

Risk factors for voluntary early old-age retirement in middle-aged workers: A meta-analysis

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Objective This meta-analysis aimed to identify sociodemographic, lifestyle, work-related and health risk factors for voluntary early old-age retirement among middle-aged workers.

Methods Searches were conducted in PubMed, Web of Science, PsycInfo, and Scopus from their inception until February 2025. Observational longitudinal studies involving workers aged 40–64 years were included. Two reviewers evaluated the methodological quality of the studies. A random-effects meta-analysis was performed, and heterogeneity and publication bias were assessed.

Results From 13 899 publications, 23 longitudinal studies (N=2 270 430 participants) were included. The following factors were associated with an increased risk of early old-age retirement: age [hazard ratio (HR) 1.35, 95% CI (confidence interval) 1.12–1.63 per year increase], overweight or obesity (HR 1.10, 95% CI 1.03–1.17), physically demanding work (HR 1.29, 95% CI 1.05–1.59), low job control (HR 1.14, 95% CI 1.11–1.17), low influence at work (HR 1.10, 95% CI 1.02–1.19), low organizational justice (HR 1.27, 95% CI 1.10–1.46), lack of skills and knowledge development (HR 2.16, 95% CI 1.63–2.85), suboptimal self-rated general health (HR 1.22, 95% CI 1.12–1.34), chronic physical conditions (HR 1.11, 95% CI 1.05–1.17), and depressive symptoms (HR 1.34, 95% CI 1.12–1.61). Conversely, a lower risk was found among individuals who were unmarried, separated, or widowed (HR 0.74, 95% CI 0.60–0.91).

Conclusions This meta-analysis underscores the impact of overweight, physical and psychosocial work factors, lacking skills and knowledge development and health conditions on early old-age retirement risk among middle-aged workers. Targeted interventions to encourage healthy lifestyles, foster a supportive work environment, and promote mental health may help to reduce early old-age retirement risk.

Key terms depression; employment; health status; mental health; occupational exposure.

With a growing elderly population due to increased life expectancy and declining birth rates, the retirement age has been progressively rising across the Organisation for Economic Cooperation and Development (OECD) countries (1, 2). Concurrently, the approval criteria for disability retirement have become more stringent (1, 2). As a result, there has been a surge in the number of individuals opting for voluntary early old-age retirement, a trend that may have disproportionately impacted blue- compared to white-collar workers (1). To address these challenges and alleviate financial pressures on pension systems, several countries, particularly within the OECD, are shifting from voluntary early old-age retirement to part-time retirement options to extend

working lives (2). Voluntary early old-age retirement is a common pathway out of working life, with unemployment and disability retirement being other common exit routes (3–5).

Worldwide, there has been an increase in health risk factors such as obesity, sedentary lifestyles, and chronic conditions like diabetes, mental health conditions, and musculoskeletal disorders (6, 7). This rise in health concerns is linked to higher rates of early retirement or unemployment (5). In addition to health risks, previous research has shown that age (4, 8) and certain occupational factors – such as low influence at work, low levels of social capital and low organizational justice (9, 10) – are associated with the increased rates of voluntary

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early old-age retirement. However, previous studies have reported contradictory results regarding the role of sex (4, 11), education (8, 11) and occupational class (8, 12) in voluntary early old-age retirement. The risk is higher for individuals who have the financial means to stop working before the retirement age and for those whose partners have a positive attitude toward early retirement (13).

While some risk factors for voluntary early old-age retirement among middle-aged workers have been identified, there remains a significant gap in comprehensive information regarding these factors. To effectively extend working careers of aging workers, it is crucial to pinpoint both individual and work-related risk factors that contribute to voluntary early old-age retirement. This understanding is essential for developing targeted preventive interventions and programs. In our current study, we aimed to address this gap by conducting a systematic review and meta-analysis of observational longitudinal studies. Our objective was to estimate the magnitudes of the effects of various sociodemographic, lifestyle, occupational factors, and health conditions on the risk of voluntary early old-age retirement among middle-aged individuals.

Methods

Search strategy

Our review protocol and meta-analysis were developed in accordance with the PRISMA statement (14). We conducted a comprehensive search of PubMed, Web of Science, PsycInfo, and Scopus databases from their inception until February 2025, using a combination of MeSH terms and text words as detailed in table 1. Within the PI(E)COTS framework, we focused on ‘P’ (population) to limit our search to middle-aged workers and ‘O’ (outcome) to create a sensitive search string, ensuring no relevant studies were overlooked. We did not use ‘I(E)’ (intervention/exposure for observational studies), ‘C’ (control/comparison group), or ‘S’ (setting) in our search string. We applied a filter for ‘T’ (types of studies) to exclude clinical trials and reviews but did not restrict the search by publication year (15). Additionally, we extended our search to include Google Scholar and manually searched the reference lists of included reports and seven previous systematic reviews on disability retirement (16–22).

Inclusion and exclusion criteria

This review included longitudinal studies focusing on middle-aged employees, specifically those aged 45–64

years. Recognizing that many studies targeted individuals aged ≥ 40 , we expanded our inclusion criteria to encompass studies involving workers aged 40–64 years. These studies needed to examine a risk factor related to voluntary early old-age retirement, disability retirement, unemployment, or job change. In this review, we focus exclusively on voluntary early old-age retirement, defined as retirement before the country-specific minimum official retirement age (13, 23, 24). We excluded research involving clinical subjects, individuals who were exclusively unemployed, solely on sick leave, or already retired. Furthermore, studies that combined different forms of labor market exits into a single outcome, such as combining voluntary early old-age retirement with unemployment or disability retirement, were also excluded.

Quality assessment

Two reviewers independently assessed the methodological quality of the studies using criteria adapted from the Effective Public Health Practice Project quality assessment tool (supplementary material, www.sjweh.fi/article/4241, table S1) (25). The evaluation focused on five key potential biases: selection, performance, detection, attrition, and confounding, as detailed in supplementary figures S1–S2. Any disagreements between the reviewers were resolved through discussion.

Risk factors

The risk factors included sociodemographic factors, lifestyle habits, occupational factors, and health conditions. The sociodemographic factors included age, sex, marital status, education, and occupational class. Lifestyle factors encompassed smoking, body mass index (BMI), leisure-time physical activity, and excessive alcohol consumption. Occupational factors comprised physical and psychosocial factors at work, as well as opportunities for skills and knowledge development. Health conditions ranged from self-rated general health to daily activity limitations and included both physical and mental conditions.

Voluntary early old-age retirement

Voluntary early old-age retirement involves choosing to leave the workforce before reaching the official retirement age, either partially or fully. This decision is often supported by programs like the Voluntary Retirement Scheme (eg, in some Nordic countries), which provide employees with the option to retire early and receive benefits (13). The Voluntary Retirement Scheme requires a minimum retirement age, which is the earliest age at which an individual can opt to retire and start

Table 1. Searches performed on PubMed, Web of Science, and Scopus on 12 February 2025.

Search	Query	Items found (N)
PubMed		
#1	"Unemployment"[Mesh] OR "disability pension"[tiab] OR "disability retirement"[tiab] OR "early retirement"[tiab] OR "retired early"[tiab] OR "labor market exit"[tiab] OR "labour market exit"[tiab] OR "personnel turnover"[Mesh] OR (quit[tiab] AND job[tiab]) OR (quit[tiab] AND organization[tiab]) OR (quit[tiab] AND organisation[tiab]) OR (quit[tiab] AND employment[tiab])	18 447
#2	"Middle aged"[Mesh] OR "old people"[tiab] OR "older people"[tiab] OR "old individuals"[tiab] OR "older individuals"[tiab] OR "old participants"[tiab] OR "older participants"[tiab] OR "old workers"[tiab] OR "older workers"[tiab] OR "40 years"[tiab] OR "45 years"[tiab] OR "50 years"[tiab] OR "55 years"[tiab] OR "60 years"[tiab]	5 133 746
#3	#1 AND #2	6656
#4	clinical trials and reviews	308
#5	#3 NOT #4	6348
Web of Science		
#1	ALL=(unemploy*) OR ALL=("disability pension") OR ALL=("disability retirement") OR ALL=("early retire*") OR ALL=("retired early") OR ALL=("labor market exit") OR ALL=("labour market exit") OR ALL=("personnel turnover") OR ALL=(quit AND job) OR ALL=(quit AND organization) OR ALL=(quit AND organisation) OR ALL=(quit AND employment)	73 204
#2	ALL=("middle aged") OR ALL=("middle age") OR ALL=("old people") OR ALL=("older people") OR ALL=("old individuals") OR ALL=("older individuals") OR ALL=("old participants") OR ALL=("older participants") OR ALL=("old workers") OR ALL=("older workers") OR ALL=("40 years") OR ALL=("45 years") OR ALL=("50 years") OR ALL=("55 years") OR ALL=("60 years")	496 445
#3	#1 AND #2	3414
#4	reviews, proceeding abstracts, meeting abstracts, letters, and editorials	164
#5	#3 NOT #4	3250
Scopus		
#1	TITLE-ABS-KEY (unemployment OR "disability pension" OR "disability retirement" OR "early retirement" OR "retired early" OR "labor market exit" OR "labour market exit" OR "personnel turnover" OR "quit job" OR "quit organization" OR "quit organisation" OR "quit employment")	95 230
#2	TITLE-ABS ("Middle aged" OR "old people" OR "older people" OR "old individuals" OR "older individuals" OR "old participants" OR "older participants" OR "old workers" OR "older workers" OR "40 years" OR "45 years" OR "50 years" OR "55 years" OR "60 years")	658 106
#3	#1 AND #2	3315
#4	Limited to articles and English	2655

receiving retirement benefits. This age varies by country and is influenced by factors such as national policies, economic conditions, and life expectancy (9, 13, 23, 26). Voluntary early old-age retirement is not based on health conditions and can also be applied to individuals who do not qualify for disability retirement (12). In many countries, this type of retirement is available to individuals with paid employment starting at age 61 (12, 23). However, programs like the Voluntary Retirement Scheme allow for earlier retirement under specific conditions, providing greater flexibility for employees.

Statistical analysis

When encountering multiple reports from a single study, we prioritized extracting data from those that provided more thorough adjustments for confounding variables or included a larger sample size. For each study, we obtained the most adjusted risk estimates and their 95% confidence intervals (CI) for the exposures. Two studies (4 reports) (23, 27–29) presented findings for two outcomes: voluntary early old-age retirement without income and voluntary early old-age retirement with income. Another study (30) provided results for voluntary early old-age retirement before age 55 and for voluntary early old-age retirement at ≥ 55 years. For these studies, we included voluntary early old-age retirement with income and voluntary early old-age retirement at age ≥ 55 in the meta-analyses.

Three studies compared the risk of voluntary early old-age retirement for men with that for women (4, 8, 11). To combine these studies with others that compared the risk for women with that for men, we inverted the men's hazard ratio (HR) to derive the HR for women and used the standard error of the men's estimate to calculate the 95% CI. To examine the effects of education and occupational class on voluntary early old-age retirement, we recalculated the adjusted HR by comparing workers with ≤ 12 years of education with those with > 12 years of education (4, 8, 11, 12, 27, 31, 32) and workers in intermediate and low occupational classes with those in high occupational class (8, 12, 33). Another study (10) compared past and never smokers with current smokers. To compare past and current smokers with never smokers, we first inverted the HR for never smokers to obtain the HR for current smokers and divided the HR for past smokers by that of never smokers. We then used the standard error of the never smokers' estimate to calculate the 95% CI for current smokers. A different study (3) compared lack of physical activity with moderate or vigorous physical activity. To combine this study with another (10) that compared moderate or vigorous physical activity with lack of physical activity, we inverted the HR for lack of physical activity to obtain the HR for moderate or vigorous physical activity and used the standard error of the lack of physical activity estimate to calculate the 95% CI.

One study (11) compared healthy workers with those diagnosed with a chronic physical condition. To estimate the effect of a chronic physical condition on the likelihood of voluntary early old-age retirement, we inverted the estimate for healthy workers and used the average standard errors of chronic obstructive pulmonary disease, heart failure, and diabetes to calculate 95% CI. Additionally, logistic regression was employed to identify risk factors for voluntary early old-age retirement in this study. We converted the odds ratios and their 95% CI to risk ratios, noting that 22.5% of the participants retired early during the follow-up period. We used a fixed-effect meta-analysis to integrate subgroups within a single study and a restricted maximum likelihood (REML) random-effects meta-analysis to synthesize findings from various studies (34). Meta-regression was employed to explore sources of variability in effect sizes across different studies (34). A funnel plot was used to examine publication bias, and Egger's regression test was used to assess the asymmetry of the funnel plot (34). Additionally, the trim-and-fill method was applied to impute potentially missing studies due to publication bias (34). Borderline statistical significance was defined as a $P > 0.05$ but < 0.10 . Stata version 18, (StataCorp, College Station, TX, USA) was used for conducting the meta-analyses.

Results

A total of 12 899 reports were collected from PubMed, Web of Science, PsycInfo and Scopus, as shown in figure 1. The first reviewer screened the titles and abstracts, including the first 1000 results from Google Scholar, bringing the total to 13 899. Of these, 12 935 duplicates and ineligible publications were excluded. Subsequently, 964 articles were examined in full to assess their relevance, with most of these full-text articles screened to determine the age of the participants, which was not reported in the abstracts. Of these, 907 were excluded for not studying voluntary early old-age retirement and 25 studies (35–59) failed to meet the inclusion criteria. This review ultimately encompassed 32 reports (3–5, 8–13, 23, 24, 26–33, 60–72), which included 23 longitudinal studies involving 2 270 430 participants. The results of seven studies were detailed across 19 distinct reports, while the findings from four studies were consolidated into a single report. The number of participants in the studies ranged from 1167 to 1 000 000 individuals (supplementary table S2). The distribution of the 23 studies includes seven from Denmark, six from the Netherlands, three from Sweden, two from Norway, and one each from Finland, France, Germany, and the United Kingdom. Additionally, one study included participants

from 11 different European countries: Austria, Belgium, Denmark, France, Germany, Greece, Italy, Spain, Sweden, Switzerland, and the Netherlands.

Methodological quality of the studies

Six studies were assessed as having a low risk of selection bias, twelve were rated as moderate risk, and five were identified as high risk, as detailed in supplementary figure S1. For performance bias, three studies were rated as low risk, while nineteen studies were considered moderate risk, as shown in supplementary figures S1–S2. Additionally, one study (3 reports) was considered to have a low risk of bias for some exposures (23, 29) and a moderate risk for another exposure (28). Regarding detection bias, fourteen studies were evaluated as low risk, and nine as moderate risk. In terms of confounding, six studies were deemed to have a low risk of bias, having accounted for most confounding factors. Fourteen studies were rated as having a moderate risk of bias, as they only adjusted for some confounders in their observed associations, and one study (32) was rated as having a high risk. Additionally, two studies (six reports) were considered to have a low risk of bias for some exposures (3, 64) and a moderate risk for others (5, 63, 68, 69). One study was rated to have a moderate risk for one exposure (23) and a high risk for other exposures (28, 29). Concerning attrition bias, fifteen studies were considered low risk, six moderate risk, and one study was marked as high risk. Furthermore, one study (four reports) was rated as having a low risk of attrition bias for one report (13), but a moderate risk for other reports (4, 24, 67).

Meta-analysis

Sociodemographic factors. A 1-year increase in age was associated with voluntary early old-age retirement, with a HR of 1.35 (95% CI 1.12–1.63, table 2 and supplementary figure S3). The heterogeneity was high (99.7%) and was not accounted for by the methodological quality or sample size of the included studies. Additionally, excluding two studies (12, 71) that showed a small effect did not alter the heterogeneity. There was no significant difference in the risk of voluntary early old-age retirement between men and women (HR 1.07, 95% CI 0.81–1.40, six studies, figure 2A), between individuals with 12 years or less education and those with higher levels of education (HR 1.05, 95% CI 0.88–1.25, seven studies, figure 2B) nor between different occupational classes (supplementary figure S4). The risk was lower for single, divorced, or widowed workers compared to married or cohabiting workers (HR 0.74, 95% CI 0.60–0.91, four studies, table 2 and supplementary figure S5).

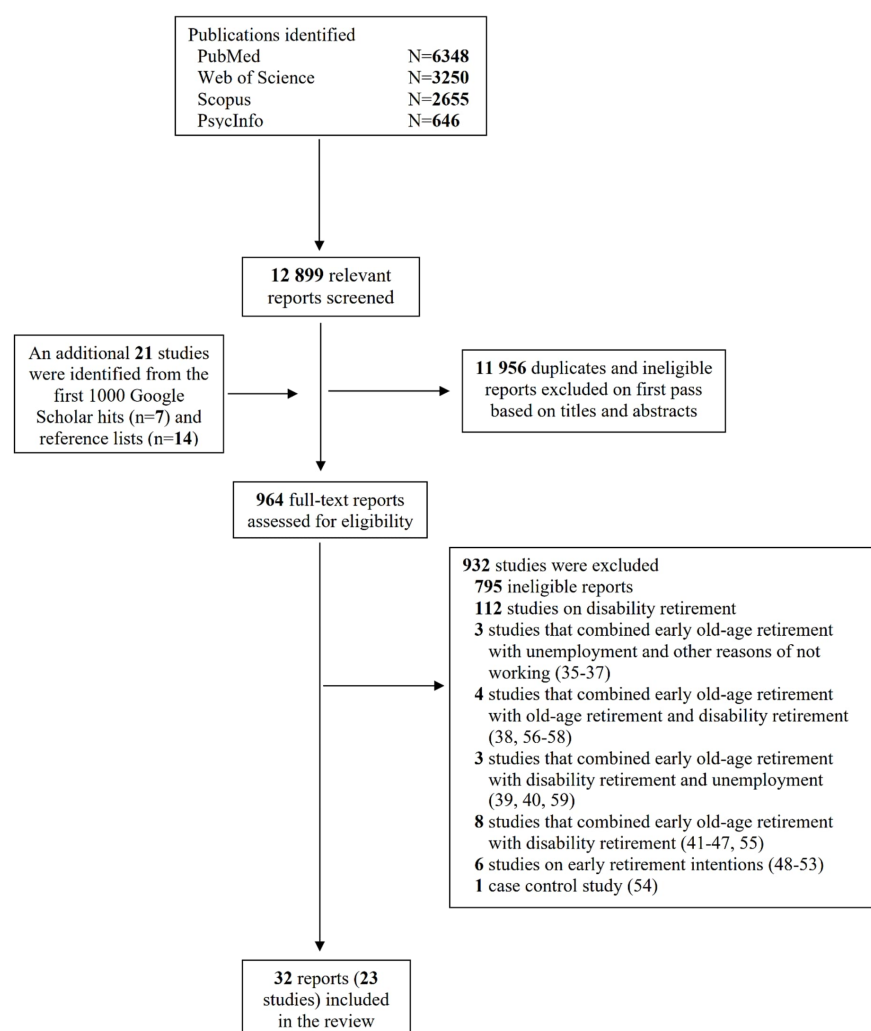


Figure 1. PRISMA flow diagram of the studies selection.

Lifestyle factors. Overweight individuals (BMI 25.0–29.9 kg/m²) had an increased risk of voluntary early old-age retirement (HR 1.11, 95% CI 1.04–1.19, two studies, supplementary figure S6). The estimate for obesity (BMI ≥ 30.0 kg/m²) did not reach statistical significance due to low statistical power. The HR for overweight or obesity (BMI ≥ 25.0 kg/m²) was 1.10 (95% CI 1.03–1.17). Smoking was not related to voluntary early old-age retirement (supplementary figure S7), whereas moderate or high levels of alcohol consumption were associated with a small excess risk of voluntary early old-age retirement (HR 1.05, 95% CI 1.01–1.10, three studies, supplementary figure S8). Individuals with moderate or vigorous levels of physical activity during leisure time were more likely to retire early than those with low levels of leisure-time physical activity (HR 1.13, 95% CI 1.04–1.22, two studies, supplementary figure S9).

Occupational factors. The following occupational factors were associated with an increased risk of voluntary early old-age retirement: physically demanding work (HR

1.29, 95% CI 1.05–1.59, five studies, figure 3A), low job control (HR 1.14, 95% CI 1.11–1.17, three studies, figure 3B), low influence at work (HR 1.10, 95% CI 1.02–1.19, two studies, figure 3B), low organizational justice (HR 1.27, 95% CI 1.10–1.46, two studies, figure 3C), and limited opportunities for skills and knowledge development (HR 2.16, 95% CI 1.63–2.85, two studies, figure 3D). High emotional demands, low job rewards, low social support, low predictability at work, and poor quality of management were not identified as factors contributing to voluntary early old-age retirement (supplementary figures S10–S14).

Health conditions. Suboptimal self-rated general health (HR 1.22, 95% CI 1.12–1.34, eleven studies), chronic physical conditions (HR 1.11, 95% CI 1.05–1.17, five studies), and depressive symptoms (HR 1.34, 95% CI 1.12–1.61, six studies) were associated with increased risk of voluntary early old-age retirement (table 2 and figure 4). Mental health conditions (HR 1.16, 95% CI 0.99–1.37, eleven studies, P=0.07, supplementary figure

Table 2. Risk factors of voluntary early old-age retirement.

Risk factor	No. of studies	Sample	HR	95% CI	I ² statistic (%)
Sociodemographic factors					
Age, 1-year increase	5	88 522	1.35	1.12–1.63	99.7
Female sex	6	704 343	1.07	0.81–1.40	96.8
Marital status (unmarried, separated, or widowed vs. married or cohabiting)	4	1 084 546	0.74	0.60–0.91	97.0
Education, 12 years or less vs. higher level	7	2 193 988	1.05	0.88–1.25	99.8
Occupational class (ref: high)					
Intermediate	3	66 599	0.95	0.69–1.30	91.1
Low	3	66 599	0.85	0.39–1.82	97.4
Lifestyle factors					
Smoking					
Ever	2	10 461	1.01	0.97–1.06	0
Past	2	10 461	1.00	0.93–1.08	0
Current	2	10 461	1.02	0.97–1.08	0
Body mass index					
Overweight	2	10 461	1.11	1.04–1.19	0
Obesity	2	10 461	1.05	0.92–1.19	0
Overweight or obesity	2	10 461	1.10	1.03–1.17	0
Moderate or vigorous physical activity	2	10 461	1.13	1.04–1.22	0
Excessive alcohol intake	3	18 903	1.05	1.01–1.10	0
Occupational factors					
Physically demanding work	6	141 545	1.22	1.00–1.49	95.7
High emotional demands	3	10 390	1.01	0.93–1.09	0
Low influence at work	2	7 414	1.10	1.02–1.19	0
Low job control	3	129 070	1.14	1.11–1.17	0
Low job rewards	2	5 288	1.06	0.95–1.18	0
Low social support	2	8 514	1.07	0.95–1.21	54.9
Low predictability at work	2	2 241	0.88	0.57–1.36	64.2
Low quality of management	2	5 495	1.10	0.97–1.26	48.4
Low organizational justice	2	5 130	1.27	1.10–1.46	0
Low possibilities of skills and knowledge development	2	4 193	2.16	1.63–2.85	0
Health conditions					
Suboptimal self-rated general health (poor/moderate vs. good/excellent)	11	84 191	1.22	1.12–1.34	46.4
Mental health conditions					
Depressive symptoms	6	15 314	1.34	1.12–1.61	39.6
Chronic physical conditions	5	644 665	1.11	1.05–1.17	0
Musculoskeletal disorders	2	64 176	1.10	0.98–1.22	0
Cardiovascular disease	3	641 620	1.16	0.98–1.37	57.6
Respiratory diseases	3	691 454	1.08	0.99–1.19	22.1
Diabetes	3	641 620	1.02	0.96–1.09	15.1
Daily activity limitations	5	16 338	1.16	0.99–1.36	0

S15), experiencing daily activity limitations (HR 1.16, 95% CI 0.99–1.36, $P=0.07$, five studies, supplementary figure S16), cardiovascular disease (HR 1.16, 95% CI 0.98–1.37, $P=0.09$, three studies, supplementary figure S17), and respiratory disease (HR 1.08, 95% CI 0.99–1.19, $P=0.09$, three studies, supplementary figure S18) were borderline statistically significantly associated with an increased risk of voluntary early old-age retirement. However, musculoskeletal disorders, and diabetes did not show a significant contribution to the risk (supplementary figures S19–S20). Meta-regression showed that the observed differences in effect size across various studies on self-rated general health, mental health conditions and depressive symptoms appeared to be independent of the methodological quality of the studies. However, for mental health conditions, smaller

studies showed a larger effect size compared to larger studies. The pooled HR was 1.40 (95% CI 1.04–1.88, $N=7840$) for five smaller studies and 1.06 (95% CI 0.90–1.25, $N=209\,670$) for six larger studies. There was no evidence of publication bias (supplementary figures S21–S22). In fact, using the trim-and-fill method suggested that four small studies showing a significant association were missing from the right side of the funnel plots for self-rated general health (supplementary figure S23).

Discussion

The findings of this study indicate that for 40–64-year-old individuals, factors such as excess body mass, physically demanding jobs, psychosocial risk factors at work, lack of skills and knowledge development, suboptimal self-rated general health, and physical and mental health conditions are associated with an increased risk of voluntary early old-age retirement. These results suggest that to prolong the working careers of aging workers, it is essential to avoid overweight, ensure favorable physical and psychosocial working conditions, and maintain good health.

As expected, we found that older workers are more likely to retire early than younger workers. This trend is influenced by several factors: older workers often face health issues, experience layoffs, or feel dissatisfied with their work (73). Additionally, they may retire early to take care of family members or because they have accumulated sufficient savings (73). However, the rate of voluntary early old-age retirement did not differ between men and women, levels of education and occupational class. The included studies on sex, education and occupational class were highly heterogeneous and reported contradictory results. The lack of differences might be due to universal drivers for voluntary early old-age retirement, such as health issues, desire for leisure, and financial readiness, which can affect individuals regardless of their sex, education, or occupational class. Additionally, many retirement policies and incentives are designed to be broadly applicable, ensuring that all eligible employees, regardless of their background, have similar opportunities to retire early.

We observed that unpartnered (single, divorced, and/or widowed) older workers were less likely to voluntarily retire early compared to their partnered counterparts. A previous study suggested that the social significance of work partially mediated the link between marital status and early retirement by offering regular social interaction, which particularly benefited unpartnered older workers (74). Unpartnered older workers do not have a spouse at home who might prefer their partner

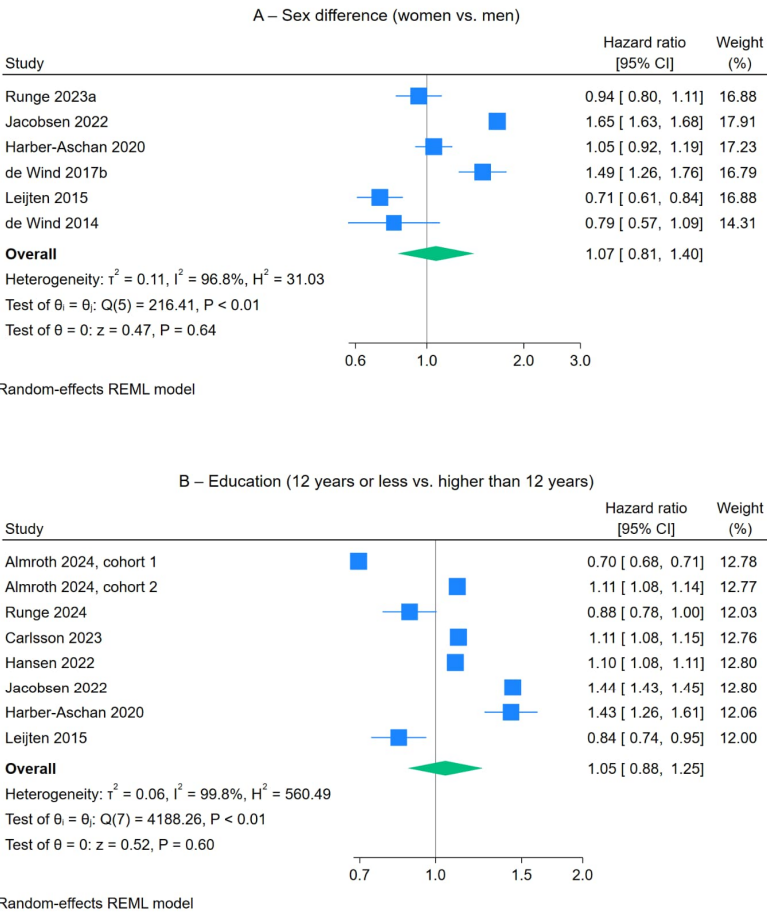


Figure 2. The effects of sex (A) and education (B) on voluntary early old-age retirement risk.

to retire early (74). Conversely, workers with a partner who holds a positive attitude towards early retirement are more likely to retire early compared to those whose partners have a negative or neutral attitude or those without a partner (13). Furthermore, workers who have the financial means to stop working before reaching the official retirement age are more likely to opt for early retirement (13). This financial capability is often more common among partnered workers, as they may benefit from dual incomes and shared financial responsibilities, making early retirement a more feasible option.

Overweight and excessive alcohol consumption have been found to increase the risk of voluntary early old-age retirement. However, the pooled estimates were derived from only two studies on overweight/obesity and three studies on alcohol consumption, and the observed effects were relatively small. The two studies on obesity included in the analysis had low statistical power, which limits the reliability of their findings. Similarly, the overall meta-analysis also suffered from low statistical power, indicating a need for further research on this topic. The small effect of excessive alcohol consumption can be attributed to the comparison group used in the studies, which included abstainers, light drinkers, and moderate drinkers. It is important to note that both

abstainers and moderate drinkers are at a higher risk of health conditions, as abstainers often stop drinking due to pre-existing health issues.

Workers who engaged in physical activities during their leisure time were more inclined to voluntarily retire early than those who were inactive. Individuals who prioritize leisure time physical activity might be more disciplined in financial planning and thus financially stable enough to retire early. They may value a balanced lifestyle and seek to retire early to spend more time on activities they enjoy. The observed link between physical activity and voluntary early old-age retirement might be coincidental, as only two studies have explored this connection. These studies categorized physical activity levels in a binary manner, defining “physically active” as engaging in exercise at least once a week or more. This limited scope suggests that further research is needed to confirm and better understand this potential relationship.

We observed higher rates of voluntary early old-age retirement among workers with low influence at work and limited opportunities for skills and knowledge development. This finding supports previous research indicating that a good psychosocial work environment promotes extended employment beyond retirement age (75). While high physical work demands were identified

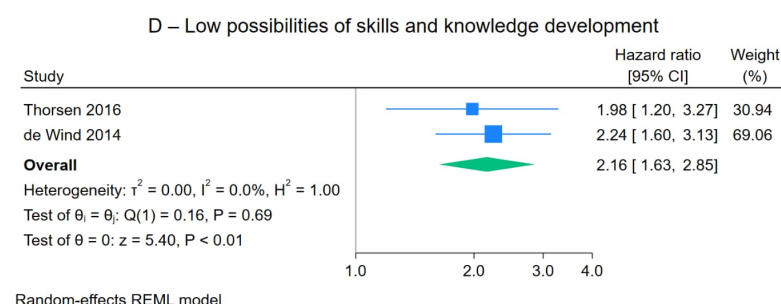
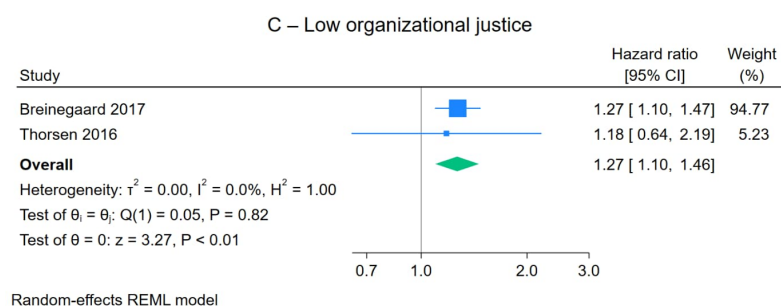
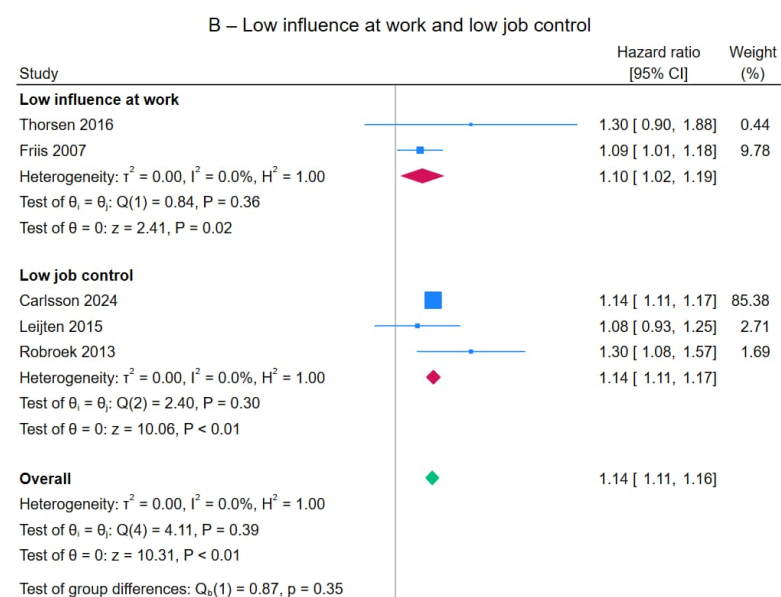
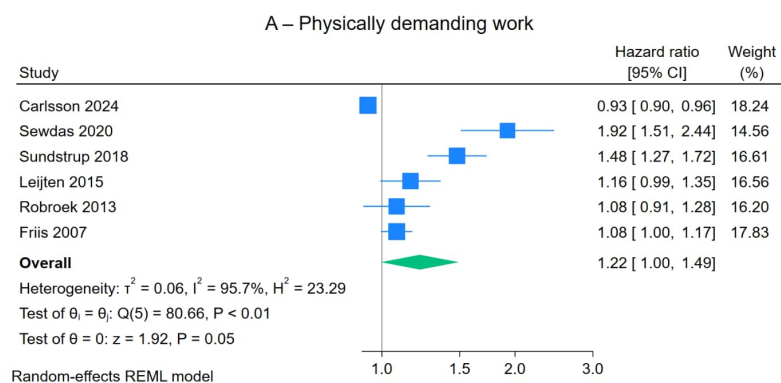


Figure 3. The effects of moderate or high physically demanding work (A), low influence at work and low job control (B), low organizational justice (C), and low possibilities of skills and knowledge development (D) on voluntary early old-age retirement risk.

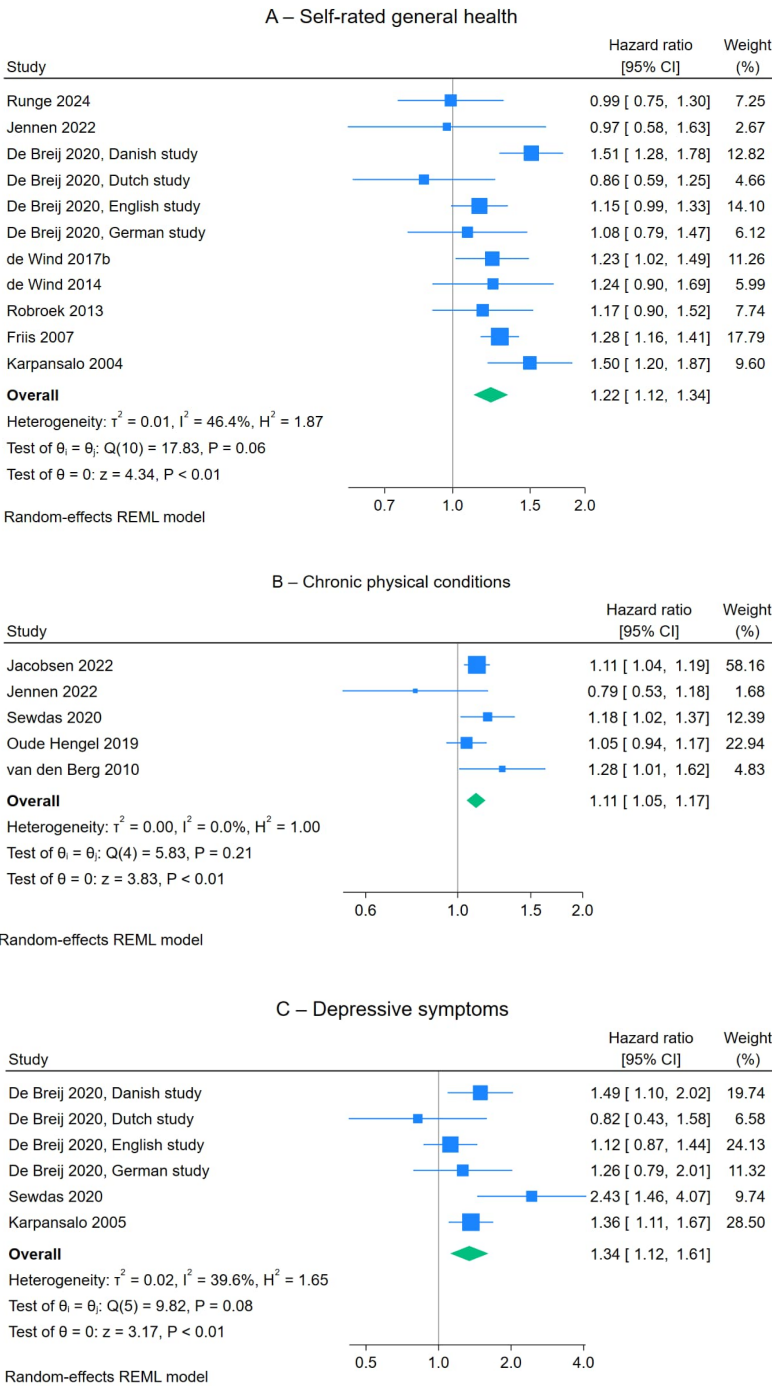


Figure 4. The effects of self-rated general health (A), chronic physical conditions (B), and depressive symptoms (C) on voluntary early old-age retirement.

as a risk factor, a supportive psychosocial work environment appeared to facilitate extended employment even for those in physically demanding jobs (75). A poor psychosocial work environment and poor mental health may act as interconnected barriers to prolonged work careers. Low influence at work is linked to an increased risk of depressive symptoms (76), and poor self-rated general health (77). Additionally, limited opportunities for skills and knowledge development are associated

with a decline in self-rated general health (77) and a higher likelihood of leaving current employment (25). These psychosocial factors may contribute to voluntary early old-age retirement through their impact on mental health conditions. The relationship between poor working conditions and voluntary early old-age retirement is complex and multifaceted. It is plausible that deteriorating mental health acts as a mediator in this association. A study found that effort–reward imbalance increased

the risk of early labor market exit via a decrease in self-rated general health (78). Future research is needed to explore this potential mediation effect. Understanding this relationship could provide valuable insights for developing targeted interventions aimed at improving workplace conditions and supporting mental health, ultimately helping to reduce the incidence of voluntary early old-age retirement.

Physical (11) and mental (63, 70) health conditions are a major cause of labor force exit. Consistent with a previous meta-analysis of five studies (20), we identified an increased risk of voluntary early old-age retirement among middle-aged workers with poor self-rated health. The observed association between poor self-rated health and voluntary early old-age retirement are attributed to both physical and mental health conditions (79). We found that depressive symptoms are associated with a higher risk of voluntary early old-age retirement than physical conditions. In line with our results, a previous study (80) investigating factors associated with extending employment beyond retirement age found that the probability of extended employment was significantly higher in the absence of diagnosed mental disorders and among employees without symptoms of psychological distress, whereas the contribution of somatic conditions was modest. In our meta-analysis, chronic somatic conditions were modestly associated with an increased risk of voluntary early old-age retirement, a finding that aligns with a previous meta-analysis of five studies (20). This study suggests that addressing mental health conditions is crucial to mitigating their impact on voluntary early old-age retirement.

Limitations of the included studies and the review

Each study included in this meta-analysis employed a longitudinal design and most studies recruited a sufficient number of participants, thereby ensuring adequate statistical power to examine risk factors for voluntary early old-age retirement. However, several limitations were identified within these studies. Notably, many studies did not account for a comprehensive range of potential confounding factors, with only 35% adjusting their observed associations for most of these factors. Such omissions could potentially exaggerate the reported associations. Moreover, 39% of the studies relied on self-reported data to assess voluntary early old-age retirement. One study included 16 psychosocial factors in a single multivariable model (64). Some of these factors may be highly correlated. After this overadjustment, the direction of association was even reversed for poor leadership quality and poor predictability. However, these reverse associations were not statistically significant.

This review also encountered certain limitations. For some risk factors, the number of available studies was limited, resulting in low statistical power. Multiple meta-analyses, including those on leisure time physical activity, low influence at work, and low organizational justice, included only two studies. One of these studies was quite small, contributing minimally to the pooled risk estimates. Therefore, these risk estimates should be interpreted with caution. Additionally, a moderate to high level of heterogeneity was observed in certain meta-analyses. Consequently, further large-scale longitudinal studies are required to thoroughly investigate some risk factors. Our research was confined to studies published in English, which may introduce bias, as studies with non-significant findings are more likely to be published in local language journals. Despite this, our analysis encompassed a diverse array of risk factors for voluntary early old-age retirement. Most studies reviewed reported non-significant associations between some risk factors and voluntary early old-age retirement. In our literature search, we included three prominent American databases and the largest European database. Additionally, we used Google Scholar as a complementary resource. Given that PubMed, Web of Science, and Scopus are leading databases, the likelihood of missing significant studies is minimal. Lastly, the included studies were from European countries only. Therefore, the generalizability of our findings may be limited to regions with similar welfare regimes.

Concluding remarks

The findings of this study highlight several key factors associated with an increased risk of voluntary early old-age retirement among middle-aged individuals. Specifically, excess body mass, physically demanding jobs, psychosocial risk factors at work, lack of skills and knowledge development, physical and mental health conditions significantly contribute to voluntary early old-age retirement. However, it is important to note that the number of studies examining some of these risk factors was limited, which may affect the robustness of these findings. To prolong working careers of aging workers, targeted interventions and programs are necessary to address these factors by encouraging healthy lifestyle choices, fostering a supportive work environment, providing opportunities for skill development, improving organizational justice, increasing job influence and control, and promoting health programs and resources to manage health conditions.

Conflict of interest

The authors declare no conflicts of interest.

Ethics Approval

An ethics approval is not required for conducting a systematic review that includes only aggregated data from previously published studies.

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