how negative SDOH contributes to poorer outcomes. Collectively, these hypothetical case examples highlight the CSDH framework's emphasis on the interaction of socioeconomic, political, and material circumstances in shaping health outcomes, revealing the necessity for comprehensive interventions addressing both structural and intermediary determinants to mitigate CIPN severity and improve the quality of life for ovarian cancer patients (WHO, 2010).

Despite the insights highlighted above, unfortunately there is limited research on SDOH factors and their association with CIPN in ovarian cancer patients. Specifically, several gaps exist in understanding how the socio-economic and political context, such as governance, macroeconomic policies, social policies, public policies, and cultural values, influence CIPN outcomes in this patient population. Also, socioeconomic position elements like social class, ethnicity, education, occupation, and income, and intermediary determinants such as material circumstances (e.g., area deprivation, walkability, food availability) and the healthcare system itself are underexplored in the context of CIPN. Understanding these structural and intermediary determinants and its association with CIPN in ovarian cancer will be important for addressing CIPN severity.

This integrative review's strength lies in its pioneering use of the SDOH conceptual model to explore CIPN severity in ovarian cancer patients, providing a noteworthy insight into how various structural and intermediary SDOH impact CIPN in the ovarian cancer population. By systematically examining different SDOH elements, this review provides a foundation for informing future studies and interventions. However, the article has notable limitations. First, as an integrative literature review, there is a potential for missing relevant articles during screening, which may result in an incomplete synthesis of existing knowledge. Second, the limited availability of relevant literature meant that only two articles were included, which restricts the generalizability and robustness of the findings, therefore highlighting a gap in science. Third, the use of hypothetical case examples, while illustrative, may not capture the full complexity of real-world scenarios, potentially oversimplifying the multifaceted nature of CIPN in ovarian cancer patients. Despite these limitations, our article offers significant insights and emphasizes the need for integrated, multi-dimensional strategies to address CIPN in ovarian cancer patients.

## 5. Implications for research

Despite the comprehensive framework provided by the Commission on Social Determinants of Health (CSDH), this integrated review reveals significant gaps in understanding the association of social determinants of health on the severity of CIPN in ovarian cancer patients. Notably, there is limited research on how the socio-economic and political context, including governance, macroeconomic policies, social policies, public policies, and cultural values, impacts CIPN outcomes. Additionally, socioeconomic position elements such as social class, ethnicity, education, occupation, and income are underexplored in relation to CIPN. Intermediary determinants, including material circumstances (e.g., area deprivation, walkability, food availability), psychosocial factors (e.g., stress, social support), health-related behaviors (e.g., diet, exercise), and the healthcare system's role, require further investigation to fully understand their association with CIPN severity.

### 5.1. Further research directions

1. Cross-sectional Studies: Conducting cross-sectional studies can provide important insights into the prevalence and severity of CIPN among diverse ovarian cancer patient populations. These studies can elucidate the relationships between CIPN and various social

determinants of health, such as income, education, occupation, and social support. Additionally, they can evaluate the impact of health behaviors, including smoking, diet, and exercise, on CIPN severity.

2. Longitudinal Studies: Conducting longitudinal studies to track changes in CIPN severity over time and its correlation with SDOH can provide a deeper understanding of the causal relationships.
3. Biological and Behavioral Factors: Exploring the role of lifestyle factors such as exercise, diet, alcohol, and substance use in CIPN severity, and their biological underpinnings can inform targeted interventions.
4. Psychosocial Interventions: Developing and testing interventions that enhance social support and reduce stress to determine their efficacy in mitigating CIPN symptoms.

## 6. Conclusion

This integrative review provides foundational clues that SDOH may impact the severity of CIPN in ovarian cancer patients. However, more research is needed.

### CRedit authorship contribution statement

**Chisom O. Odii:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **David E. Vance:** Writing – review & editing. **Fiona B. A. T. Agbor:** Methodology. **Amanda Jenkins:** Software, Methodology. **Ellen M. Lavoie Smith:** Writing – review & editing, Supervision.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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