REVIEW ARTICLE

Social determinants of dementia: A scoping review

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Abstract

Dementia risk is influenced by the social conditions in which people live. These social determinants of dementia (SDOD) are potential targets for prevention. We conducted a comprehensive scoping review to identify current evidence on SDOD in two stages: (1) review of systematic reviews on SDOD; and (2) review of primary literature to address identified gaps in the evidence base. Of the 3445 articles screened, 26 reviews and 74 primary studies were included. Evidence from reviews provide clear and consistent patterns for some SDOD (e.g., education, air pollution, socioeconomic status, ethnicity), while evidence for others is still emerging (e.g., housing quality/stability), or lacking entirely (e.g., incarceration). SDOD are important over the life course.

Additional evidence is needed for understudied domains and to unravel the complex interactions between determinants, whilst education and air pollution stand out as key targets for public health interventions.

Highlights

- There is clear and consistent evidence for some social determinants of dementia (SDOD) across diverse domains.
- Evidence for other SDOD (e.g., housing, incarceration) is still emerging or lacking.
- Evidence for SDOD comes mainly from high-income countries.
- The complex intercorrelations between SDODs demand a nuanced analytical approach.
- Standardized measures and longer follow-up to study SDOD are recommended.

1 | INTRODUCTION

Dementia is among the most significant contributors to health and socioeconomic costs worldwide.[1,2] As the global population ages, the prevalence of dementia is forecast to increase, with low-and middle-income countries (LMICs) bearing the greatest burden.[2] Inequalities also exist within countries, with higher dementia rates and earlier age of disease onset disproportionately affecting those with fewer socioeconomic resources.[3,4]

Epidemiological studies have reported decreasing age-specific incidence of dementia in high-income countries (HICs) of around 13% per decade.[5,6] These secular trends imply that risk reduction is possible, and are thought to be secondary to improved public health, for example reduced smoking rates, and social factors, for example higher rates of education.[5,6] Most research on dementia prevention has been focused on individual-level interventions[7]—those which are focused on encouraging individuals to lower their risk through lifestyle change or adherence to medications. However, population-level interventions— those which focus on changing social conditions and environments to lower risk across the population—may be more effective and may help to reduce inequalities.[8,9] In addition, most research on dementia prevention is conducted in HICs. Therefore, an inclusive population-level dementia prevention approach is a public health priority.[10]

Several potentially modifiable risk factors for dementia, such as hypertension, smoking, and midlife obesity, have been identified at different stages of the life course, and causality has been asserted by expert groups.[11,12] These risk factors follow a socioeconomic gradient, with a higher clustering of risk in resource-constrained and socially deprived settings.[13] For instance, an individual living in an affluent area is more likely to be able to access and afford healthy foods and achieve a higher level of education compared to an individual living in a resource-

deprived area. The conditions in which individuals live, work, and age can significantly influence disparities in dementia risk. These environmental conditions, the "social determinants of health," have a key role in shaping health outcomes, including dementia risk.[3,4,11] By systematically identifying and addressing these determinants in relation to dementia risk, it may be possible to lower dementia risk in a manner that is both impactful and equitable across populations.[14,15]

Researching social determinants of health is complex because of the broad range and interacting nature of environmental and socioeconomic factors that constitute social environments. In addition, some social determinants can be challenging to assess due to their complex nature (e.g., discrimination). As the social determinants of dementia are still unclear, we undertook a comprehensive and wide-ranging scoping review to systematically and pragmatically capture the present state of evidence linking social determinants of health to incident dementia.[16–18] Consequently, more specific research questions can be answered in future narrower systematic reviews.

The overarching aim of this scoping review is to guide this emerging field of research on social determinants of dementia (SDOD) by providing an overview of existing research, identifying gaps, and presenting a series of actionable research recommendations for future studies.

2 | METHODS

The protocol for this scoping review was registered on the Open Science Framework (https://doi.org/10.17605/OSF.IO/SK69J).[19] We have reported the results against the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Scoping Review extension checklist (see Supplementary Material).

2.1 | Review definition

We defined SDOD as: "conditions, beyond medical, demographic, and individual lifestyle factors, which may influence people's dementia risk through their life." This definition was developed through a consensus agreement by the DEMON (DEep deMentia phenOtyp-iNg) Network Social Determinants of Health international research group.[20] It builds upon existing definitions of social determinants of health in the literature[15,21] as well as from leading international public health agencies, such as the World Health Organization (see Table S1 for full details).[11,22,23]

2.2 | Review stages

Pilot searches indicated that a search strategy accommodating all primary literature investigating the associations between social determinants of health and incident dementia (> 50,000 search hits) would not be feasible. We therefore conducted a scoping review in two stages: (1) a review of published systematic reviews on social determinants of health and incident dementia, including the Lancet Commission reports on dementia;[11,22,23] and (2) a review of primary literature on social determinants of health and incident dementia using a search strategy designed to update or fill gaps identified by the first stage. Searches were designed by an expert librarian (I.K.), building upon examples of social determinants of health from existing literature (Table S1), and conducted without language restrictions.

2.2.1 | Review of reviews

The Lancet Commission on dementia prevention, intervention, and care has published three reports.[11,22,23] These reports summarised results from systematic reviews and meta-analyses of associations, as well as specific additional studies on genetic epidemiology, mechanistic evidence, and interventional evidence. Although modifiable risk factors were predominantly reviewed through an individual-level paradigm (e.g., hypertension, physical activity), the reports have also comprehensively presented evidence related to some SDOD, such as education, air pollution, and inequalities. The first report was published in 2017[22] and was updated in 2020[23] and 2024.[11]

We then searched for systematic reviews that examined evidence linking specific social determinants of health, not comprehensively covered in the Lancet Commission reports, to dementia risk. We searched Medline via Ovid on the 22nd of February 2024, using terms for "dementia" and "*social determinants of health,*" and "*review*" without date restrictions (see Table S2 for the full search strategy). We included systematic reviews that were conducted using a clearly reported systematic literature search and reported on a specific synthesis of literature pertaining to the longitudinal associations of one or more social determinants of health and incident dementia. The social determinants must have been measured at a time when the subject was dementia-free, dementia status must then also be ascertained at a later time

point (with the exception of ethnicity/race, for which we included cross-sectional analyses as ethnicity/race is obtained by birth). We required that dementia was ascertained either by clinical assessment (direct, self-reported clinical diagnosis, or via healthcare record linkage) or using a validated algorithm for establishing dementia status based on cognitive and/or functional tests in cohort studies. Two reviewers (Se.W. and A.G.) independently screened articles for inclusion and resolved conflicts through discussion.

Data from all included reviews, including the Lancet Commission reports,[11,22,23] were extracted using a template that captured the information presented in Table S3.

2.2.2 | Update search for primary literature review

We then searched for primary literature. For those SDOD that were covered by systematic reviews identified in stage 1, we searched for primary literature published since the search date of the published systematic review. For other SDOD that were not covered by a systematic review, databases were searched from inception (see Table S4). We performed these searches (described fully in Table S2) in Medline via Ovid, Web of Science, and PsycINFO on the 11th of May 2024. Studies were screened by two reviewers independently (Se.W. reviewed all articles, and M.K., Sh.W., E.H., and U.S. reviewed 25% each), followed by conflict resolution. Eligibility criteria for this stage were the same as stage 1 (except that the study needed to be an original article and not a systematic review). Extraction was completed by one reviewer (A.G.) and checked by a second reviewer (M.K., Sh.W., E.H., U.S., 25% each) for accuracy, using a template which captured the data as presented in Table S5.

2.3 | Synthesis

The narrative synthesis of extracted data is structured by six social determinants of health domains, as identified from sources detailed in Table S1. These domains are: (1) food environment, (2) physical environment, geography and pollution, (3) housing and sanitation, (4) income, employment, working conditions, socioeconomic status, and poverty, (5) social inclusion and ethnicity, and 6) education. Specific examples for each of the six SDOD domains were identified. In cases where a study included data relevant to multiple domains (e.g., occupational electromagnetic field exposure), we included this study in both relevant domains (e.g., domains 2 and 4). The effects of SDOD mediators that might be situated on the causal pathway from another SDOD to incident dementia (e.g., ethnicity → socioeconomic position → dementia risk) and SDOD that modified the effect of another SDOD (e.g., occupational complexity by ethnic groups), were out of the scope of this scoping review for context-specific intercorrelation and comparability reasons.

For each specific SDOD, we describe the level of evidence after reviewing the Lancet Commission reports, systematic reviews, and primary literature.
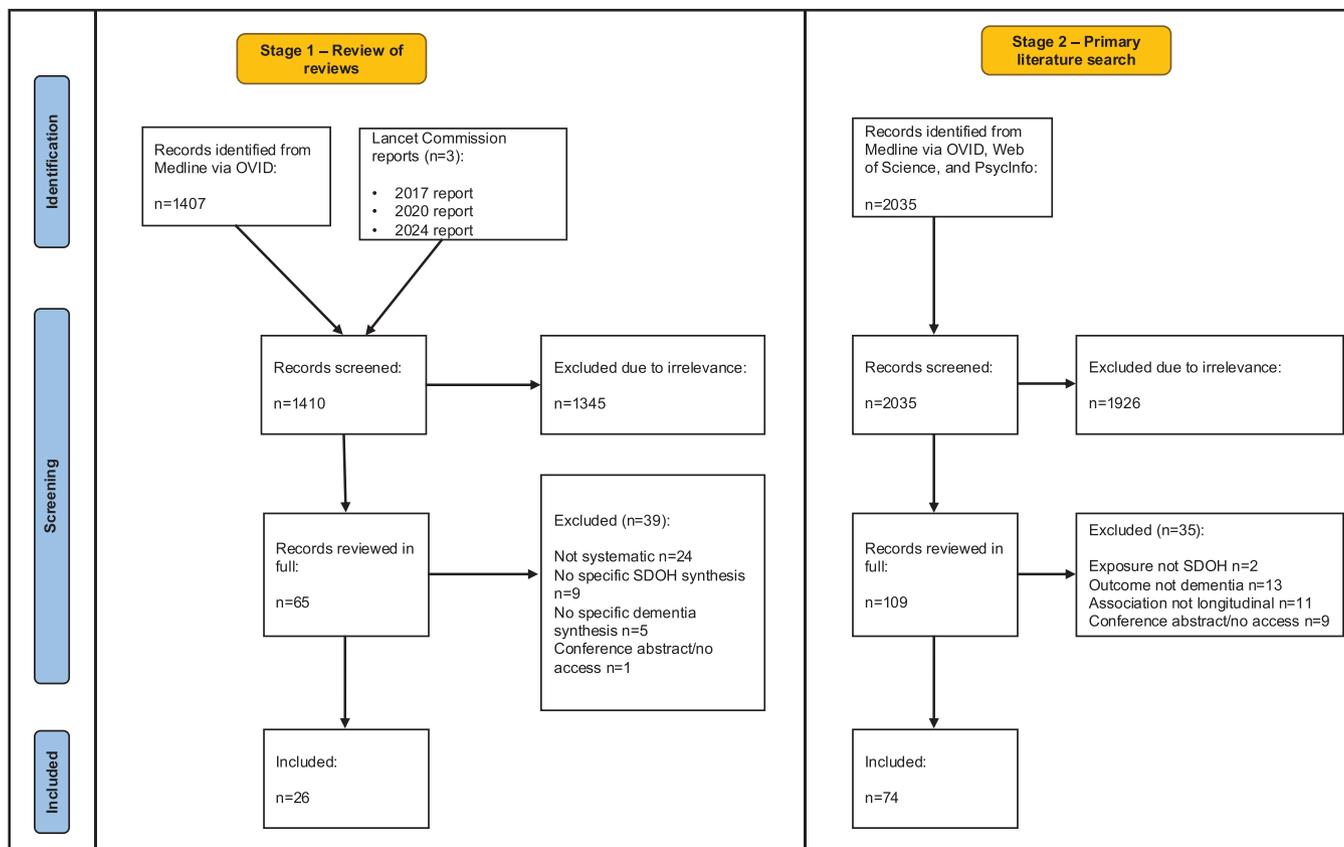
FIGURE 1 The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flowchart.

3 | RESULTS

3.1 | Search results

We considered 3445 articles for inclusion, of which 100 (n = 26 reviews; n = 74 primary studies) were included (Figure 1). Extracted data are reported in full in Supplementary Tables S3 and S5, and a narrative summary of available evidence is reported for each SDOD domain below. An overall summary of the findings is depicted in Figure 2.

3.1.1 | Food environment

We identified one systematic review which aimed to summarize evidence on the association of food insecurity with multiple outcomes of brain health, including dementia (Table S3).[24] Although some evidence linking food insecurity to poorer cognition was identified, no studies measuring incident dementia as an outcome were identified by the authors. However, our primary literature search identified two primary studies (Table S5). A population-based study from the United States found a positive association between experiencing food insecurity and increased dementia risk (odds ratio [OR] = 1.38; 95% confidence interval [CI] = 1.15;1.67).[25] In contrast, a Japanese study reported an association between subjective availability of food stores and increased dementia risk (hazard ratio [HR] = 1.30[1.10;1.52] lowest vs. highest quartile), while the associations between objective availability of food stores and dementia risk was statistically non-significant.[26]

3.1.2 | Physical environment, geography, and pollution

We identified 10 reviews[11,23,27–34] (Table S3) and 15 additional primary studies[35–49] related to environmental SDOD (Table S5).

The Lancet Commission highlights a wealth of evidence, including two systematic reviews with meta-analyses, linking ambient air pollution to dementia risk.[11,23] Specific cohort studies highlighted by the commission included those notable for their particularly low risk of bias,[50] and those that reported a significant mediating role of air pollution in explaining some of the racial differences in dementia risk within HICs.[51,52] The commission reports focused primarily on ambient air pollution, typically measured as particulate matter (PM)2.5 and PM10. We identified further primary studies, which found associations between increased dementia risk and exposure to indoor pollution from solid cooking fuel,[41] and ambient exposures such as Agent Orange,[42] respirable aluminum,[48] and radon.[47]

Two systematic reviews reported on a large range of environmental social determinants of health.[27,28] The more recent and larger systematic review by Zhao et al.[27] assessed 132 studies including 44
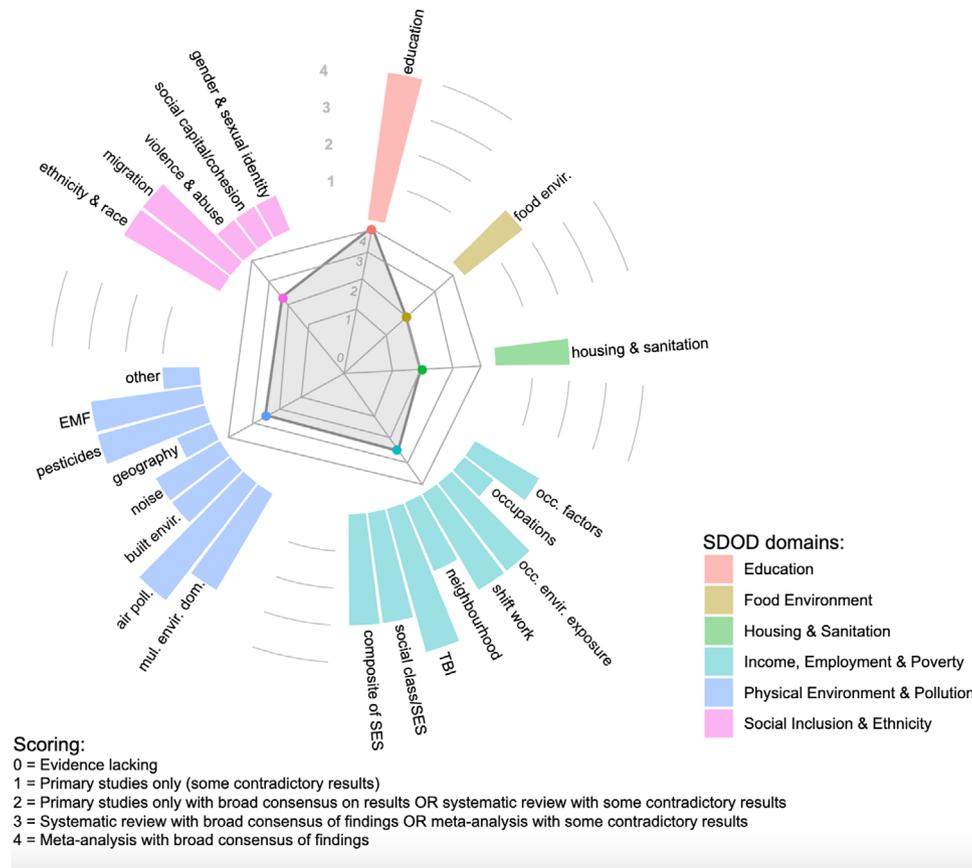
FIGURE 2 Modified radar plot showing the availability of current evidence on social determinants of dementia, by domain.

different natural, physical, and social environmental determinants of health. Associations of several SDOD were meta-analysed and positive associations were reported for road proximity (n = 5), neighborhood deprivation (n = 9) (see also 3.2.4), and exposure to aluminium (n = 14), solvents (n = 12), electromagnetic fields (n = 27) (see also 3.2.4), and pesticides (n = 14) (see also 3.2.4).[27] No difference in dementia risk was reported for residential green space (n = 7), rurality (n = 28), living close to a power line (n = 4), noise (n = 4), water silicon levels (n = 5), and vibrations at work (n = 2).[27] There were too few studies available, and/or measures were too heterogeneous between studies, for other social determinants of health to allow for meta-analytic comparison. Examples of these included exposure to fluoride[53] and lithium[54] in drinking water, and exposure to atomic bombings.[55]

We identified other systematic reviews that presented more focused summaries of evidence. These reviews largely corroborated the findings of the broader Zhao et al. review,[27] for example, positive associations with dementia risk were reported for road proximity,[29] electromagnetic fields,[33,34] pesticides,[32] and solvents,[32] whereas findings were mixed for exposure to urban green space.[29] Mixed findings were also reported for land use (accessibility, walkability, land use mix), and noise exposure.[29]

Primary studies[35–49] were identified that investigated novel potential determinants of health such as exposure to "blue space" (i.e., an

outdoor environment that features water; Table S5). In a US-based cohort study, no significant association was reported between blue space cover and the risk of dementia among fee-for-service Medicare beneficiaries aged 65 years or older.[40] Analysis of a multigenerational population-based US cohort found that childhood exposure to second-hand smoke elevates the risk of dementia.[56] Additionally, ecological studies reported positive associations with dementia risk for several geographical SDOD, including birth in a high stroke mortality state[37] and area-level ethnicity.[43]

3.1.3 | Housing and sanitation

We identified one systematic review, which searched for US-based studies on the association between homelessness and dementia risk (Table S3).[57] Based on six studies, the authors suggested a positive association between homelessness and dementia.[57]

We identified an additional recent primary study on the association between homelessness and dementia in the United States[58] (Table S5). Roncarati et al.[58] found that US veterans with housing instability had 1.41 (HR = 1.41[1.36;1.47]) times higher dementia risk compared to veterans without housing instability.

3.1.4 | Income, employment, working conditions, socioeconomic status, and poverty

We identified 16 systematic reviews that investigated social determinants of health based on income, employment, working conditions, socioeconomic status, and poverty with dementia risk (Supplementary Table S3).[11,22,23,27,33,34,59–67]

Three systematic reviews considered the general construct of socioeconomic position and reported associations between lower socioeconomic position and increased dementia risk.[65–67] Socioeconomic position is a complex concept that can include many individual-level (e.g., education, income, financial security, occupation) as well as neighborhood-based measures, making it difficult to directly compare studies. In the meta-analyses by Bodryzlova et al.,[65] occupational attainment and income were independently associated with increased dementia risk. A review by Wang et al.[66] reported an increased dementia risk linked to a lower socioeconomic position composite score (which included occupational attainment and income variables), but did not find an association between solely occupational attainment or solely income with dementia risk.

Nine systematic reviews investigated specific occupations as risk factors.[11,22,23,27,33,34,59–61,67] Meta-analyses reported an increased dementia risk for shift work ($n = 2$ studies), occupational exposure to magnetic field ($n = 7$ studies), and solvents ($n = 2$) (see also section 3.2.2), whereas no association was identified for non-manual work compared to manual work ($n = 6$), occupational complexity ($n = 4$), occupational pesticide exposure ($n = 2$) (see also section 3.2.2), or night shifts ($n = 2$).[59] In contrast, earlier reviews (which did not meta-analyse results) observed a higher dementia risk for those in manual professions or with lower work complexity in four out of five cohort studies in one review[60] and four out of four studies in the other.[67] A review by Then et al.[61] divided work complexity into four types, and noted that "people complexity" (e.g., training others), and "data complexity" (e.g., performing arithmetic operations) showed protective associations, whereas results were mixed for "things complexity" (e.g., using special devices to work) and "work demands" (e.g., perceived control and stress). Lastly, more evidence for shift work (including night shifts) as a risk factor for dementia was found in the systematic reviews by Gao et al.[62] and Hai et al.,[63] although the overall evidence base was deemed insufficient for causal association by the Lancet Commission.[11] Evidence for occupational traumatic brain injury as a modifiable risk factor was also presented by the Lancet Commission.[11,22,23] The authors described findings from two systematic reviews[68,69] with meta-analyses of cohort studies, which reported higher dementia risk for professions with high-risk of traumatic brain injury (e.g., veterans, professional soccer and rugby players) compared to matched general population samples.[70–76]

We identified 32 new primary studies which broadens the evidence base for a link between socioeconomic status and dementia risk (Table S5).[4,77–106] The link between socioeconomic status and dementia risk now extends as far back as childhood.[82,92] A more detailed exploration of occupational factors such as contact with co-workers[87] and older age at retirement (≥66 years),[104] which were reported

to be associated with reduced dementia risk in Northern European studies. Occupational conflict[86] and military employment[101] were not found to be associated with dementia risk in population-based cohorts. Further evidence for associations between higher wealth/income and lower dementia risk has been reported in several population-based cohorts,[4,82,83,88,89,100] using both individual-level measures and neighborhood-based assessments.[4,79–81]

3.1.5 | Social inclusion and ethnicity

Three systematic reviews on race or ethnicity as SDOD were identified (Table S3).[107–109] The most recent meta-analysis from Shiekh et al.[107] included 19 studies primarily from HICs and concluded that Black individuals had an increased dementia risk as compared to White individuals, while findings for Asian and Latino individuals were non-significant. A large systematic review that was restricted to studies conducted within the United States ($n = 114$) also reported a higher incidence of dementia in African American and Caribbean American populations as compared to Japanese American (men only), Mexican American, and non-Latino White American populations.[108] These findings of a higher risk among Black groups, particularly in the United States, were supported by several new primary studies identified by our search (Table S5).[37,43,79,83,85,89,106,110–122] A systematic review restricted to the Asia-Pacific region reported lower dementia prevalence among ethnic Chinese, compared to ethnic Malay and ethnic Indian individuals, across three comparative studies within Singapore.[109] Finally, a higher dementia prevalence was observed among Indigenous Australian individuals compared to the general Australian population.[109]

One systematic review on migration and dementia risk included seven studies from the United Kingdom, the Netherlands, and Norway (Table S3).[123] In a pooled analysis, which combined migrants with ethnic minorities without a report of migration history, dementia risk was found to be higher for migrants/ethnic minorities compared to natives (OR = 1.73[1.42;2.11]). No association was observed between the age of migration and future dementia risk[124] (Table S5).

We identified several new, primary studies that investigated the association between characteristics of the social environment and dementia risk (Table S5). Most reported elevated dementia risk associated with characteristics of the social environment, such as higher neighborhood disorder,[80,125] increased neighborhood social vulnerability,[114] social isolation,[80] and lower social capital.[126,127] Two studies, however, found no association with dementia risk for neighborhood social cohesion.[80,125]

Other SDOD in this domain were also identified that were reported to have an association with increased dementia risk in primary studies, which included sibling loss,[112] transgender sexual identity,[128] being victims of financial abuse in later-life[129] or severe spousal physical abuse,[130] and adverse childhood experiences.[127,131,132] No association was found for intimate partner violence[133] (using a less severe threshold than Leung et al.[130]), physical or psychological abuse.[129] Findings about sexual relationships were mixed with one study reporting an

increased risk for those in a same-sex relationship,[134] while another study found no association between sexual relationships (same-sex or opposite-sex relationships) and dementia risk (Table S5).[135]

3.1.6 | Education

The Lancet Commission reports on dementia determined low formal educational attainment to be a causal modifiable risk factor for dementia, with possible direct and indirect effects on cognitive reserve (Table S3).[11,22,23] This was based on a broad evidence base that included evidence from HIC and LMICs, as well as within-country comparisons among ethnic minority groups. Education was typically assessed by attainment (e.g., ranging from no education to university degree). The Commission authors further postulated that educational attainment disparities might explain much of the increased dementia risk for women (beyond the effects of longer life expectancy).[11,136]

4 | DISCUSSION

4.1 | Main findings

In this scoping review, we systematically summarized the current evidence linking social determinants of health with dementia risk, highlighting a rapidly growing body of research that demonstrates increasing maturity. We built on existing definitions and conceptual work to define SDOD, and synthesising evidence across reviews ($n = 26$) and primary studies ($n = 74$). We identified evidence of associations with dementia risk across six domains of SDOD (food environment; physical environment geography, and pollution; housing and sanitation; income, employment, working conditions, socioeconomic status, and poverty; social inclusion and ethnicity; and education).

The evidence base for some SDOD is large, robust, and consistent, such as low education, air pollution, and the overall effect of low socioeconomic status. For other SDOD, evidence bases are less robust (e.g., food environment), heterogeneous (e.g., environmental exposures) or are simply lacking (e.g., incarceration). Overall, the field requires continued efforts to identify robust evidence across diverse populations, more standardised measures for SDOD, and more collaborative and harmonisation approaches to compare associations across contexts. Other challenges for the field include developing more robust methods to reduce confounding and selection biases, and to ensure that there is a sufficient length of follow-up to avoid reverse causality.

The lack of studies in the domains of food environment, housing and sanitation, and social inclusion, highlights the need for more primary studies in these areas. For example, no studies on agriculture, availability of fast food, food programs, housing quality, sanitation, racism, discrimination, or incarceration were identified. Research on these potential SDOD often encounters challenges related to insufficient data availability or difficulties with longitudinal follow-up, such as those arising from housing instability. Nevertheless, advances in data collection and the emergence of novel databases have facilitated progress in this area. For instance, Veteran Affairs records have been used in a novel way to investigate homelessness in the US.[58] It is established that discrimination is associated with general health and cardiovascular health outcomes.[137] For example, discrimination has been linked to hypertension,[138] medication non-adherence,[139] and missed healthcare appointments.[140] These factors may therefore be expected to increase dementia risk through cerebrovascular disease burden.[141,142] Alternatively, discrimination may act on dementia risk through mental health[143] and/or poor lifestyle, including substance use.[144] Furthermore, most research in areas such as built environment and pollution were conducted in HICs which may have limited generalisability to LMICs, where most dementia cases occur and certain exposures (e.g., to solid cooking fuel) are more common.

Factors related to low socioeconomic status were generally found to be associated with increased dementia risk. For example, the following indicators of socioeconomic status were associated with elevated risk of dementia: reduced wealth or income, manual work or occupations classified as "low complexity," shift work, occupational exposure to magnetic fields and solvents, and neighborhood disadvantage. However, variability in findings across studies may have arisen from selection/attrition biases, different adjustment for confounders across studies, as well as differences in outcome and exposure classification. More focused reviews, which include quality appraisal processes, could explore these possibilities in more detail. An added consideration is that the same socioeconomic indicator may have a different role in different settings. This may also be the case for differences based on ethnicity or race, which may differ from one context to another depending on levels of entrenched structural racism and other power imbalances. Moreover, although many studies have been published on ethnicity and race, data from many ethnic groups and populations in the Global South remain limited. Persistent methodological issues continue to present challenges, including those of age standardisation, sampling bias, treatment of confounding factors, and the disaggregation and self-determination of ethnic groups. To address these gaps, more in-depth collaborative studies are needed to unravel cultural differences and secular trends in socioeconomic, ethnic, and racial inequalities in dementia prevalence over time.[143,145]

4.2 | Findings in context

Social determinants of health are not likely to be the proximal or downstream "causes" of dementia but may instead be better defined as the upstream "causes of the causes"[146] that may interact with one another to increase dementia risk across the life course. Targeting social determinants of health is an ideal opportunity for dementia prevention efforts. However, a challenge for researchers lies in disentangling the interrelationships between SDOD and other risk factors.[14] In addition, vulnerable populations often share multiple risk factors. For instance, veterans are more likely to experience mental health problems, substance abuse, trauma, and are more likely to be homelessness.[147,148] The high clustering of these risk factors presents significant challenges for research focused on SDOD.[13]

We observed that among the most recent studies we identified, there was an increasing trend towards examining connected relationships between multiple SDOD. For example, effect modification by age, neighborhood income, and walkability has been assessed on the association between residential green space and the risk of dementia.[35] The findings show that younger ages (65–74 years), lower-income, and non-car dependent neighborhoods may benefit most from residential green space.[35] Furthermore, Tani et al.[46] observed that sidewalk coverage in Japan was associated with a decreased dementia risk among participants living in urban areas but not among those living in rural areas. Genetic risk factors, such as the ε4-allele of *apolipoprotein E*, may also modulate the influence of social determinants on dementia risk, underscoring the need for further research. For example, less racial/ethnic disparity was detected in a study among the carriers of apolipoprotein E ε4-allele suggesting interaction of genetic factors with social determinants of health.[120]

Recent work to develop "polysocial scores" (akin to polygenic risk scores but using multiple social determinants of health variables) could offer a novel opportunity to investigate multiple interconnected social determinants of health, their clustering, and their relationships with dementia risk.[149,150] Strengthening the causal epidemiology in this space is important. For example, some included studies measured lifestyle behaviors, like smoking or alcohol, as "confounders". However, classic public health models would suggest that such behaviours are, at least in part, intermediate factors on the causal pathway between social disadvantage and poor health. Thus, more focused studies into specific SDOD should focus on investigating these direct and indirect pathways to inform robust study design with appropriate confounder adjustment.

4.3 | Strengths and limitations

We adopted a pragmatic approach to cover the breadth of literature on the association between social determinants of health and incident dementia. We systematically designed our search strategies in several stages to ensure good representation of the literature on this topic. When searching for reviews, we restricted our search to Medline via Ovid to capture high quality key systematic reviews in this field, although we may also have missed some reviews published only in other databases. As is standard practice for a scoping review, we did not perform a risk of bias assessment for individual studies.[16–18] This will be particularly important for more focused systematic reviews that build upon this work. We critically scrutinized the methodological strategies of the studies and systematic reviews we included, as this will be helpful to those using our work to inform updated systematic reviews in the future. Although our search strategy was designed to be broad and globally relevant, it is to be noted that most evidence was captured from HICs. It is possible that some SDOD specific to certain global contexts are yet to be uncovered in the literature.

We only included studies measuring incident dementia as an outcome. Other outcome measures, such as cognitive testing, structural brain abnormalities, and cognitive reserve, are clearly important to understanding these relationships and should be included in future studies. Our scoping review approach also precludes detailed considerations of whether the evidence base for any given SDOD is sufficient to assert causality. We aimed to provide a broad overview of the level of existing evidence for each determinant, with the aim of informing more targeted reviews addressing specific knowledge gaps.

4.4 | Recommendations for future research

Findings from this scoping review can be translated into several recommendations for future studies.

First, the lack of studies in the domains of food environment,[151] housing[152] and sanitation, and social inclusion and ethnicity[153]—which have all been proposed for dementia (Table S1) and linked to other non-communicable diseases—demands more primary studies in these areas on the relationship with dementia. Specific social determinants within other domains remain understudied, such as transport infrastructure, income distribution, unemployment, discrimination, structural conflict, and racism (Table S1).

Second, future studies will benefit from standardised study designs, exposure classification, analyses, and reporting to allow comparisons and achieve a granular understanding of how social determinants are associated with risk of dementia. For example, the World Health Organization recently published a "Preferred Product Characteristics" for blood-based biomarkers for Alzheimer's disease,[154] and a similar schema for SDOD could be highly useful. Classification systems, such as the International Standard Classification of Occupations, may produce clearer evidence on the associations between occupational factors and dementia risk.

Third, more cohort studies performed in LMICs and continents outside Northern America and Europe are needed.

Fourth, better data linkage between social and environmental data with healthcare data is highly recommended.

Fifth, there is a need of cohorts with longer follow-up periods for understudied social determinants of health (Table S1) such as household solid cooking fuel, residential segregation, occupational complexity, and socioeconomic position.

Finally, future studies employing rigorous methodologies can significantly advance the field. For example, ensuring careful causal epidemiology work to elicit causal pathways and confounding factors. This is particularly important given that many apparent confounders may in fact be on the causal pathway to dementia, or be both confounders and mediators within complex system relationships.[155] Other types of studies and causal inference designs can add value, including natural experiment studies of health and social policy changes, and instrumental variable analysis.

4.5 | Conclusion

This scoping review identified a large, and growing evidence base for SDOD. Broad consensus has been reached that the evidence for some

determinants, such as low education and air pollution, is sufficient to infer causality. For other determinants, including socioeconomic status, occupation, and ethnic minority groups, there are clear and consistent patterns of evidence available from systematic reviews and meta-analyses. For yet other determinants, such as housing and food insecurity, the evidence is still emerging. Most evidence originates from HICs, despite an increasing majority of people living with dementia in LMICs. Future research must address this imbalance while remaining attuned to the challenges of disentangling complex relationships among interacting social phenomena, which are often highly context specific. Results of this scoping review provide actionable research recommendations for future studies, which in turn may inform much-needed health policy actions to increase population dementia risk equitably. Future risk reduction strategies and policies should therefore incorporate a wider range of dementia risk factors informed by our evolving understanding of the social determinants of health.

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CONFLICT OF INTEREST STATEMENT

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REFERENCES

1. Wimo A, Seeher K, Cataldi R, et al. The worldwide costs of dementia in 2019. *Alzheimers Dement*. 2023;19:2865-2873. doi:10.1002/alz.12901
2. Nicholson S, Baccarelli A, Prada D. Role of brain extracellular vesicles in air pollution-related cognitive impairment and neurodegeneration. *Environ Res*. 2022;204(Pt C):112316. doi:10.1016/j.envres.2021.112316
3. Cha H, Farina MP, Hayward MD. Socioeconomic status across the life course and dementia-status life expectancy among older Americans. *SSM-Population Health*. 2021;15:100921. doi:10.1016/j.ssmph.2021.100921
4. Klee M, Leist AK, Veldsman M, Ranson JM, Llewellyn DJ. Socioeconomic deprivation, genetic risk, and incident dementia. *Am J Prev Med*. 2023;64(5):621-630. doi:10.1016/j.amepre.2023.01.012
5. Matthews FE, Arthur A, Barnes LE, et al. A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the cognitive function and ageing study I and II. *Lancet*. 2013;382(9902):1405-1412. doi:10.1016/S0140-6736(13)61570-6
6. Wolters FJ, Chibnik LB, Waziry R, et al. Twenty-seven-year time trends in dementia incidence in Europe and the United States: the Alzheimer Cohorts Consortium. *Neurology*. 2020;95(5):e519-e531. doi:10.1212/WNL.0000000000010022
7. Walsh S, Wallace L, Kuhn I, et al. Are population-level approaches to dementia risk reduction under-researched? A rapid review of the dementia prevention literature. *The Journal of Prevention of Alzheimer's Disease*. 2024;11(1):241-248. doi:10.14283/jpad.2023.57
8. Walsh S, Wallace L, Merrick R, et al. How many future dementia cases would be missed by a high-risk screening program? A retrospective cohort study in a population-based cohort. *Alzheimers Dement*. 2024;20(9):6278-6286. doi:10.1002/alz.14113
9. Walsh S, Wallace L, Mukadam N, et al. What is a population-level approach to prevention, and how could we apply it to dementia risk reduction?. *Public Health*. 2023;225:22-27. doi:10.1016/j.puhe.2023.09.019
10. World Health Organization. *Optimizing Brain Health Across The Life Course: WHO Position Paper*. World Health Organization; 2022. https://www.who.int/publications/i/item/9789240054561
11. Livingston G, Huntley J, Liu KY, et al. Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission. *Lancet*. 2024;404(10452):572-628. doi:10.1016/S0140-6736(24)01296-0
12. World Health Organization. *Risk Reduction Of Cognitive Decline And Dementia: WHO Guidelines*. World Health Organization; 2019. https://www.who.int/publications/i/item/9789241550543
13. Marmot M. Fair society, healthy lives. The Marmot Review. 2010. Accessed July 23, 2025. https://www.parliament.uk/globalassets/documents/fair-society-healthy-lives-full-report.pdf
14. Walsh S, Merrick R, Brayne C. The relevance of social and commercial determinants for neurological health. *Lancet Neurol*. 2022;21(12):1151-1160. doi:10.1016/S1474-4422(22)00428-8
15. Adkins-Jackson PB, George KM, Besser LM, et al. The structural and social determinants of Alzheimer's disease related dementias. *Alzheimers Dement*. 2023;19(7):3171-3185. doi:10.1002/alz.13027
16. Anderson S, Allen P, Peckham S, Goodwin N. Asking the right questions: scoping studies in the commissioning of research on the organisation and delivery of health services. *Health Research Policy and Systems*. 2008;6:1-12. doi:10.1186/1478-4505-6-7
17. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*. 2005;8(1):19-32. doi:10.1080/1364557032000119616
18. Munn Z, Peters MD, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when

choosing between a systematic or scoping review approach. *BMC Med Res Method*. 2018;18:1-7. doi:10.1186/s12874-018-0611-x

19. Geraets AF, Walsh S, Siette J, et al. Social determinants of dementia: a scoping review. Protocol published on OSF Registries. 2024. doi:10.17605/OSF.IO/SK69J

20. Ranson JM, Khleifat AA, Lyall DM, et al. The Deep Dementia Phenotyping (DEMON) Network: a global platform for innovation using data science and artificial intelligence. *Alzheimers Dement*. 2022;18(S2):e067308. doi:10.1002/alz.067308

21. Raphael D, Bryant T, Mikkonen J, Alexander R. *Social Determinants of Health: The Canadian Facts*. Ontario Tech University Faculty of Health Sciences; 2020.

22. Livingston G, Sommerlad A, Orgeta V, et al. Dementia prevention, intervention, and care. *Lancet*. 2017;390(10113):2673-2734. doi:10.1016/S0140-6736(17)31363-6

23. Livingston G, Huntley J, Sommerlad A, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*. 2020;396(10248):413-446. doi:10.1016/S0140-6736(20)30367-6

24. McMichael AJ, McGuinness B, Lee J, Minh HV, Woodside JV, McEvoy CT. Food insecurity and brain health in adults: a systematic review. *Crit Rev Food Sci Nutr*. 2022;62(31):8728-8743. doi:10.1080/10408398.2021.1932721

25. Qian H, Khadka A, Martinez SM, et al. Food insecurity, memory, and dementia among US adults aged 50 years and older. *JAMA Netw Open*. 2023;6(11):e2344186-e2344186. doi:10.1001/jamanetworkopen.2023.44186

26. Tani Y, Suzuki N, Fujiwara T, Hanazato M, Kondo K. Neighborhood food environment and dementia incidence: the Japan gerontological evaluation study cohort survey. *Am J Prev Med*. 2019;56(3):383-392. doi:10.1016/j.amepre.2018.10.028

27. Zhao Y-L, Qu Y, Ou Y-N, Zhang Y-R, Tan L, Yu J-T. Environmental factors and risks of cognitive impairment and dementia: a systematic review and meta-analysis. *Ageing Res Rev*. 2021;72:101504. doi:10.1016/j.arr.2021.101504

28. Killin LOJ, Starr JM, Shiue IJ, Russ TC. Environmental risk factors for dementia: a systematic review. *BMC Geriatrics*. 2016;16(1):175. doi:10.1186/s12877-016-0342-y

29. Chen X, Lee C, Huang H. Neighborhood built environment associated with cognition and dementia risk among older adults: a systematic literature review. *Soc Sci Med*. 2022;292:114560. doi:10.1016/j.socscimed.2021.114560

30. Huang L, Zhang Y, Wang Y, Lan Y. Relationship between chronic noise exposure, cognitive impairment, and degenerative dementia: update on the experimental and epidemiological evidence and prospects for further research. *JAD*. 2021;79(4):1409-1427. doi:10.3233/JAD-201037

31. Clark C, Crumpler C, Notley H. Evidence for environmental noise effects on health for the United Kingdom policy context: a systematic review of the effects of environmental noise on mental health, wellbeing, quality of life, cancer, dementia, birth, reproductive outcomes, and cognition. *Int J Environ Res Public Health*. 2020;17(2):393. doi:10.3390/ijerph17020393

32. Yan D, Zhang Y, Liu L, Yan H. Pesticide exposure and risk of Alzheimer's disease: a systematic review and meta-analysis. *Sci Rep*. 2016;6:32222. doi:10.1038/srep32222

33. Jalilian H, Teshnizi SH, Roosli M, Neghab M. Occupational exposure to extremely low frequency magnetic fields and risk of Alzheimer disease: a systematic review and meta-analysis. *Neurotoxicology*. 2018;69:242-252. doi:10.1016/j.neuro.2017.12.005

34. Garcia AM, Sisternas A, Hoyos SP. Occupational exposure to extremely low frequency electric and magnetic fields and Alzheimer disease: a meta-analysis. *Int J Epidemiol*. 2008;37(2):329-340. doi:10.1093/ije/dym295

35. Brown S, Aitken W, Lombard J, et al. Longitudinal impacts of precision greenness on Alzheimer's disease. *J Prev Alzheimers Dis*. 2024;11(3):710-720. doi:10.14283/jpad.2024.38

36. Cantuaria ML, Waldorff FB, Wermuth L, et al. Residential exposure to transportation noise in Denmark and incidence of dementia: national cohort study. *Br Med J (Clin Res Ed)*. 2021;374:n1954. doi:10.1136/bmj.n1954

37. Gilsanz P, Mayeda ER, Glymour MM, Quesenberry CP, Whitmer RA. Association between birth in a high stroke mortality state, race, and risk of dementia. *JAMA Neurol*. 2017;74(9):1056-1062. doi:10.1001/jamaneurol.2017.1553

38. Godina SL, Rosso AL, Hirsch JA, et al. Neighborhood greenspace and cognition: the cardiovascular health study. *Health Place*. 2023;79:102960. doi:10.1016/j.healthplace.2022.102960

39. Hu H-Y, Ma Y-H, Deng Y-T, et al. Residential greenness and risk of incident dementia: a prospective study of 375,342 participants. *Environ Res*. 2023;216:114703. doi:10.1016/j.envres.2022.114703

40. Klompmaker JO, Laden F, Browning MH, et al. Associations of greenness, parks, and blue space with neurodegenerative disease hospitalizations among older US adults. *JAMA Netw Open*. 2022;5(12):e2247664-e2247664. doi:10.1001/jamanetworkopen.2022.47664

41. Li M, Ma C, Wu C. Association between solid cooking fuel use and dementia in older Chinese adults: the mediating effect of depression. *Int J Environ Health Res*. 2024;34(2):779-791. doi:10.1080/09603123.2023.2167950

42. Martinez S, Yaffe K, Li Y, Byers AL, Peltz CB, Barnes DE. Agent Orange exposure and dementia diagnosis in US veterans of the Vietnam era. *JAMA Neurol*. 2021;78(4):473-477. doi:10.1001/jamaneurol.2020.5011

43. Pohl DJ, Seblova D, Avila JF, et al. Relationship between residential segregation, later-life cognition, and incident dementia across race/ethnicity. *Int J Environ Res Public Health*. 2021;18(21):11233. doi:10.3390/ijerph182111233

44. Rodriguez-Loureiro L, Gadeyne S, Bauwelinck M, Lefebvre W, Vanpoucke C, Casas L. Long-term exposure to residential greenness and neurodegenerative disease mortality among older adults: a 13-year follow-up cohort study. *Environ Health*. 2022;21(1):49. doi:10.1186/s12940-022-00863-x

45. Slawsky ED, Hajat A, Rhew IC, et al. Neighborhood greenspace exposure as a protective factor in dementia risk among US adults 75 years or older: a cohort study. *Environ Health*. 2022;21(1):14. doi:10.1186/s12940-022-00830-6

46. Tani Y, Hanazato M, Fujiwara T, Suzuki N, Kondo K. Neighborhood sidewalk environment and incidence of dementia in older Japanese adults: the Japan gerontological evaluation study cohort. *Am J Epidemiol*. 2021;190(7):1270-1280. doi:10.1093/aje/kwab043

47. Zeng X, Berriault C, Arrandale VH, DeBono NL, Harris MA, Demers PA. Radon exposure and risk of neurodegenerative diseases among male miners in Ontario, Canada: a cohort study. *Am J Ind Med*. 2023;66(2):132-141. doi:10.1002/ajim.23449

48. Zeng X, MacLeod J, Berriault C, et al. Aluminum dust exposure and risk of neurodegenerative diseases in a cohort of male miners in Ontario, Canada. *Scand J Work Environ Health*. 2021;47(7):531-539. doi:10.5271/sjweh.3974

49. Zhou S, Wang K. Childhood secondhand smoke exposure and risk of dementia, Alzheimer's disease and stroke in adulthood: a prospective cohort study. *J Prev Alzheimers Dis*. 2021;8:345-350. doi:10.14283/jpad.2021.10

50. Chen H, Kwong JC, Copes R, et al. Exposure to ambient air pollution and the incidence of dementia: a population-based cohort study. *Environ Int*. 2017;108:271-277. doi:10.1016/j.envint.2017.08.020

51. Bowe B, Xie Y, Yan Y, Al-Aly Z. Burden of cause-specific mortality associated with PM2. 5 air pollution in the United States. *JAMA*

Netw Open. 2019;2(11):e1915834. doi:10.1001/jamanetworkopen.2019.15834

52. Shi L, Zhu Q, Wang Y, et al. Incident dementia and long-term exposure to constituents of fine particle air pollution: a national cohort study in the United States. *Proc Natl Acad Sci.* 2023;120(1):e2211282119. doi:10.1073/pnas.2211282119

53. Russ TC, Killin LO, Hannah J, Batty GD, Deary IJ, Starr JM. Aluminium and fluoride in drinking water in relation to later dementia risk. *Br J Psychiatry.* 2020;216(1):29-34. doi:10.1192/bjp.2018.287

54. Kessing LV, Gerds TA, Knudsen NN, et al. Association of lithium in drinking water with the incidence of dementia. *JAMA Psychiatry.* 2017;74(10):1005-1010. doi:10.1001/jamapsychiatry.2017.2362

55. Yamada M, Kasagi F, Mimori Y, Miyachi T, Ohshita T, Sasaki H. Incidence of dementia among atomic-bomb survivors—radiation effects research foundation adult health study. *J Neurol Sci.* 2009;281(1-2):11-14. doi:10.1016/j.jns.2009.03.003

56. Zhou S, Gao L, Liu F, Tian W, Jin Y, Zheng ZJ. Socioeconomic status and depressive symptoms in older people with the mediation role of social support: a population-based longitudinal study. *Int J Methods Psychiatr Res.* 2021;30(4):e1894. doi:10.1002/mpr.1894

57. Babulal GM, Rani R, Adkins-Jackson P, Pearson AC, Williams MM. Associations between homelessness and Alzheimer's disease and related dementia: a systematic review. *Journal of Applied Gerontology: The Official Journal of the Southern Gerontological Society.* 2022;41(11):2404-2413. doi:10.1177/07334648221109747

58. Roncarati JS, DeVone F, Halladay C, Tsai J, Jutkowitz E. Risk of dementia among veterans experiencing homelessness and housing instability. *J Am Geriatr Soc.* 2024;72(2):382-389. doi:10.1111/jgs.18680

59. Huang L-Y, Hu H-Y, Wang Z-T, et al. Association of occupational factors and dementia or cognitive impairment: a systematic review and meta-analysis. *J Alzheimers Dis.* 2020;78(1):217-227. doi:10.3233/JAD-200605

60. Gracia Rebled AC, Santabarbara Serrano J, Lopez Anton RLA, Tomas Aznar C, Marcos Aragues G. [Occupation and Risk of Cognitive Impairment and Dementia in People in over 55 Years: a Systematic Review, Spain]. *Rev Esp Salud Publica.* 2016;90:e1-e15.

61. Then FS, Luck T, Luppa M, et al. Systematic review of the effect of the psychosocial working environment on cognition and dementia. *Occup Environ Med.* 2014;71(5):358-365. doi:10.1136/oemed-2013-101760

62. Gao Y, Fu X, Hu H, et al. Impact of shift work on dementia: a systematic review and dose-response meta-analysis. *Public Health.* 2023;223:80-86. doi:10.1016/j.puhe.2023.07.029

63. Hai Y, Xue Y, Wang Y-H. Does long-term shift work increase the risk of dementia? A systematic review and meta-analysis. *Am J Alzheimers Dis Other Demen.* 2022;37:15333175221141535. doi:10.1177/15333175221141535

64. Leso V, Caturano A, Vetrani I, Iavicoli I. Shift or night shift work and dementia risk: a systematic review. *Eur Rev Med Pharmacol Sci.* 2021;25(1):222-232. doi:10.26355/eurrev_202101_24388

65. Bodryzlova Y, Kim A, Michaud X, André C, Bélanger E, Moullec G. Social class and the risk of dementia: a systematic review and meta-analysis of the prospective longitudinal studies. *Scand J Public Health.* 2022;51(8):1122-1135. doi:10.1177/14034948221110019

66. Wang A-Y, Hu H-Y, Ou Y-N, et al. Socioeconomic status and risks of cognitive impairment and dementia: a systematic review and meta-analysis of 39 prospective studies. *J Prev Alzheimers Dis.* 2023;10:83-94. doi:10.14283/jpad.2022.81

67. Fratiglioni L, Wang H-X. Brain reserve hypothesis in dementia. *J Alzheimers Dis.* 2007;12(1):11-22. doi:10.3233/jad-2007-1210

68. Gu D, Ou S, Liu G. Traumatic brain injury and risk of dementia and Alzheimer's disease: a systematic review and meta-analysis. *Neuroepidemiology.* 2022;56(1):4-16. doi:10.1159/000520966

69. Gardner RC, Bahorik A, Kornblith ES, Allen IE, Plassman BL, Yaffe K. Systematic review, meta-analysis, and population attributable risk of dementia associated with traumatic brain injury in civilians and veterans. *J Neurotrauma.* 2023;40(7-8):620-634. doi:10.1089/neu.2022.0041

70. Barnes DE, Byers AL, Gardner RC, Seal KH, Boscardin WJ, Yaffe K. Association of mild traumatic brain injury with and without loss of consciousness with dementia in US military veterans. *JAMA Neurol.* 2018;75(9):1055-1061. doi:10.1001/jamaneurol.2018.0815

71. Yaffe K, Lwi SJ, Hoang TD, et al. Military-related risk factors in female veterans and risk of dementia. *Neurology.* 2019;92(3):e205-e211. doi:10.1212/WNL.0000000000006778

72. Mackay DF, Russell ER, Stewart K, MacLean JA, Pell JP, Stewart W. Neurodegenerative disease mortality among former professional soccer players. *N Engl J Med.* 2019;381(19):1801-1808. doi:10.1056/NEJMoa1908483

73. Russell ER, Mackay DF, Stewart K, MacLean JA, Pell JP, Stewart W. Association of field position and career length with risk of neurodegenerative disease in male former professional soccer players. *JAMA Neurol.* 2021;78(9):1057-1063. doi:10.1001/jamaneurol.2021.2403

74. Russell ER, Mackay DF, Lyall D, et al. Neurodegenerative disease risk among former international rugby union players. *J Neurol Neuros Psychiatry.* 2022;93(12):1262-1268. doi:10.1136/jnnp-2022-329675

75. Orhant E, Carling C, Chapellier JF, et al. A retrospective analysis of all-cause and cause-specific mortality rates in French male professional footballers. *Scand J Med Sci Sports.* 2022;32(9):1389-1399. doi:10.1111/sms.14195

76. Ueda P, Pasternak B, Lim C-E, et al. Neurodegenerative disease among male elite football (soccer) players in Sweden: a cohort study. *Lancet Public Health.* 2023;8(4):e256-e265. doi:10.1016/S2468-2667(23)00027-0

77. Appel AM, Brønnum-Hansen H, Garde AH, et al. Socioeconomic position and late-onset dementia: a nationwide register-based study. *J Aging Health.* 2022;34(2):184-195. doi:10.1177/0898264321103720

78. Arora K, Xu L, Bhagianadh D. Dementia and cognitive decline in older adulthood: are agricultural workers at greater risk?. *J Gerontol Ser B.* 2021;76(8):1629-1643. doi:10.1093/geronb/gbab005

79. Becerril A, Pfoh ER, Hashmi AZ, et al. Racial, ethnic and neighborhood socioeconomic differences in incidence of dementia: a regional retrospective cohort study. *J Am Geriatr Soc.* 2023;71(8):2406-2418. doi:10.1111/jgs.18322

80. Choi EY, Cho G, Chang VW. Neighborhood Social Environment and Dementia: the Mediating Role of Social Isolation. *J Gerontol B Psychol Sci Soc Sci.* 2024;79(4):gbad199. doi:10.1093/geronb/gbad199

81. Dai J, Xu Y, Wang T, Zeng P. Exploring the relationship between socioeconomic deprivation index and Alzheimer's disease using summary-level data: from genetic correlation to causality. *Prog Neuropsychopharmacol Biol Psychiatry.* 2023;123:110700. doi:10.1016/j.pnpbp.2022.110700

82. Geraets AF, Leist AK. Sex/gender and socioeconomic differences in modifiable risk factors for dementia. *Sci Rep.* 2023;13(1):80. doi:10.1038/s41598-022-27368-4

83. Hudomiet P, Hurd MD, Rohwedder S. Trends in inequalities in the prevalence of dementia in the United States. *Proc Natl Acad Sci.* 2022;119(46):e2212205119. doi:10.1073/pnas.2212205119

84. Hyun J, Hall CB, Katz MJ, et al. Education, occupational complexity, and incident dementia: a COSMIC collaborative cohort study. *J Alzheimers Dis.* 2022;85(1):179-196. doi:10.3233/JAD-21062

85. Hyun J, Hall CB, Sliwinski MJ, et al. Effect of mentally challenging occupations on incident dementia differs between African Americans and non-Hispanic Whites. *J Alzheimers Dis.* 2020;75(4):1405-1416. doi:10.3233/JAD-191222

86. Ishtiak-Ahmed K, Hansen ÅM, Mortensen EL, et al. Prolonged or serious conflicts at work and incident dementia: a 23-year follow-up

of the Copenhagen City Heart Study. *Int Arch Occup Environ Health.* 2019;92:165-173. doi:10.1007/s00420-018-1365-9

87. Ishtiak-Ahmed K, Hansen ÅM, Garde AH, et al. Social relations at work and incident dementia: 29-years' follow-up of the Copenhagen male study. *J Occup Environ Med.* 2018;60(1):12-18. doi:10.1097/JOM.0000000000001158

88. Jain S, Murphy TE, O'Leary JR, Leo-Summers L, Ferrante LE. Association between socioeconomic disadvantage and decline in function, cognition, and mental health after critical illness among older adults: a cohort study. *Ann Intern Med.* 2022;175(5):644-655. doi:10.7326/M21-3086

89. Keohane LM, Nikpay S, Braun K, et al. Association of race and income with incident diagnosis of Alzheimer's disease and related dementias among Black and White older adults. *J Appl Gerontol.* 2023;42(5):898-908. doi:10.1177/07334648221142851

90. Kivimäki M, Walker KA, Pentti J, et al. Cognitive stimulation in the workplace, plasma proteins, and risk of dementia: three analyses of population cohort studies. *Br Med J (Clin Res Ed).* 2021;374:n1804. doi:10.1136/bmj.n1804

91. Ko H, Kim S, Kim K, et al. Genome-wide association study of occupational attainment as a proxy for cognitive reserve. *Brain.* 2022;145(4):1436-1448. doi:10.1093/brain/awab351

92. Korhonen K, Leinonen T, Tarkiainen L, Einiö E, Martikainen P. Childhood socio-economic circumstances and dementia: prospective register-based cohort study of adulthood socio-economic and cardiovascular health mediators. *Int J Epidemiol.* 2023;52(2):523-535. doi:10.1093/ije/dyac205

93. Lai KY, Webster C, Kumari S, Gallacher JE, Sarkar C. The associations of socioeconomic status with incident dementia and Alzheimer's disease are modified by leucocyte telomere length: a population-based cohort study. *Sci Rep.* 2023;13(1):6163. doi:10.1038/s41598-023-32974-x

94. Li R, Li R, Xie J, et al. Associations of socioeconomic status and healthy lifestyle with incident early-onset and late-onset dementia: a prospective cohort study. *The Lancet Healthy Longevity.* 2023;4(12):e693-e702. doi:10.1016/S2666-7568(23)00211-8

95. Liao H, Pan D, Deng Z, et al. Association of shift work with incident dementia: a community-based cohort study. *BMC Medicine.* 2022;20(1):484. doi:10.1186/s12916-022-02667-9

96. Ling Y, Yuan S, Huang X, et al. The association of night shift work with the risk of all-cause dementia and Alzheimer's disease: a longitudinal study of 245,570 UK biobank participants. *J Neurol.* 2023;270(7):3499-3510. doi:10.1007/s00415-023-11672-8

97. Martin-Bassols N, de New SC, Johnston DW, Shields MA. Cognitive activity at work and the risk of dementia. *Health Econ.* 2023;32(7):1561-1580. doi:10.1002/hec.4679

98. Nabe-Nielsen K, Holtermann A, Gyntelberg F, et al. The effect of occupational physical activity on dementia: results from the Copenhagen Male Study. *Scand J Med Sci Sports.* 2021;31(2):446-455. doi:10.1111/sms.13846

99. Ou Y-N, Zhang Y-B, Li Y-Z, et al. Socioeconomic status, lifestyle and risk of incident dementia: a prospective cohort study of 276730 participants. *Geroscience.* 2024;46(2):2265-2279. doi:10.1007/s11357-023-00994-0

100. Park YS, Joo HJ, Jang YS, Jeon H, Park E-C, Shin J. Socioeconomic status and dementia risk among intensive care unit survivors: using National Health Insurance cohort in Korea. *Journal of Alzheimer's Disease.* 2024;97(1):273-281. doi:10.3233/JAD-230715

101. Power MC, Murphy AE, Gianattasio KZ, et al. Association of military employment with late-life cognitive decline and dementia: a population-based prospective cohort study. *Mil Med.* 2023;188(5-6):e1132-e1139. doi:10.1093/milmed/usab413

102. Raggi M, Dugravot A, Valeri L, et al. Contribution of smoking towards the association between socioeconomic position and dementia: 32-year follow-up of the Whitehall II prospective cohort study. *Lancet Reg Health Eur.* 2022;23:100516. doi:10.1016/j.lanepe.2022.100516

103. Ren J-J, Zhang P-D, Li Z-H, et al. Association of night shifts and lifestyle risks with incident dementia. *J Gerontol A Biol Sci Med Sci.* 2023;78(9):1725-1732. doi:10.1093/gerona/glad116

104. Sundström A, Rönnlund M, Josefsson M. A nationwide Swedish study of age at retirement and dementia risk. *Int J Geriatr Psychiatry.* 2020;35(10):1243-1249. doi:10.1002/gps.5363

105. Sundström A, Sörman DE, Hansson P, Ljungberg JK, Adolfsson R. Mental demands at work and risk of dementia. *J Alzheimers Dis.* 2020;74(3):735-740. doi:10.3233/JAD-190920

106. Weiss J. Contribution of socioeconomic, lifestyle, and medical risk factors to disparities in dementia and mortality. *SSM-Population Health.* 2021;16:100979. doi:10.1016/j.ssmph.2021.100979

107. Shiekh SI, Cadogan SL, Lin L-Y, Mathur R, Smeeth L, Warren-Gash C. Ethnic differences in dementia risk: a systematic review and meta-analysis. *J Alzheimers Dis.* 2021;80(1):337-355. doi:10.3233/JAD-201209

108. Mehta KM, Yeo GW. Systematic review of dementia prevalence and incidence in United States race/ethnic populations. *Alzheimers Dement.* 2017;13(1):72-83. doi:10.1016/j.jalz.2016.06.2360

109. Venketasubramanian N, Sahadevan S, Kua E, Chen C, Ng T-P. Interethnic differences in dementia epidemiology: global and Asia-Pacific perspectives. *Dement Geriatr Cogn Disord.* 2011;30(6):492-498. doi:10.1159/000321675

110. Beydoun MA, Beydoun HA, Banerjee S, Weiss J, Evans MK, Zonderman AB. Pathways explaining racial/ethnic and socio-economic disparities in incident all-cause dementia among older US adults across income groups. *Translational Psychiatry.* 2022;12(1):478. doi:10.1038/s41398-022-02243-y

111. Bonnechère B, Liu J, Thompson A, Amin N, van Duijn C. Does ethnicity influence dementia, stroke and mortality risk? Evidence from the UK Biobank. *Frontiers in Public Health.* 2023;11:1111321. doi:10.3389/fpubh.2023.1111321

112. Cha H, Thomas PA, Umberson D. Sibling deaths, racial/ethnic disadvantage, and dementia in later life. *J Gerontol Ser B.* 2022;77(8):1539-1549. doi:10.1093/geronb/gbab202

113. Cheung G, To E, Rivera-Rodriguez C, et al. Dementia prevalence estimation among the main ethnic groups in New Zealand: a population-based descriptive study of routinely collected health data. *BMJ Open.* 2022;12(9):e062304. doi:10.1136/bmjopen-2022-062304

114. Fortinsky RH, Robison J, Steffens DC, Grady J, Migneault D, Wakefield D. Association of race, ethnicity, education, and neighborhood context with dementia prevalence and cognitive impairment severity among older adults receiving medicaid-funded home and community-based services. *Am J Geriatr Psychiatry.* 2023;31(4):241-251. doi:10.1016/j.jagp.2022.12.001

115. Mukadam N, Marston L, Lewis G, Livingston G. Risk factors, ethnicity and dementia: a UK Biobank prospective cohort study of White, South Asian and Black participants. *PLoS One.* 2022;17(10):e0275309. doi:10.1371/journal.pone.0275309

116. Hayes-Larson E, Ikesu R, Fong J, et al. Association of education with dementia incidence stratified by ethnicity and nativity in a cohort of older Asian American individuals. *JAMA Netw Open.* 2023;6(3):e231661-e231661. doi:10.1001/jamanetworkopen.2023.1661

117. Li JM, Boustani MA, French DD. Social determinants of health in community-dwelling dementia patients aged 65 and over: analysis of the 2019 national health interview survey. *Gerontol Geriatr Med.* 2023;9:23337214231190244. doi:10.1177/23337214231190244

118. Higgins Tejera C, Ware EB, Kobayashi LC, et al. Decomposing interaction and mediating effects of race/ethnicity and circulating blood levels of cystatin C on cognitive status in the United States health and retirement study. *Front Hum Neurosci.* 2023;17:1052435. doi:10.3389/fnhum.2023.1052435

119. Kornblith E, Bahorik A, Boscardin WJ, Xia F, Barnes DE, Yaffe K. Association of race and ethnicity with incidence of dementia among older adults. *JAMA*. 2022;327(15):1488-1495. doi:10.1001/jama.2022.3550

120. Lim U, Wang S, Park SY, et al. Risk of Alzheimer's disease and related dementia by sex and race/ethnicity: the Multiethnic Cohort Study. *Alzheimers Dement*. 2022;18(9):1625-1634. doi:10.1002/alz.12528

121. Mukadam N, Marston L, Lewis G, Mathur R, Rait G, Livingston G. Incidence, age at diagnosis and survival with dementia across ethnic groups in England: a longitudinal study using electronic health records. *Alzheimers Dement*. 2023;19(4):1300-1307. doi:10.1002/alz.12774

122. Younan D, Wang X, Gruenewald T, et al. Racial/ethnic disparities in Alzheimer's disease risk: role of exposure to ambient fine particles. *J Gerontol A Biol Sci Med Sci*. 2022;77(5):977-985. doi:10.1093/gerona/glab231

123. Selten J-P, Termorshuizen F, van Sonsbeek M, Bogers J, Schmand B. Migration and dementia: a meta-analysis of epidemiological studies in Europe. *Psychol Med*. 2021;51(11):1838-1845. doi:10.1017/S0033291720000586

124. Garcia MA, Ortiz K, Arévalo SP, et al. Age of migration and cognitive function among older Latinos in the United States. *J Alzheimers Dis*. 2020;76(4):1493-1511. doi:10.3233/JAD-191296

125. Wong R, Wang Y. Role of neighborhood physical disorder and social cohesion on racial and ethnic disparities in dementia risk. *J Aging Health*. 2022;34(9-10):1178-1187. doi:10.1177/08982643221101352

126. Fujihara S, Tsuji T, Nakagomi A, et al. Association of community-level social capital with dementia: a multilevel nine-year longitudinal study using data from the Japan Gerontological Evaluation Study. *Soc Sci Med*. 2023;338:116316. doi:10.1016/j.socscimed.2023.116316

127. Tani Y, Fujiwara T, Kondo K. Adverse childhood experiences and dementia: interactions with social capital in the Japan Gerontological Evaluation Study Cohort. *Am J Prev Med*. 2021;61(2):225-234. doi:10.1016/j.amepre.2021.01.045

128. Guo Y, Li Q, Yang X, et al. Prevalence of Alzheimer's and related dementia diseases and risk factors among transgender adults, Florida, 2012–2020. *Am J Public Health*. 2022;112(5):754-757. doi:10.2105/AJPH.2022.306720

129. Koga C, Tsuji T, Hanazato M, Takasugi T, Kondo K. Types of elder abuse and Dementia onset among older adults in Japan: a 6-year longitudinal study from the Japan Gerontological Evaluation Study. *Arch Gerontol Geriatr*. 2022;100:104656. doi:10.1016/j.archger.2022.104656

130. Leung F-H, Thompson K, Weaver DF. Evaluating spousal abuse as a potential risk factor for Alzheimer's disease: rationale, needs and challenges. *Neuroepidemiology*. 2006;27(1):13-16. doi:10.1159/000093894

131. Tani Y, Fujiwara T, Kondo K. Association between adverse childhood experiences and dementia in older Japanese adults. *JAMA Netw Open*. 2020;3(2):e1920740. doi:10.1001/jamanetworkopen.2019.20740

132. Roberts AL, Zafonte R, Chibnik LB, et al. Association of adverse childhood experiences with poor neuropsychiatric health and dementia among former professional US football players. *JAMA Netw Open*. 2022;5(3):e223299. doi:10.1001/jamanetworkopen.2022.3299

133. Cations M, Keage HA, Laver KE, Byles J, Loxton D. Intimate partner violence and risk for mortality and incident dementia in older women. *J Interpers Violence*. 2022;37(5-6):NP2605-NP2625. doi:10.1177/0886260520943712

134. Hanes DW, Clouston SA. Cognitive aging in same-and different-sex relationships: comparing age of diagnosis and rate of cognitive decline in the health and retirement study. *Gerontology*. 2023;69(3):356-369. doi:10.1159/000526922

135. Perales-Puchalt J, Gauthreaux K, Flatt J, et al. Risk of dementia and mild cognitive impairment among older adults in same-sex relationships. *Int J Geriatr Psychiatry*. 2019;34(6):828-835. doi:10.1002/gps.5092

136. Huque H, Eramudugolla R, Chidiac B, et al. Could country-level factors explain sex differences in dementia incidence and prevalence? A systematic review and meta-analysis. *J Alzheimers Dis*. 2023;91(4):1231-1241. doi:10.3233/JAD-220724

137. Javed Z, Haisum Maqsood M, Yahya T, et al. Race, racism, and cardiovascular health: applying a social determinants of health framework to racial/ethnic disparities in cardiovascular disease. *Circ: Cardiovasc Qual and Outcomes*. 2022;15(1):e007917. doi:10.1161/CIRCOUTCOMES.121.007917

138. Dolezsar CM, McGrath JJ, Herzig AJ, Miller SB. Perceived racial discrimination and hypertension: a comprehensive systematic review. *Health Psychol*. 2014;33(1):20-34. doi:10.1037/a0033718

139. Cuffee YL, Hargraves JL, Rosal M, et al. Reported racial discrimination, trust in physicians, and medication adherence among inner-city African Americans with hypertension. *Am J Public Health*. 2013;103(11):e55-e62. doi:10.2105/AJPH.2013.301554

140. Greer TM. Perceived racial discrimination in clinical encounters among African American hypertensive patients. *J Health Care Poor Underserved*. 2010;21(1):251-263. doi:10.1353/hpu.0.0265

141. van der Heide FCT, Valeri L, Dugravot A, et al. Role of cardiovascular health factors in mediating social inequalities in the incidence of dementia in the UK: two prospective, population-based cohort studies. *eClinicalMedicine*. 2024;70:102539. doi:10.1016/j.eclinm.2024.102539

142. Ikram UZ, Snijder MB, Agyemang C, et al. Perceived ethnic discrimination and the metabolic syndrome in ethnic minority groups: the healthy life in an urban setting study. *Psychosom Med*. 2017;79(1):101-111. doi:10.1097/PSY.0000000000000350

143. Vargas SM, Huey Jr SJ, Miranda J. A critical review of current evidence on multiple types of discrimination and mental health. *Am J Orthopsychiatry*. 2020;90(3):374-390. doi:10.1037/ort0000441

144. Pascoe EA, Lattanner MR, Richman LS. Meta-analysis of interpersonal discrimination and health-related behaviors. *Health Psychol*. 2022;41(5):319-331. doi:10.1037/hea0001147

145. Siette J, Meka A, Antoniades J. Breaking the barriers: overcoming dementia-related stigma in minority communities. *Frontiers in Psychiatry*. 2023;14:1278944. doi:10.3389/fpsyt.2023.1278944

146. Marmot M, Allen J, Bell R, Bloomer E, Goldblatt P. WHO European review of social determinants of health and the health divide. *Lancet*. 2012;380(9846):1011-1029. doi:10.1016/S0140-6736(12)61228-8

147. Trivedi RB, Post EP, Sun H, et al. Prevalence, comorbidity, and prognosis of mental health among US veterans. *Am J Public Health*. 2015;105(12):2564-2569. doi:10.2105/AJPH.2015.302836

148. Fargo J, Metraux S, Byrne T, et al. Prevalence and risk of homelessness among US veterans. *Prev Chronic Dis*. 2012;9:E45. doi:10.5888/pcd9.110112

149. Li Y, Zeng Z, Zhuang Z, et al. Polysocial and polygenic risk scores and all-cause dementia, Alzheimer's disease, and vascular dementia. *J Gerontol A Biol Sci Med Sci*. 2024;79(3):glad262. doi:10.1093/gerona/glad262

150. Figueroa JF, Frakt AB, Jha AK. Addressing social determinants of health: time for a polysocial risk score. *JAMA*. 2020;323(16):1553-1554. doi:10.1001/jama.2020.2436

151. Branca F, Lartey A, Oenema S, et al. Transforming the food system to fight non-communicable diseases. *BMJ*. 2019;364:l296. doi:10.1136/bmj.l296

152. Dear KB, McMichael AJ. *The Health Impacts of Cold Homes and Fuel Poverty*. British Medical Journal Publishing Group; 2011. https://www.instituteofhealthequity.org/resources-reports/the-health-impacts-of-cold-homes-and-fuel-poverty/the-health-impacts-of-cold-homes-and-fuel-poverty.pdf

153. van Bergen AP, Wolf JR, Badou M, et al. The association between social exclusion or inclusion and health in EU and OECD countries: a systematic review. *Eur J Public Health*. 2019;29(3):575-582. doi:10.1093/eurpub/cky143

154. World Health Organization. Preferred product characteristics of blood-based biomarker diagnostics for Alzheimer disease. 2024; Accessed July 23, 2025. https://www.who.int/publications/i/item/9789240099067

155. Schisterman EF, Cole SR, Platt RW. Overadjustment bias and unnecessary adjustment in epidemiologic studies. *Epidemiology*. 2009;20(4):488-495. doi:10.1097/EDE.0b013e3181a819a1

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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